Netherlands Research School
of Sedimentary Geology

Annual report 2004
Netherlands Research School of Sedimentary Geology (NSG)

Colophon
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Preface

NSG originated in 1994 as a national centre for advanced training, catalysing cooperation between earth sciences departments of the Vrije Universiteit and Universiteit Utrecht.
NSG's advanced training and research has set the stage for an integrated approach to System Earth. The coupling of fundamental research, opportunities, challenges provided by societal needs, and deepening of expertise and process understanding offers an unparalleled platform for NSG researchers to participate and contribute to the themes defined by the Earth and Life Science Council (ALW) of the Netherlands Organisation of Scientific Research (NWO). As a response to a change in the research environment NSG focuses on the following themes:

- Sedimentary basins and continental margins
- Lithosphere, biosphere, climate and surface processes
- Bio- geochemistry and water

Sedimentary basins and dynamics of continental margins form a research theme where the interaction of sedimentation processes and vertical motions of the Earth's crust form the main target. Erosion, denudation and volcanism are studied in comparison of the dynamics of sedimentary basis development.

The relation between climate variability and surface processes is studied in NSG's second theme from a solid-earth perspective.

Bio-geochemical processes are studied in groundwater, oceans and paleo-ecosystems in order to understand the interaction between living organisms and System Earth.

In addition to these themes the Board of NWO has formulated an interdisciplinary focus on System Earth as a whole. It is obvious that Earth Sciences by its nature can play an active role in further shaping this large-scale programme, allowing building out connections with not only exact sciences but also social sciences and economy. These developments go hand in hand with recent initiatives in strengthening research cooperation and advanced training in Europe. National integration is a prerequisite to benefit from the new European Research Area (ERA).

In 2003 the University boards of Vrije Universiteit and Universiteit Utrecht have requested the Royal Netherlands Academy of Arts and Sciences (KNAW) for a peer review NSG in order to obtain an official recognition by the Academy for the period 2004 – 2010. In the summer of 2004 the KNAW accredited NSG officially for the third time.

The annual NSG report 2004 reflects the ambition of NSG and its researchers to actively build on a future for Earth Sciences in a society of continuous change.

Prof. dr. S.A.P.L. Cloetingh
Scientific Director NSG

Netherlands Research School of Sedimentary Geology

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NSG Office

Drs. R.J.G. Kaandorp, Executive Secretary

Mission

The mission of the Netherlands Research School of Sedimentary Geology (NSG) is to promote the understanding of process-oriented aspects of the planet Earth and its impact on energy and environmental issues. To fulfil this mission an integrated approach across the Earth science disciplines is required which NSG primairy fulfils by offering a broad training programme for all its PhD students. Active participiation in the training programme of NSG and its (inter-)national partners, such as ISES, EURPROX and CSAG allows students to both widen and deepen their knowledge in aspects of the geosciences.

NSG recognises its obligations in the fields of PhD supervision and the expanding opportunities for PhD students to benefit from advanced courses in Earth Sciences, implemented by NSG and in co-operation with its EUROBASIN and EUROPROX partners. Besides NSG research staff, leading international scientists are invited as course instructors to give short courses covering the entire research spectrum of NSG.

Through its creation, NSG aims to facilitate an effective change in culture and traditional thinking towards a coupling of fundamental and applied research and their use in geosciences. NSG endorses a strong feed-back between thematic observations and predictive modelling as well as the full use of material and human resources in advanced teaching and research on a national and European level.

The research programme of NSG is directed towards the advancement of fundamental geosciences with a strong interest in developing new, modern, scientific concepts and methodologies in close interaction with applications in the fields of natural resources and the environment. The programme is characterised by a close coupling of data acquisition, advanced laboratory techniques and innovative numerical modelling targeted on the three NSG research themes “Sedimentary basins and continental margins”, “Lithosphere, biosphere, climate and surface processes” and “Bio- geochemistry and water”.

An important part of the NSG strategy is directed towards further strengthening of its active partnership with other organisations and users of Earth science know-how in industry, government and academia.

NSG Scientific Staff

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Dr. R.A. Stephenson
Dr. E. Willingshofer
Dr. B.P. Zoetemeijer

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Drs. K. Linthout
Dr. P. Maaskant
Dr. M.A. Zakrzewski

Isotope Geochemistry

Prof. dr. P.A.M. Andriessen
Dr. T. Dunai
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Dr. J.R. Wijbrans

Sedimentology

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Dr. S.R. Troelstra
Dr. O. van der Plassche
Dr. H.B. Vonhof

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Dr. B.M. van Breukelen
Dr. A.A. van de Griend
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Dr. C.J. Hemker
Dr. H. Kooi
Dr. Ir. E. Seyhan
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Universiteit Utrecht

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Prof. dr. G.J. van der Zwaan
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Palaeoecology

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Dr. H. Brinkhuis
Dr. W.M. Kürschner
Dr. F. Wagner

Geochemistry

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Prof. dr. G.J. de Lange **
Prof. dr. J.W. de Leeuw**
Prof dr. ir. J.S. Sinninghe Damsté**
Dr. T. Behrends
Dr. ir. J.P.G. Loch
Dr. J.J. Middelburg
Dr. P.A.G. Regnier
Dr. S.P. Vriend

* strategic professor
** part-time ordinary professor

Chapter 1 NSG structure

Organisation
NSG consists of researchers from eleven research groups located at two universities. The faculty of Earth and Life Sciences at the Vrije Universiteit participates with researchers from seven groups in NSG. Utrecht University participates through the Institute of Paleo-environments and Paleo-climate (IPPU), which consists of three research groups from the faculty of Geosciences and one from the faculty of Biology.

Expertise of the contributing groups includes: Tectonics, Petrology, Isotope Geochemistry, Sedimentology, Stratigraphy, Paleoecology-Paleoclimatology, Hydrogeology and Paleobotany-Palynology, thus covering all fields interacting in the evolution of sedimentary basins and paleo-environments.

The NSG research programme is characterised by a process-oriented approach to the system Earth. The programme is focused on three main themes

- Sedimentary basins and continental margins
  Sedimentary basins and the dynamics of continental margins are a research theme where the interaction between sedimentation processes and vertical motions of the Earth's crust forms the main research objective. Erosion, denudation and volcanism are studied in the context of the dynamics of sedimentary basin development.
- Lithosphere, biosphere, climate and surface processes
  The relation between climate variability and surface processes are studied through integration between atmosphere, biology and solid-earth perspectives.
- Bio- geochemistry and water
  Bio-geochemical processes are studied in groundwater, oceans and paleo-ecosystems in order to understand the interaction between living organisms and System Earth.

The NSG research themes
Within the framework of NSG, the school aims to pursue the development of tectono-mechanics and petrophysics. NSG is also expanding its research effort in the analysis and modelling of recent and presently occurring geological processes. To that aim a strong focus in national and European research programmes is developing on neo-tectonics, tectonic geomorphology and initiation of exposure dating work, and the modelling of fluid flow in sedimentary basins. The work on timescales, ocean-continent correlations, marine and organic geochemistry and the coupling of the marine record to the biosphere is also an area of continuing high priority research. The NSG expertise on carbonate and siliciclastic sedimentology is connected to research on the quantification of the sediment supply side in sequence stratigraphy and the deciphering of the role of climate in the sedimentary record.
The further coupling of geology with biology continues to be an area of great potential for the future. The successful development of work at this interface on issues such as the organic imprints of carbon dioxide relationships, ecosystem collapse and recovery, as well as the marine research programme of NSG provides an excellent frame for future work on geo-biological aspects of Global Change.

NSG has realised an integration of advanced laboratory equipment and the advanced analytical skills present in the petrology and isotope geology groups with other aspects of sedimentary geology. An active participation of these groups has been essential for a full coupling of research on crustal processes and the sedimentary record. In this context the work on thermochronology and Ar/Ar, noble gases, U-Th disequilibrium and fluid inclusion research should be considered as having a great potential for integrated NSG research.

ISES

After the successful mid-term evaluation of ISES (The Netherlands Research Centre for Integrated Solid Earth Science ISES, a cooperative effort of the research schools NSG, VMSG and CTG) in 2003, a lot of effort was put into setting up the research program of the second phase in 2004. The program focuses on the four ISES natural laboratories (the Mediterranean Region, the Pannonian-Carpathian area, the Dutch Delta and the North Atlantic Margin), but also leaves space for the development of new methodology. A large number of new PhD, postdoc and Visiting Research Fellow (VRF) projects has been approved in late 2004 and early 2005, and more will follow in 2005-2006. At the same time ISES researchers have already taken action in paving the way for a continuation of ISES after 2008. In order to stimulate the new generation of scientists to take the lead in continuing the successful collaboration between solid earth scientists in the Netherlands, ISES has installed the “Platform for Embedding and Continuation (PEC). This group is exploring future possibilities for acquiring large scale national funding for the Solid Earth Sciences. New initiatives are being developed on a European Level as well, in particular the TOPO-Europe project of the International Lithosphere Programme.

Highlights of new research within the ISES Natural Laboratories

The Pannonian Basin – Carpathian System (PANNCARP)

Central in the programme is the dynamics of fluvial systems in areas of active tectonic deformation, i.e. (seismo)active faulting and differential vertical movements. In order to focus on specific problems and to concentrate research capacities, three main research lines and several localities of integrated activities are identified:

Neotectonics, climate and surface processes: Most of the present climate reconstruction studies target areas in isolated parts of the source to sink corridor, with loose connection between the active interacting parts of the mountain chains – sedimentary basins. As a result the connection patterns of these changes are poorly defined, and their mechanisms enigmatic. An integrated approach is strongly needed to tackle the complex interacting parts of the system, studied in multiple key areas along the sedimentation corridor. We aim to understand the Late Neogene interaction between climate and tectonics in the source to past sinks analogues as a key for unravel the recent changes in active sinks triggered by tectonic processes such as uplift in the orogenic belts or opening/closing of oceanic gateways.

Regional tectonics, basin evolution and modeling: Dynamic and kinematic modelling studies constrained by integrated basin analysis and thermochronology and structural field studies in the source areas derive important elements on coupling deformation in the internal, back-arc basins with continental collision and foreland basin evolution. As a consequence, we aim to study the recent tectonic evolution and sedimentary distribution of key basin areas in the Pannonian-Carpathians domain as a past analogue in order to derive and predict the evolution towards the present-day active part of the sink area.

Danube river systematics: The Danube River Basin is the maximum risk area in Europe with acute environmental concern where the increasing stresses on the environmental quality of the river basin due to human influence are given by significant natural hazards, water, air and soil pollution, waste management, modernization and intensification of agricultural practices at local, regional and transboundary levels, leading to serious deterioration of environmental conditions of the active Black Sea sink. Here, process-level studies have to be conducted to improve the knowledge on mechanisms determining the present-day structure and functioning of the sediment input, active changes and (re)distribution into the basin.

In relation to PANNCARP a proposal was recently submitted for a European Marie Curie Research Training Network, which will focus on Source-to-Sink systematics of the Danube River and Black Sea system.

Imaging, monitoring and modeling of crustal behavior in the Netherlands (NEDSEIS)

The deeper structure and processes in the crust below the Netherlands are not well understood, mainly because of a lack of data from the deeper subsurface. This is in shrill contrast to what we know about the shallower part, the sedimentary deposits that lie on top: most of the Netherlands has been imaged in three dimensions via the seismic reflection method for the purpose of oil and gas exploration.

In order to fill this gap ISES has teamed up with the Dutch astrophysicists' LOFAR radiotelescope project, by developing a PERmanent Seismic IMaging and MONitoring network (PERSIMMON) connected to the LOFAR infrastructure. PERSIMMON is designed for monitoring 3-D structures and processes in the subsurface of the Netherlands. Recently started ISES projects at TUDelft tackle the particularities of new seismic imaging techniques in order to fully use the unique capabilities that PERSIMMON has to offer, e.g. the new passive "acoustic daylight imaging" technique. To additional projects expand the PERSIMMON observations by monitoring surface movements using radar-interferometry, and by mapping the structure of the deep crust outside the range of PERSIMMON using seismological techniques. The VU will complete the program by developing the 4-D modeling methods necessary to make dynamical models of the Netherlands' subsurface.

Europe-Africa convergence and its consequences (EURAF)

In ISES-2 the EURAF program expands the investigations near the Atlantic gateways (Morocco/Spain) that were started in ISES-1 by adding a new theme, which addresses the very collision between Africa-Arabia and Eurasia and the subsequent evolution of the Anatolian region. This theme is considered timely and crucial because (1) it addresses the prime cause for turning the region into a landlocked basin setting, and (2) being the prime cause, the collisional process is expected to have been the start of a sequence of processes including the formation of the North Anatolian Fault and the westward extrusion of Anatolia. The EURAF programme continues to address the evolution of the interior parts of the land-locked basin and its connection to the large plates involved. By the time the Africa/Arabia - Eurasia collision was completed, the subduction process in the Mediterranean plate boundary region entered its final phase: that of terminal stage subduction. The complexity of the region's geodynamical evolution stems to a large extent from this terminal stage of the convergence process. Much understanding is to be gained from this transient stage during which the

geological expressions differ significantly from those in steady-state subduction zones. No region in the world offers comparable possibilities to study this. Several other former plate boundary regions, e.g. those in the Tethyan suture zone, have probably gone through similar phases in their geological history. In the Europe-Africa plate boundary zone, however, the convergence can be characterized as a still active process, albeit in its final stages. Very importantly, hypotheses concerning the kinematic-dynamic evolution can be tested against observations which - by their nature - are only available in active settings, such as seismicity data, and crustal deformation patterns obtained by space geodetic methods.

The EURAF programme now has the following principle components:

- Collision and collision-related processes in both the Eastern Mediterranean /Anatolia/Arabia region, and the Western Mediterranean region (Northwest Africa and the Gibraltar/Alboran region)
- Evolution of the Mediterranean region as a land-locked basin, including the interaction between the collisional regions and the adjacent internal parts of the Mediterranean region.
- The interaction between the Eurasian and African plates in the Mediterranean region and its role in the evolution of these plates, in particular the European lithosphere. In view of the expected strong control of the plate interaction on the Eurasian plate evolution, the results of the plate boundary studies provide an excellent basis for studying the evolution of the European lithosphere.

Quantitative Dynamic Modelling of the Northwestern European Margin System (NORMAR)

Rift basins and their borderlands are a natural target for integrated research involving geology, geophysics and geo-technology. There are several reasons for this interest:

- Sedimentary basins and their borderlands are well known for all Atlantic type continental margins and in combination they provide a record of the early-stages of (super) continental break-up, one of the most prominent mechanisms and fundamental processes that shape System Earth.
- The architecture of these rifted basins and the basin fill are strongly influenced by the displacement geometry on the bounding normal fault systems. More attention is now being paid to linkage of the structural faulting pattern onshore and the evolution of these fault systems.
- Many rifts are the locus of large volumes of magmatism and underplating, a profound process still not well understood.
- The basins and related borderlands allow study of vertical lithosphere motions that are connected to the opening of sea-gates, an essential aspect in order to understand the long-term natural climatic change of planet Earth.
- Many of the major petroleum provinces of the world are associated with rift basins.

Four new projects have recently started in the framework of NorMar, that study

1. the rheological behaviour of crustal fault rocks, which includes for the first time the effects of strain weakening and static strength recovery in realistic, phyllosilicate-bearing fault rocks;
2. The post-breakup inversion of the mid-Norwegian margin through integration of laboratory experiment studies with coupled analog-numerical modeling;

3. The syn-tectonic emplacement of deep-marine reservoir sands in the Vøring Basin;
4. The link between onshore uplift/erosion and offshore deposition history by chemical analyses of heavy mineral assemblages from offshore Norwegian sandstone sequences

Two more methodologically oriented projects investigate 1) the 'unexpected' behaviour of apatite FT and (U-Th)/He low thermal geochronometers in 'old' rocks and 2) plumes in the mantle using recently developed tools in computational seismology and the measurement of local anisotropy.

Methodology development

ISES maintains the Numerical and Tectonics laboratories that were set up during ISES-1 at the VU. Both these labs have supported and will continue to support a large number of projects in the context of ISES. In addition these labs perform an important role in education, particularly in the framework of MSc projects. The strength available in both numerical and analogue modeling at the VU have allowed linking the two methods. This unique combination has already provided important results for several of the ISES natural laboratories and delivered a large number of publications. ISES-2 will also invest in the further development of combined analogue-numerical modeling.

New European initiatives

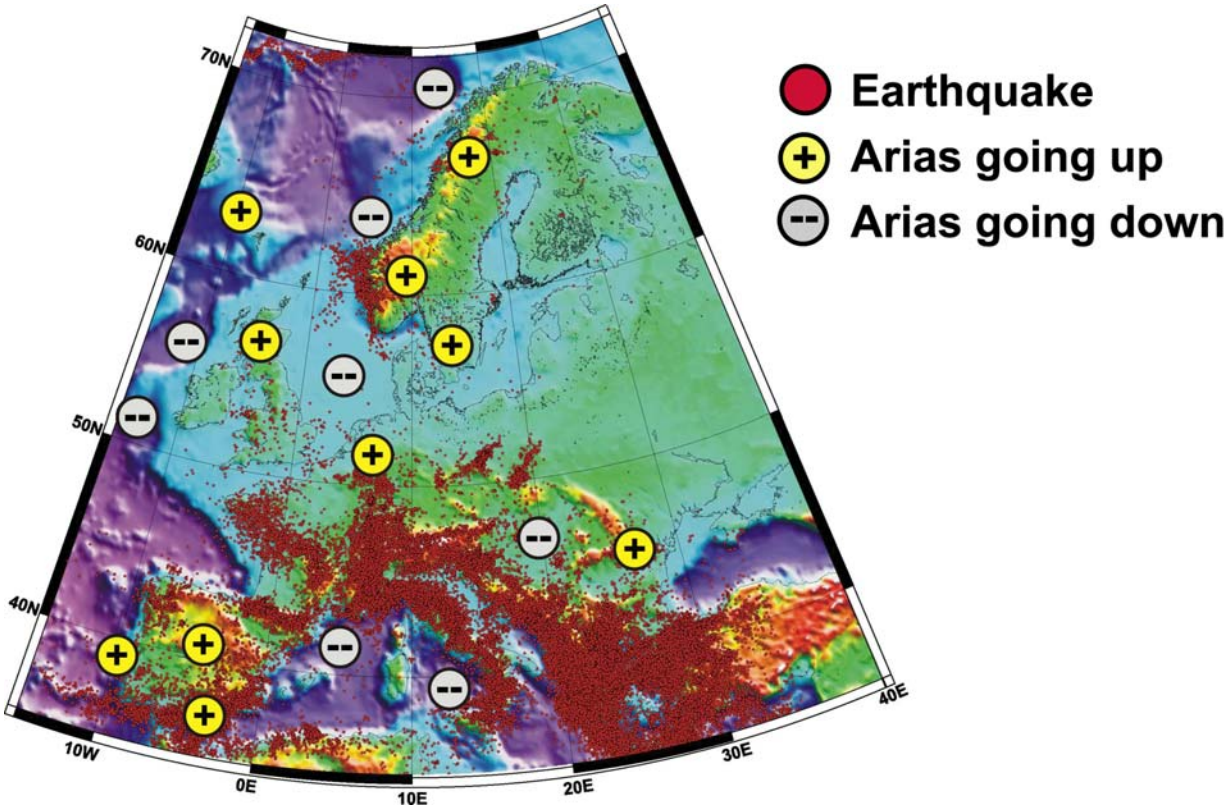
The ISES research philosophy has provided the blueprint for a new, large scale European research initiative: TOPO-Europe. TOPO-Europe addresses the 4-D topographic evolution of the intra-plate regions of Europe through a multidisciplinary approach linking geology, geophysics and geotechnology. TOPO-Europe integrates monitoring, imaging, reconstruction and modelling of the interplay between processes controlling continental topography and related natural hazards.

Continental topography is at the interface of processes taking place at depth in the Earth, at its surface, and above it. Topography influences society, not only as a result of slow landscape changes but also in terms of how it impacts on geohazards and environment. When sea-, lake- or ground-water levels rise, or land subsides, the risk of flooding increases, directly affecting the sustainability of local ecosystems and human habitats. On the other hand, declining water levels and uplifting land may lead to higher risks of erosion and desertification. Catastrophic landslides and rock falls in Europe have caused heavy damage and numerous fatalities in the recent past. Rapid population growth in mountainous regions and global warming and associated increases in the number of exceptional weather events, are likely to exacerbate the risk of devastating rock failures. Along active deformation zones, earthquakes and volcanic eruptions cause short-term and localized topography changes. Although natural processes and human activities cause geohazards and environmental changes, the relative contributions of the respective components are still poorly understood. That topography influences climate is known since the beginning of civilization, but it is only recently that we are able to model its effects in regions where good topographic and (paleo) climatologic data are available.

The present state and behavior of the Shallow Earth System is a consequence of processes operating on a wide range of time scales. These include the long-term effects of tectonic uplift, subsidence and the development of river systems, residual effects of the ice ages on crustal movement, natural climate and environmental changes over the last millennia and up to the present, and the powerful anthropogenic

impacts of the last century. If we are to understand the present state of the Earth System, to predict its future and to engineer our use of it, this spectrum of processes, operating concurrently but on different time scales, needs to be better understood. The challenge to Geosciences is to describe the state of the system, to monitor its changes, to forecast its evolution and, in collaboration with others, to evaluate modes of its sustainable use by human society.

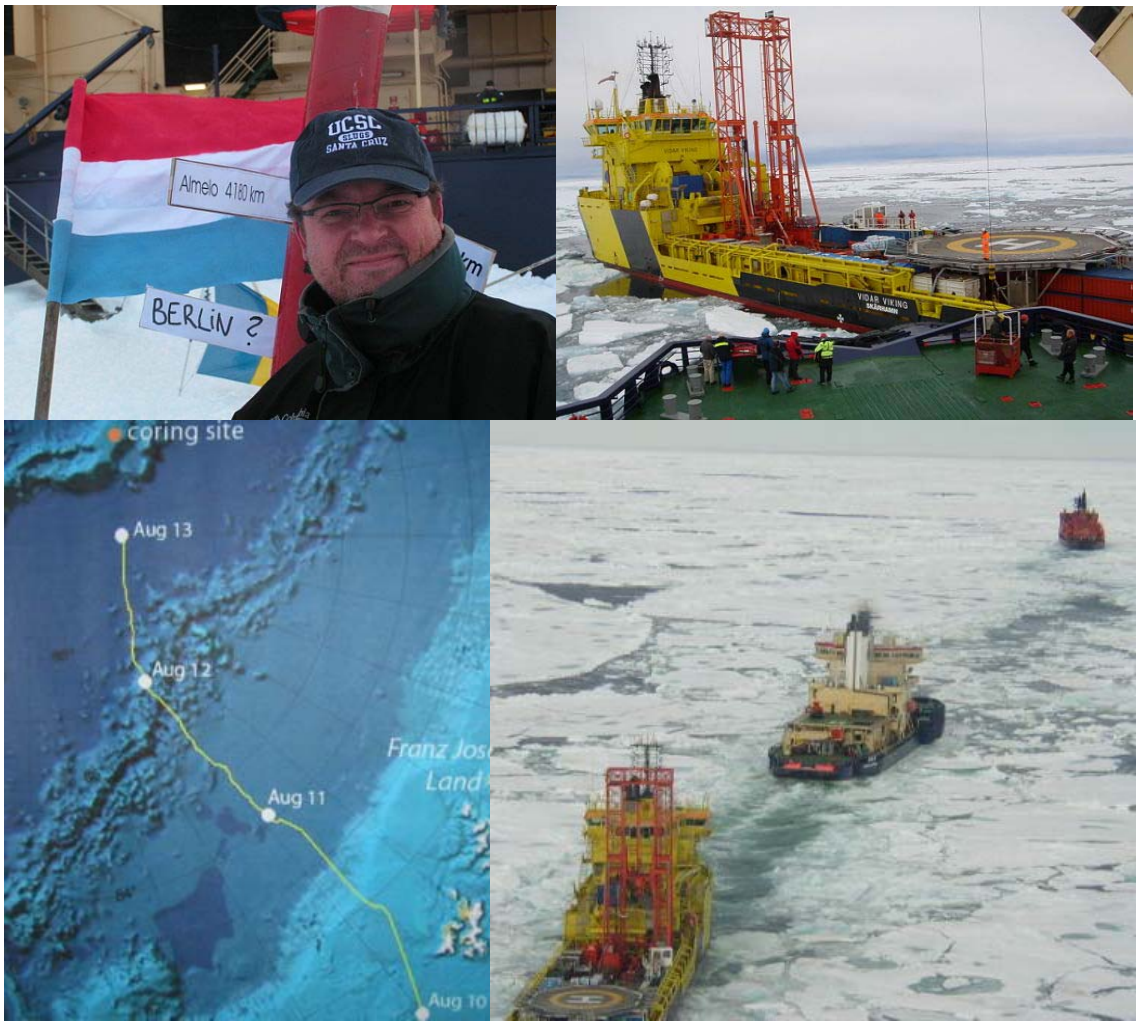
Researchers from all EU member states and Associated countries, from several North-African countries, and from Australia, Canada and the USA have expressed their interest in participating in TOPO-Europe.



Chapter 3 Examples of NSG's research programmes and projects

A first-ever glimpse of the Cenozoic history of the Arctic Ocean; *palynology a go go!*

In September 2004, the first-ever drilling of the Lomonosov Ridge was performed by the Arctic Coring Expedition, ACEX, conducted under the auspices of the Integrated Ocean Drilling Program (IODP). Also known as IODP Expedition 302, we recovered unprecedented climate records of the Arctic Ocean spanning the past ~56 Ma. Henk Brinkhuis of Utrecht University, specializing in marine palynology and palaeoceanography, was selected as Dutch (NSG) representative for onboard participation. Co-chief scientists were Kate Moran, University of Rhode Island, and Jan Backman, of Stockholm University.

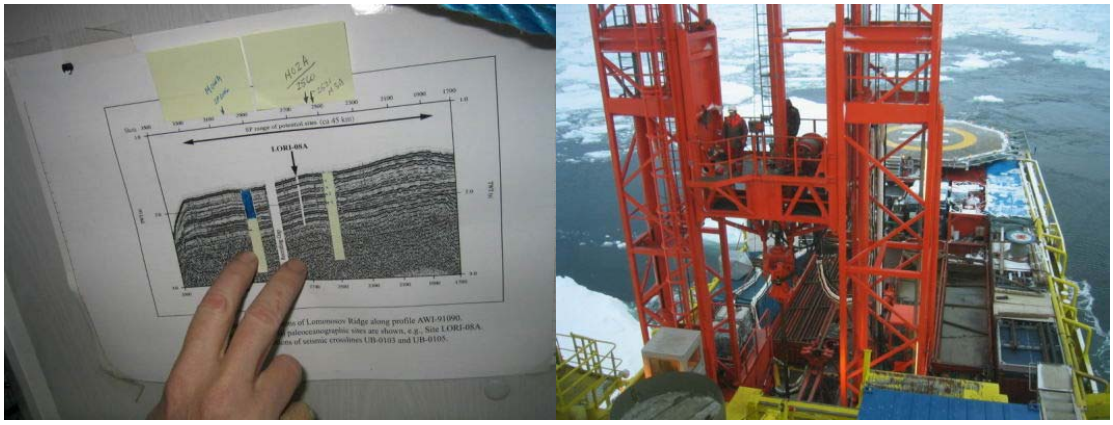


Before departure, many predicted this expedition to fail in view of the constant threat of massive ice floes. Yet, the fleet of three icebreakers, including the 45,000 horse powered nuclear Russian icebreaker Sovietski Soyuz, combined with high-tech, and immensely successful *ice-management*, allowed for ~20 days of unprecedented Arctic drilling. Core recovery was only hampered by 'traditional' equipment failure rather than

anything else; yet at least 50% of the to-be-drilled succession was eventually captured.

Initial, mainly dinoflagellate based age-assessments include the recognition of some ~200m each of upper Neogene, and middle Paleogene deposits, with a conspicuous ~25 Ma hiatus separating these units. The Neogene record appears one of slow sedimentation rates and frequent glacial conditions – contrasting the Paleogene, which is a story of waxing and waning of freshwater influence, warm conditions, and relatively high accumulation rates of organic-rich sediments.

Paleogene highlights include the early – middle Eocene transition (~50 Ma) yielding stunning concentrations of remains of the freshwater fern *Azolla* suggesting that at least episodically, completely fresh surface water settings characterized the Arctic Basin. Moreover, although predictions had placed the base of the sediment column at 50 Ma, palynology revealed the successful recovery of the Paleocene - Eocene transition. During this time of super-greenhouse conditions, ~ 55.5 Ma ago, our records show the Arctic to be subtropical. ACEX also penetrated into some 30m of 'basement', the underlying tectonized sedimentary bedrock. Palynology confirmed the hypothesis that the top of the Lomonosov Ridge 'basement' is of shallow-water, neritic (continental) origin, and has a Campanian age.



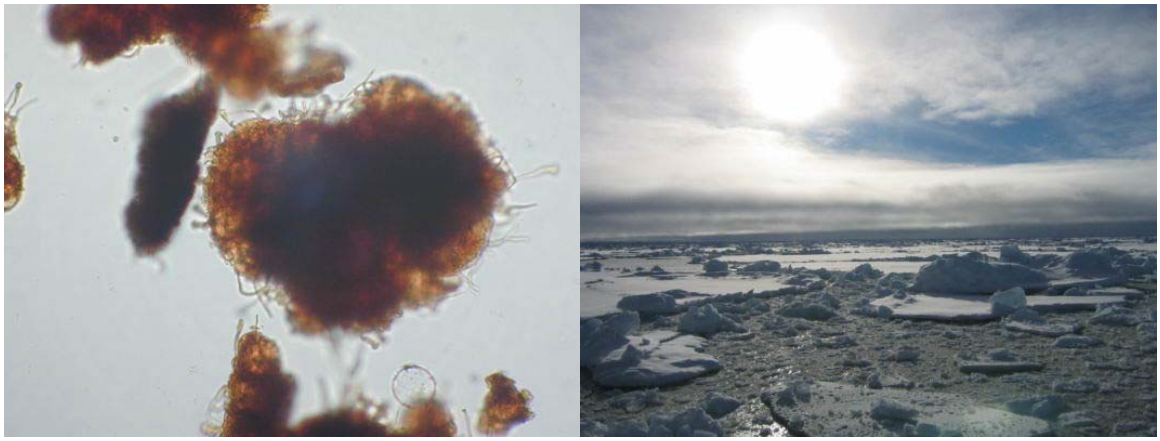


Fig. 3.9. The freshwater fern *Azolla*

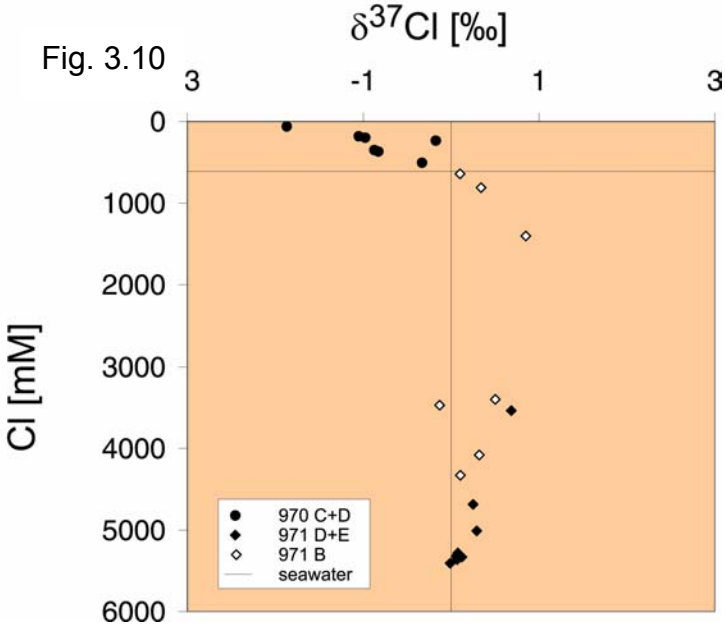
Contribution by dr. H.Brinkhuis and the ACEX Science Party

Fluids expelled at mud volcanoes – tracking down the source with stable isotopes

Introduction

Mud volcanoes are structures on the seafloor and on land, where large amounts of mud and fluid (gas and water) are emitted. Unlike "normal" volcanoes, the depth of the emitted material is rather shallow and is within the sediment cover of the tectonic plate. The eruptions are triggered by high overpressure generated by the production of methane, as a consequence of organic matter degradation in the sediment.

Fig. 3.10



Due to the continued release of fluid during silent periods and the eruption of mud breccia during eruptions (that happen discontinously and yet in an unknown frequency), mud volcanoes can be concidered as windows to the deep sediment structure. At depth, fluid-sediment interactions imprint the fluid chemistry and their distinct signature is brought to the surface sediments by the ascending fluid. The analysis of shallow pore fluids (tens of cm to hundreds of m below the seafloor), therefore, provides a key to constrain the reactions occurring at depth. The stable isotopic systems $\delta^{18}O$, δD, and $\delta^{37}Cl$ are

valuable tracers of fluid processes in the marine environment, because water (O, H) and salt (Cl) are ubiquitously present and involved in the studied processes.

Samples presented here are coming from the Olimpi Mudvolcano Field in the Eastern Mediterranean Sea, drilled during ODP Leg 160 (Emeis et al., 1998). Both mud volcanoes, namely Milano dome (site 970) and Napoli dome (site 971), are represented by two crest cores (letters C/D and D/E, respectively) and two flank cores (letters A/B). The sediments have been extracted for pore water sampling by ODP routine methods and chloride concentrations were determined immediately aboard. Stable isotopic compositions of the pore waters were analyzed at Utrecht University, where the method for chlorine isotope composition has also been developed (Eggenkamp 1994).

Results and discussion

A striking peculiarity of the pore water chemistry are largely varying Cl concentrations throughout the mud domes. At Milano dome (site 970), the advecting deep fluid is characterized by extremely low Cl concentrations (as low as 60 mM Cl), whereas at Napoli dome (site 971) the concentrations are extremely high (up to 5.4 M Cl).

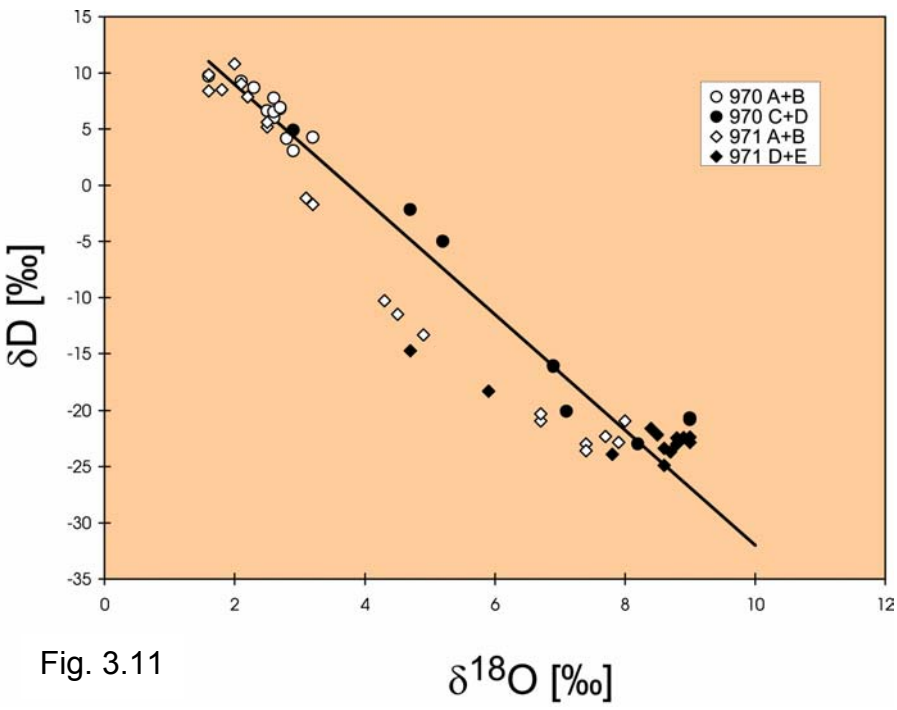


Fig. 3.11

High salinity values are clearly related to the Messinian salinity crisis (ca. 5 Ma BP). Since salts precipitated from a solution are isotopically heavier than the mother solution, the positive δ^{37}Cl signature of saline samples (Fig. 1) indicates that the source of the salt is the dissolution of halites (secondary brine). The alternative explanation, an ancient brine pool (primary brine), can be rejected, because this would, correspondingly, result in a negative signature. The low-chlorinity samples, all having negative δ^{37}Cl values (Fig. 1), are due to clay mineral dehydration and alteration. The pore waters are diluted when structural water is released from clay minerals and the minerals are transformed into secondary minerals. In the course of this, the heavier isotope is preferentially incorporated in the mineral surface, thus depleting the pore water in ^{37}Cl.

The interlayer water of clay minerals is strongly positive in δ^{18}O and strongly negative in δD. The analysis of these isotopes in the pore waters reveals that they can be

described by a mixture of seawater with a deep fluid of high $\delta^{18}O$ (+10 ‰) and low δD (-32 ‰) (Fig. 2). Such a signature is clearly due to dehydration and the investigations on $\delta^{18}O$ and δD support our findings from $\delta^{37}Cl$.

Acknowledgements

We wish to thank A. van Dijk and A. van Leeuwen-Tolboom for the isotopic measurements. Financial support has been obtained from NWO / ALW (nr. 809-63.014) and EU contract ANAXIMANDER (EVK3-CT-2002-00068).

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Contribution by dr. A. Dählmann, dr. S. Hagedoorn and prof. dr. G.J. de Lange.

Sapropels in the Mediterranean Sea: A study with climate models.

Sapropels are cyclic, dark coloured, organic-rich layers deposited on the bottom of the Mediterranean Sea (Fig. 3.12). They are formed during anoxic conditions caused by astronomically induced climate oscillations. The sapropel record is dominated by precession (date of perihelion), but also an obliquity (tilt of the Earth's rotational axis) signal has been found. Despite their ubiquitous presence and numerous studies the paleoclimatic orgin of sapropels is not fully understood. The most accepted hypothesis for the formation of sapropels is enhanced discharge of the river Nile caused by an intensified African summer monsoon. The increased supply of fresh water weakens (or even stops) the deep water formation resulting in a decease of the ventilation of the deep water. This causes anoxic conditions that result in the formation of sapropels.

Figure 3.12: Sapropels on Sicily. These sapropels were deposited at the bottom of the Mediterranean Sea about 9 millions years ago.

If this hypothesis is right, some uncertainties still remain. Firstly, according to the obliquity signal found in the sapropel record, there should be an obliquity signal in the African summer monsoon. However, the obliquity signal in the insolation at low latitudes is very weak. Secondly, the orbital signals in the discharge of the rivers entering from the Eurasian continent are not well known, which is also true for precipitation and evaporation over the Mediterranean Sea. Thirdly, even if the orbital signals in the river discharge and net precipitation are known, it is still unclear how they affect the circulation in the Mediterranean Sea.

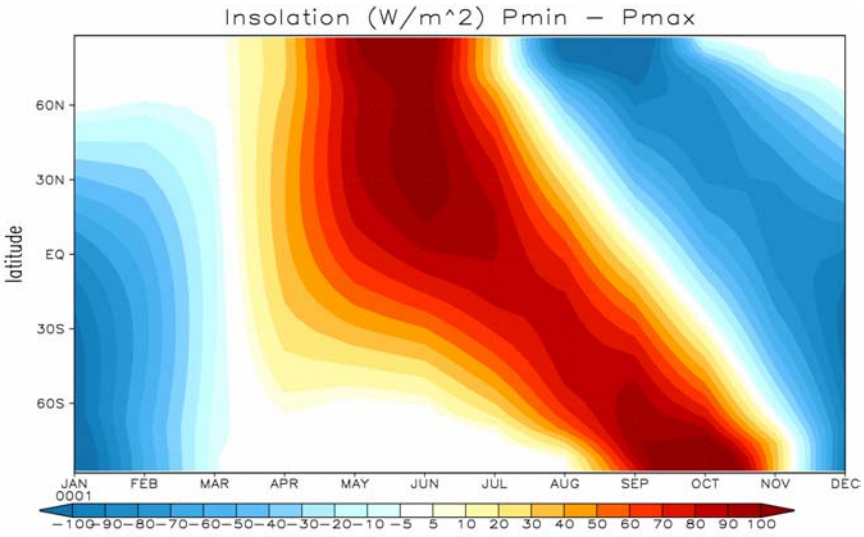
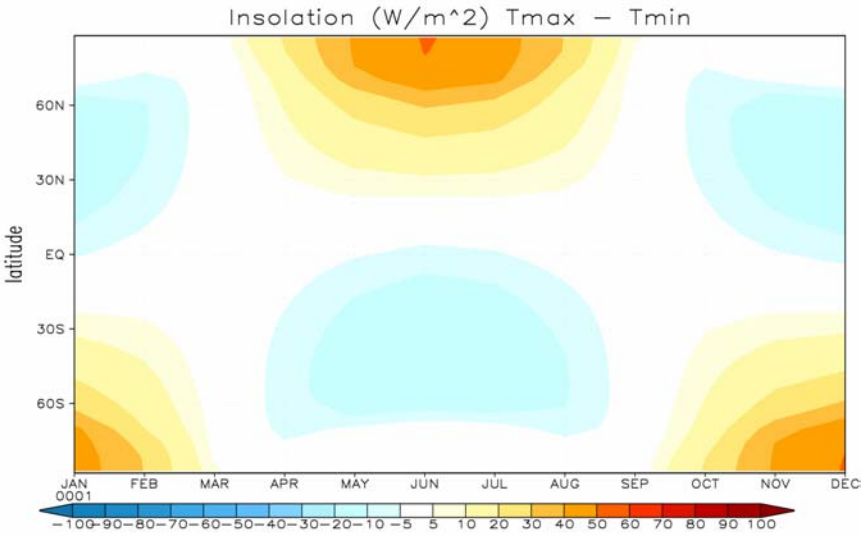


Figure 3.13: Monthly zonally averaged insolation differences (W/m^2) at the top of the atmosphere between minimum precession (P_{min}) and maximum precession (P_{max}) (upper panel) and between maximum obliquity or Tilt (T_{max}) and minimum obliquity (T_{min}) (lower panel). Minimum (maximum) precession means that boreal summer (winter) is located in perihelion.



These uncertainties were studied with climate models and the results are described in the Ph.D. thesis 'Modeling orbital induced variations in circum-Mediterranean climate'. The orbital signals in the African summer monsoon and

in the hydrological cycle over Europe and the Mediterranean Sea are studied with global climate models while the effect of these signals on the circulation in the Mediterranean Sea are studied with a regional model of the Mediterranean Sea.

Orbital signals in the climate in and around the Mediterranean Sea

When the Northern Hemisphere summer insolation is strong (i.e., during minimum precession and maximum obliquity (Fig. 3.13)) the African monsoon is also strong (Figs. 3.14a-b). The precession signal in the monsoon can (partly) be explained by the increased differential heating between the African continent and the ocean. This results in intensified monsoonal circulation leading to a stronger monsoon during minimum precession. The obliquity signal must be caused by another mechanism because the obliquity signal in insolation at low latitudes is very weak (Fig. 3.13).

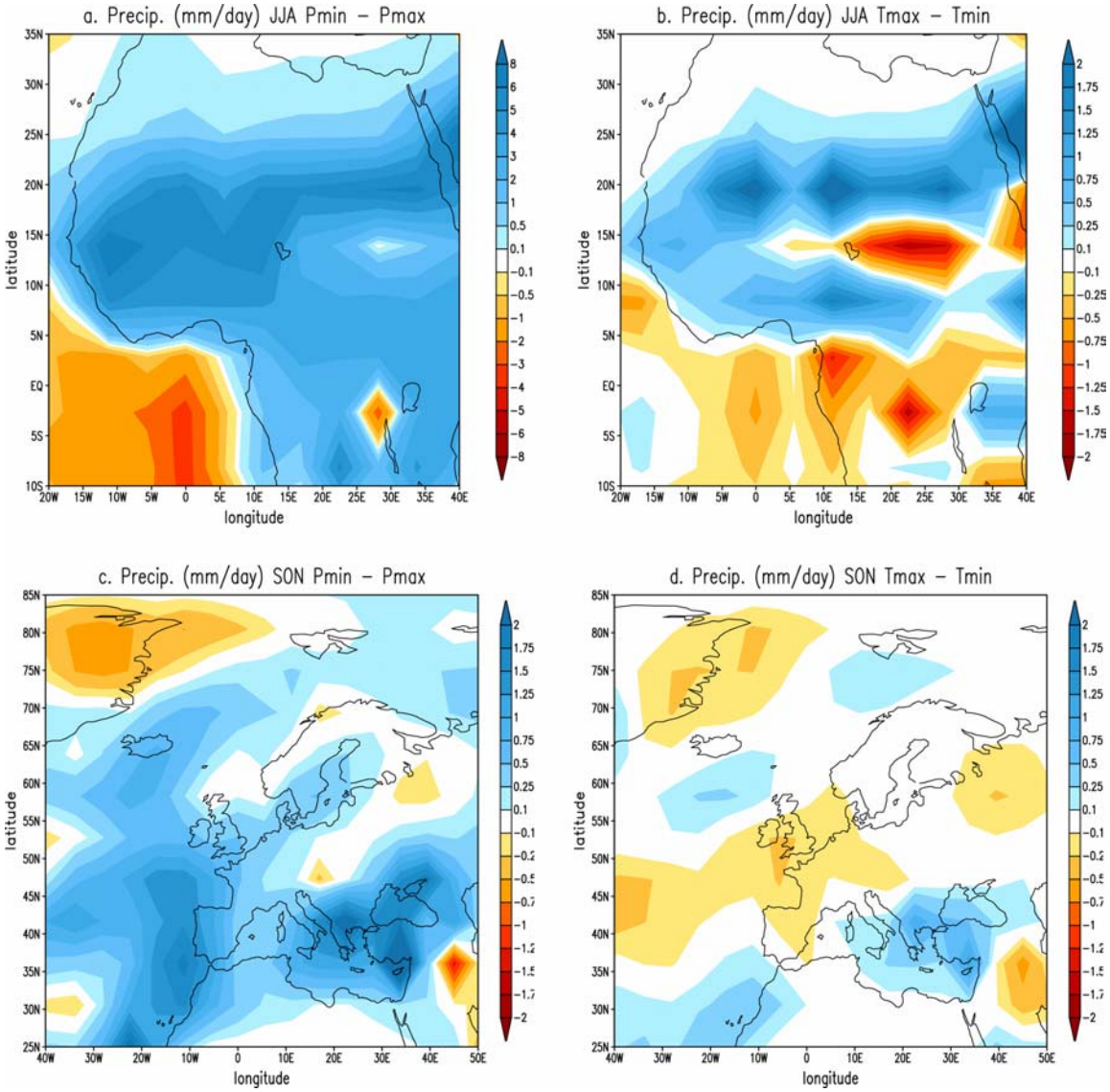


Figure 3.14: Precipitation differences (mm/day) in boreal summer (June-July-August) between minimum precession and maximum precession (Fig. a) and maximum obliquity and minimum obliquity (Fig. b) and in boreal autumn (September-October-November) between minimum precession and maximum precession (Fig. c) and maximum obliquity and minimum obliquity (Fig. d). Note the different scales between Fig. a and Figs. b-d.

The simulated obliquity and precession signal in the African monsoon are consistent with the hypothesis of the role of the Nile in the formation of sapropels. However, the climate simulations also reveal that during boreal autumn the precipitation over and around the Mediterranean Sea is also stronger during minimum precession and maximum obliquity compared to maximum precession and minimum obliquity, respectively (Figs. 3.14c-d). The mechanism is similar for precession and obliquity: In autumn the sea surface temperature of the Mediterranean Sea is high after the warm summer. At the same time land temperature already decreases. High sea surface temperature combined with low air temperature favours atmospheric convection leading to stronger precipitation. A similar signal is visible over the Atlantic Ocean (Figs. 3.14c-d).

From the results of the climate runs there are two possible mechanisms for the deposition of sapropels: The intensified African summer monsoon and/or stronger precipitation over and around the Mediterranean Sea in autumn. In order to determine which climate signal is most important, a regional ocean model of the Mediterranean Sea is forced with the results of the precession simulations of the global model. The results show that the influence of increased Nile discharge consists of decreased sea surface salinity only in the region close to the Eastern Mediterranean coast (Fig. 3.15). This is far away from the sites where deep water formation occurs (i.e., the Gulf of Lyon and the southern Adriatic Sea). In contrast, the salinity changes caused by increased runoff from the north and stronger precipitation over the Mediterranean Sea are much larger and can be seen over the entire basin (Fig. 3.15).

The salinity reductions over the deep water formation sites could reduce deep water formation which favours the formation of sapropels.

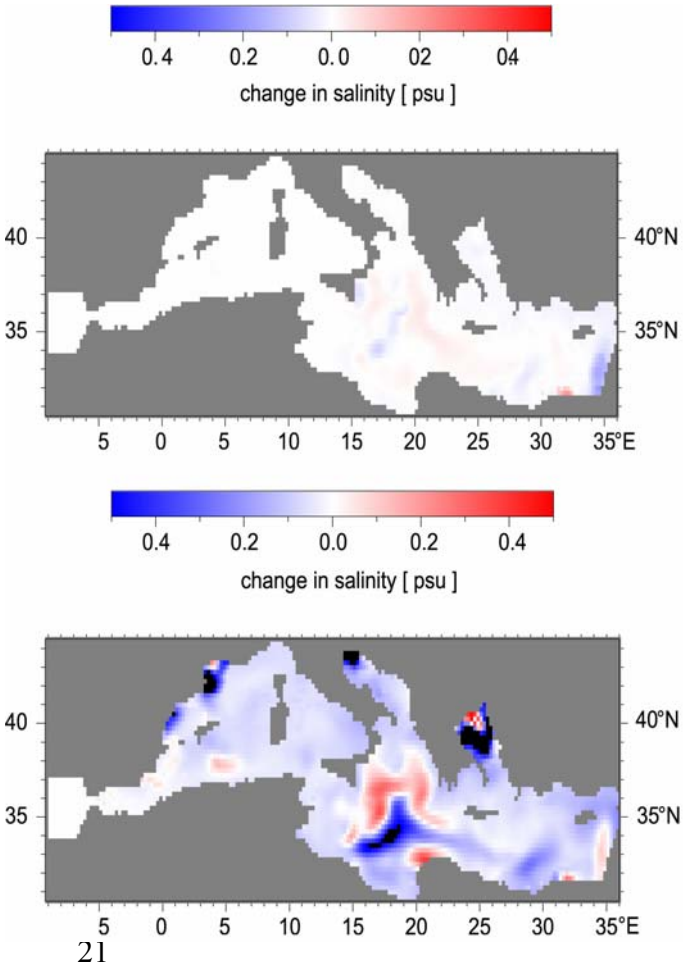


Figure 3.15: Difference of the salinity between the minimum precession experiment minus the control experiment for February (i.e., when deep water formation is strongest) for increased discharge of the river Nile (upper panel) and enhanced precipitation over the Mediterranean Sea plus discharge from the Eurasian continent (lower panel).

Concluding remarks

Simulations with global climate models reveal that both increased discharge of the river Nile and increased discharge of the rivers entering from the Eurasian continent and enhanced precipitation over the Mediterranean Sea cause

enhanced fresh water supply for the Mediterranean Sea during sapropel formation. Experiments with a model of the Mediterranean Sea shows that the influence of the Nile is much smaller than the influence of precipitation and discharge from the rivers entering from the north. Furthermore, the influence from the Nile is restricted to the Eastern Mediterranean coast, far away from the sites of deep water formation. In conclusion, results of the model experiments suggest that the role of the river Nile in the formation of sapropels is much smaller than the role of the hydrological cycle over the Mediterranean Sea and the river discharge from the Eurasian continent.

Contribution by dr. E. Tuenter.

In situ chemical osmosis experiments in the Boom Clay at the underground research facility of Mol (Belgium)

Introduction

Clay rich deposits are usually considered as natural protective covers in regional aquifers because of their low permeability. These deposits are also regarded as potential host rocks for radioactive waste disposal. The Boom Clay, an over-consolidated marine Oligocene deposit in the north eastern part of Belgium is considered as a reference formation for nuclear waste disposal (see Fig. 3.16).
Comprehensive understanding of the physical and chemical processes controlling water and solute transport through this low permeability argillaceous formation and to the environment is a key step for establishing its suitability as host rock.
Since 25 years extensive research in the fields of hydraulics, geochemistry, and geomechanics has been carried out at the HADES Underground Research Facility (URF) in Mol. Studies on the compatibility with Boom Clay of large amounts of bituminized medium level waste (MLW) (3 200 tons of Eurobitume MLW containing 750 tons of NO_3 were produced by the former Eurochemic fuel reprocessing plant at Dessel, Belgium) have recently raised a particular interest for chemical osmosis.

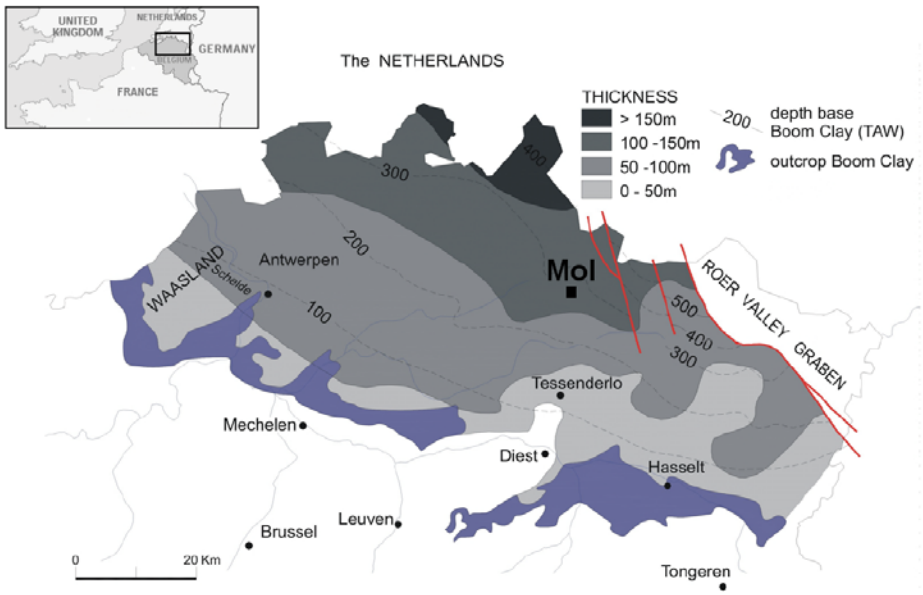


Figure 3.16a. Outcrop map of the Boom Clay (taken from the SAFIR 2 report, ONDRAF-NIRAS, 2001)

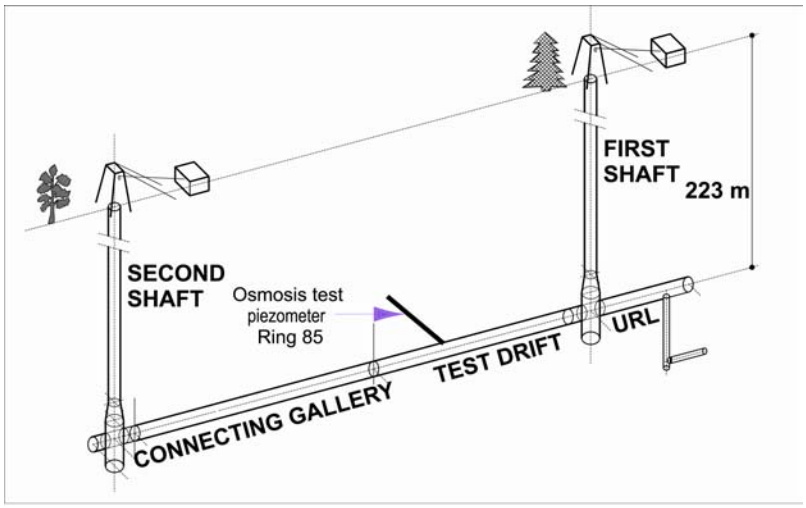


Figure 3.16b. The HADES URF location (courtesy of Euridice EIG).

Chemical osmosis is the pore fluid flow induced by chemical gradient (across a semi-permeable membrane). Osmotically-driven fluid flow occurs from low to high solute concentration and tends to raise and lower fluid pressure at the outflow and inflow sides of the membrane, respectively as illustrated by Fig. 3.17. Osmosis tends to induce an opposing hydraulic counter flow, and net flow may cease when osmotic equilibrium is reached.

Membrane behaviour in low permeability clayey materials has been widely evidenced. This behaviour is mainly due to the electrical properties (restriction of ions movement) of the clays. Ideal membranes (efficiency=1) completely prevent the passage of solutes and permit the passage of water through it. Clayey membranes are non-ideal membranes (0<efficiency<1); they allow diffusion and advection of salt through them.

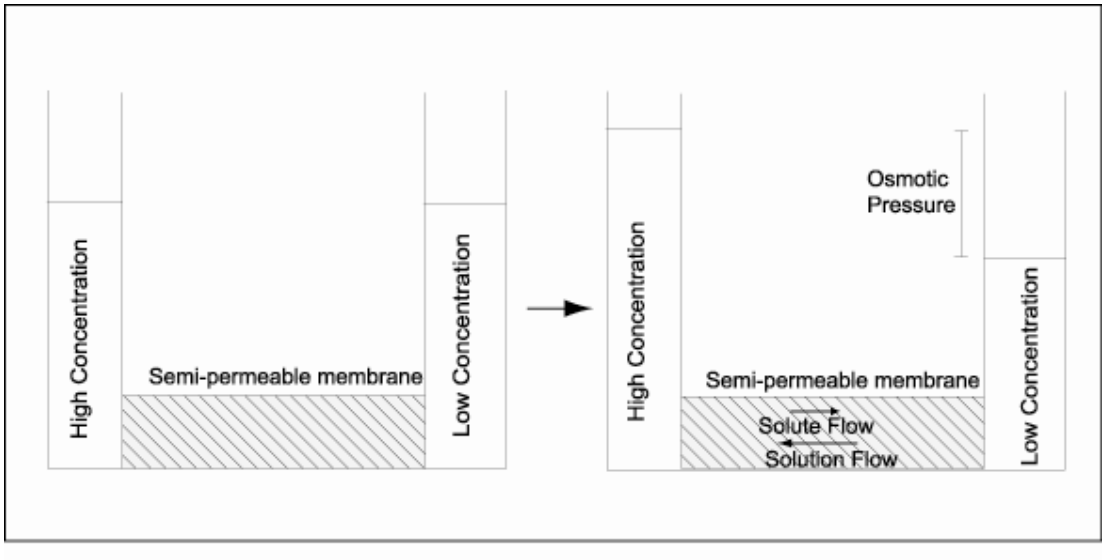


Figure 3.17: Schematic illustration of a laboratory chemical osmosis experiment.

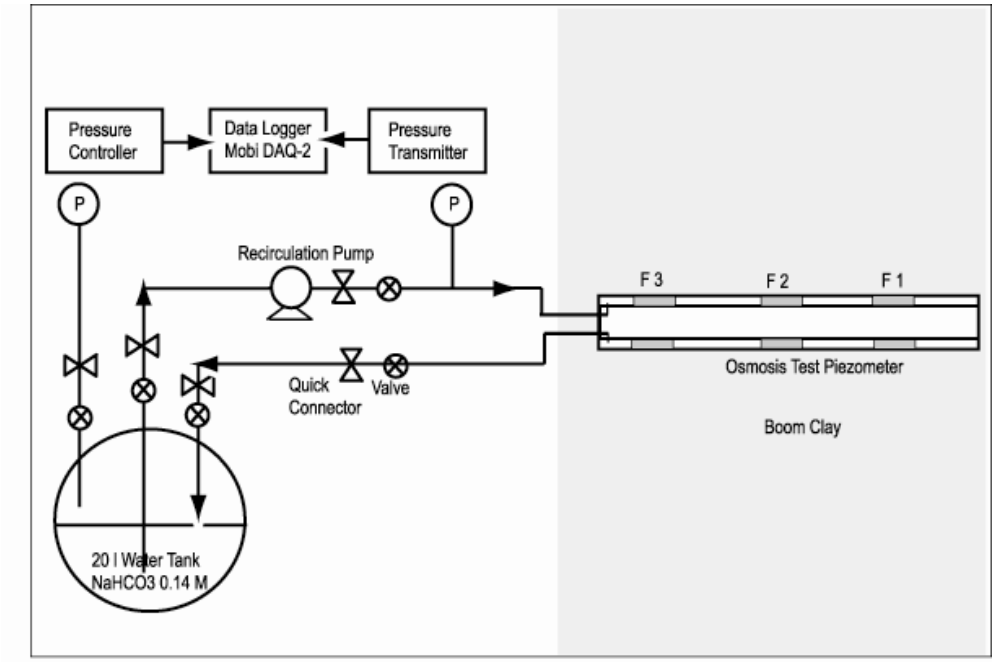


Figure 3.18: Water exchange system and piezometer used for the osmosis in-situ test.

Questions

1) Does the Boom Clay exhibit an osmotic behaviour?
2) Is osmosis a relevant process for the problem of radioactive waste disposal?
3) Is there a risk of fracturing of the near-field of MLW galleries due to osmotically induced pore pressures?

Experiment

An in-situ osmosis experiment was carried out in a filter (F3) at a distance of 3 m from the gallery. A solution of 0.14 M NaHCO3 (10 times the pore water concentration in the Boom Clay) was added to the filter. A water/saline solution exchange was performed at constant hydraulic pressure (5.557 bar at the moment of injection) in the filter. Two weeks before the experiment the water tubings connected to the filter screens were equipped with water pressure sensors. This operation caused a drop of the hydraulic pressure to the atmospheric pressure. At the moment of injection the water pressures were not yet completely reequilibrated.

Experimental results

Monitoring of the water pressure was performed during eight months in the three filters (non-injected F1 and F2, and injected F3) of the piezometer. Figure 3.19 displays the data corresponding to the first 100 days.

1. Initially, the pressure within the F3 filter increased due to pumping (water exchange). Three hours later the pressure decreased and stabilized.
2. After 12 hours the water pressure increases in the F3 filter: partly because of the water inflow from the clay formation into the filter caused by osmosis, and partly by the pressure recovery due to the hydraulic perturbation of the sensor installation (the pressure recovery signal can also be observed in the other two filters).
3. After 15.4 hours the increase in pore pressure considerably slows down: conditions of osmotic equilibrium.

4. The maximum osmotically induced pressure observed in the present experimental conditions is 2 m water column. Afterwards, the pressure continues to decay and no important changes are observed after more than 100 days.

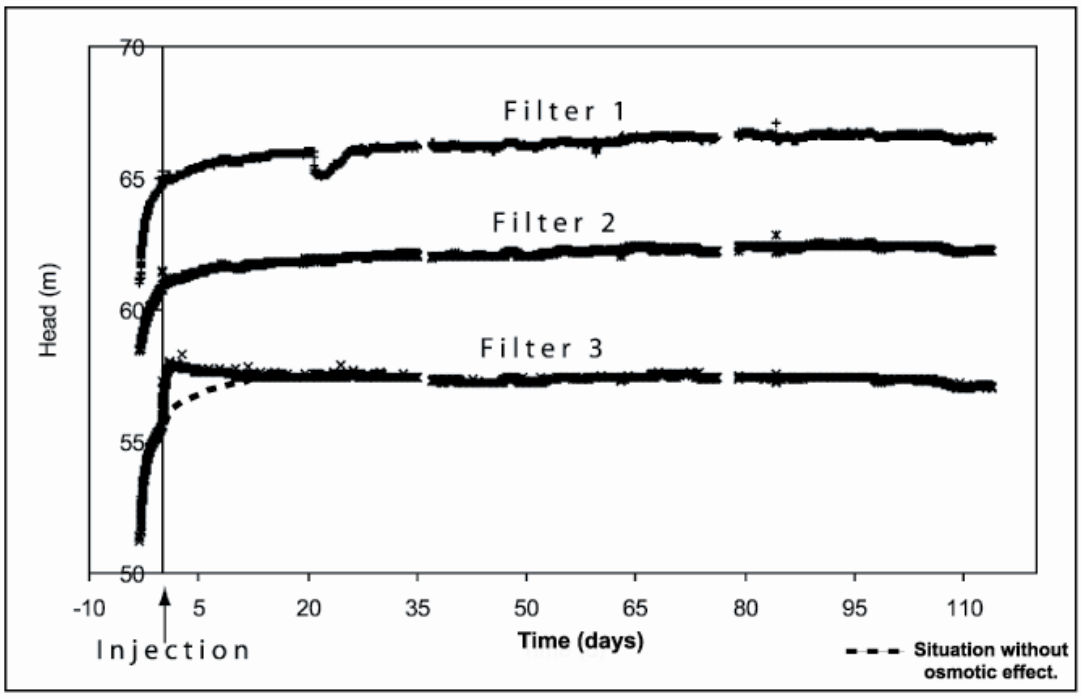


Figure 3.19: Pressure evolution in the piezometer: the filters are located at distances of 3 m (filter F3), 3.5 m (filter F2) and 4 m (filter F1) from the gallery. The osmosis test was performed in the filter F3. The dashed line shows the expected pressure response in the absence of osmosis.

The model

The continuum model used is based on the following equations:

$$J_v = -\frac{k}{\mu}(\rho_0 g \nabla h - \sigma \nabla \pi) \qquad \text{(1) Solution Flow}$$

$$J_s^m = -D^* \rho \nabla w + (1-\sigma)\rho w J_v \qquad \text{(2) Solute Flow}$$

$$\nabla \pi = \frac{RTf\rho}{m_i} \nabla w \qquad \text{(3) Gradient of Osmotic Pressure}$$

$$-\frac{1}{\rho}\nabla \cdot (\rho J_v) = S_s \frac{\partial h}{\partial t} + \gamma \frac{\partial \omega}{\partial t} \qquad \text{(4) Solution Flow}$$

$$-\frac{1}{\rho}\nabla \cdot (J_s^m) = \omega S_s \frac{\partial h}{\partial t} + n(1+\gamma\omega)\frac{\partial \omega}{\partial t} \qquad \text{(5) Solute Flow}$$

Membrane efficiency is denoted by σ.

The model incorporates the dependence of osmotic efficiency (σ) on spatially- and temporally-variable concentration (Bresler relationship).

Equations are implemented in the generic modelling FlexPDE code.

Model configuration

The model domain consists of a vertical section delimited on the left side by the casing support of the piezometer ($r=r_d$). The domain is divided into three regions: one of low permeability corresponding to the clay and two of high permeability representing respectively the inner part of the piezometer chamber and the porous metallic filter.

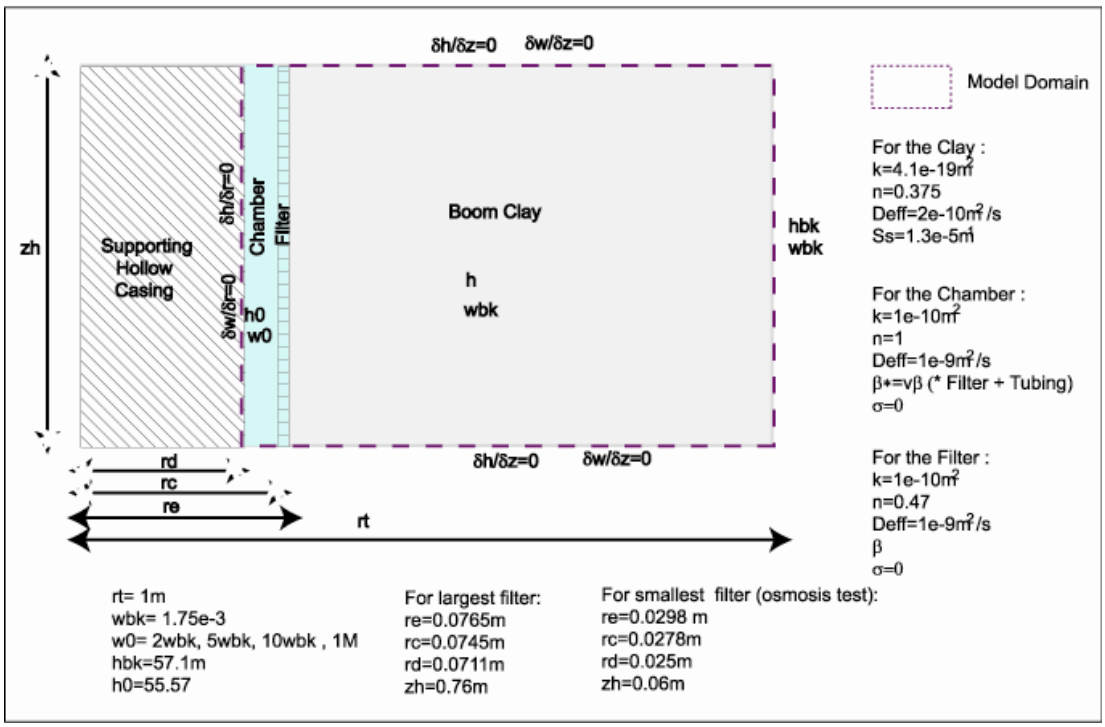


Figure 3.20: Model configuration.

Simulation results

Initially, a simulation (S1) using default parameters was performed. Then key parameters were modified to obtain a good fit (S2) with the experimental data. Used and inferred parameters are listed in Table 1. The simulation results and the temporal changes in concentration and efficiency along sections extending 20 cm from the axis of the piezometer are shown in the Figures 3.21 and 3.22.

Table 1. Used and inferred parameters from two simulations (S1 and S2).

	Parameter	S1	S2
k	Intrinsic Permeability (m^2)	$4 \cdot 10^{-19}$	$1 \cdot 10^{-19}$
D	Diffusivity (m^2/s)	$2 \cdot 10^{-10}$	$1 \cdot 10^{-10}$
S_s	Specific Storage (m^{-1})	$1.3 \cdot 10^{-5}$	$4 \cdot 10^{-6}$
b	Thickness water film (Å)	50	61
h_0	Initial head piezometer (m)	55.57	55.57
h	Osmotic equilibrium head (m)	61.4	57.91
t	Time of peak (h)	4	35
σ	Osmotic efficiency high and low conc.	0.06 - 0.52	0.07 - 0.41

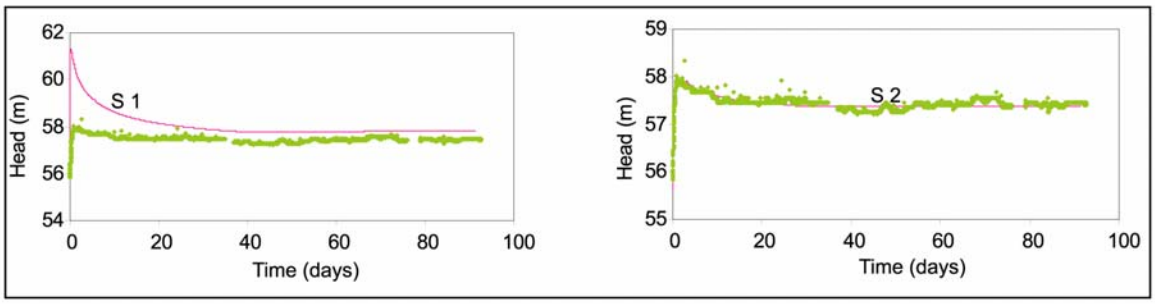
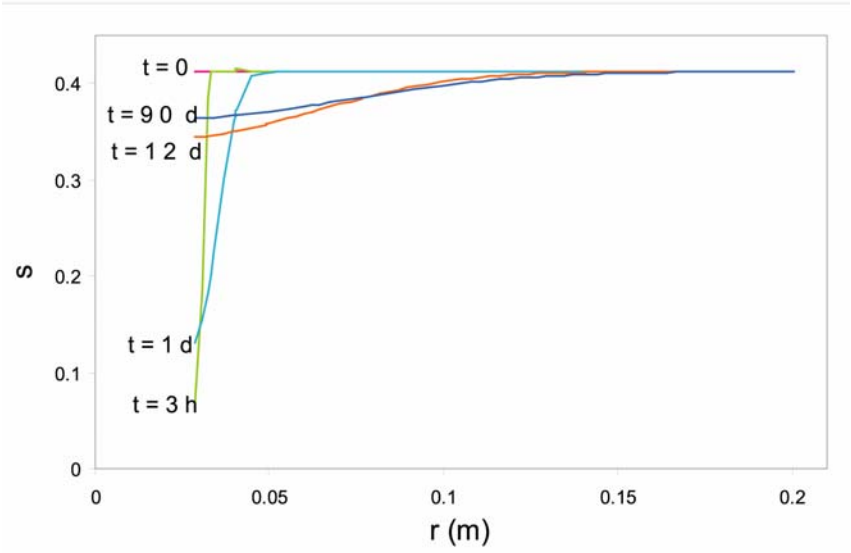


Figure 3.21: Pressure measurements and results from simulations S1 and S2.



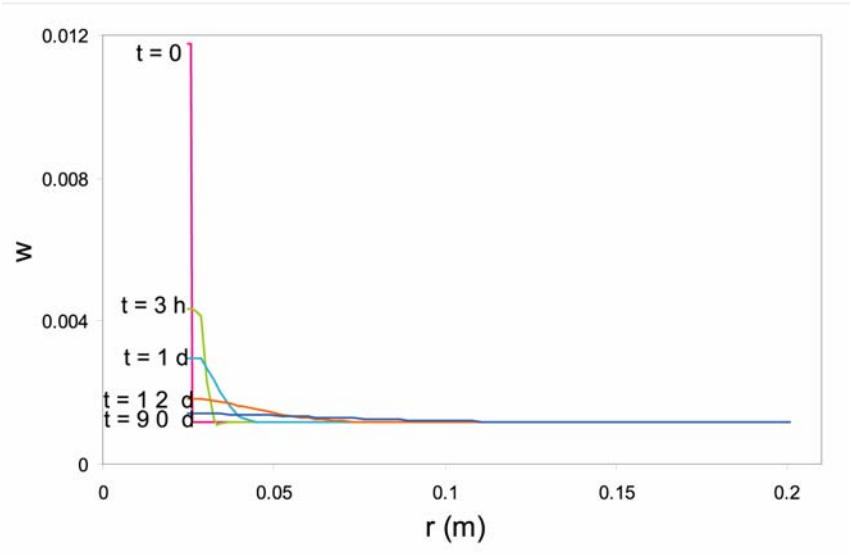


Figure 3.22: Temporal evolution of the membrane efficiency and the mass fraction for S2.

Conclusions

1. The experimental results obtained in situ confirm the occurrence of chemical osmosis in a low permeability plastic formation such as Boom Clay.
2. From the observations it appears that the necessary conditions prevail to maintain the osmosis induced fluxes and to prevent the fast dissipation of osmosis.
3. The semi-permeable membrane behaviour of the Boom Clay (high efficiency) is relevant for the radioactive waste disposal. The osmotic efficiency of Boom Clay is high under undisturbed chemical conditions (41% at 0.014 M NaHCO3), but rapidly decreases when the dissolved salts concentration increases (7 % at 0.14 M NaHCO3).
4. The presently observed osmotically induced pressure is very low. At this level, the osmotic pressure does not represent a danger of hydraulic fracturing for the host rock. However, the test has to be repeated to confirm these first results.
5. The short duration of the osmosis test performed suggests that the shut-in test method is also effective for osmosis testing. Long-term monitoring of the changes

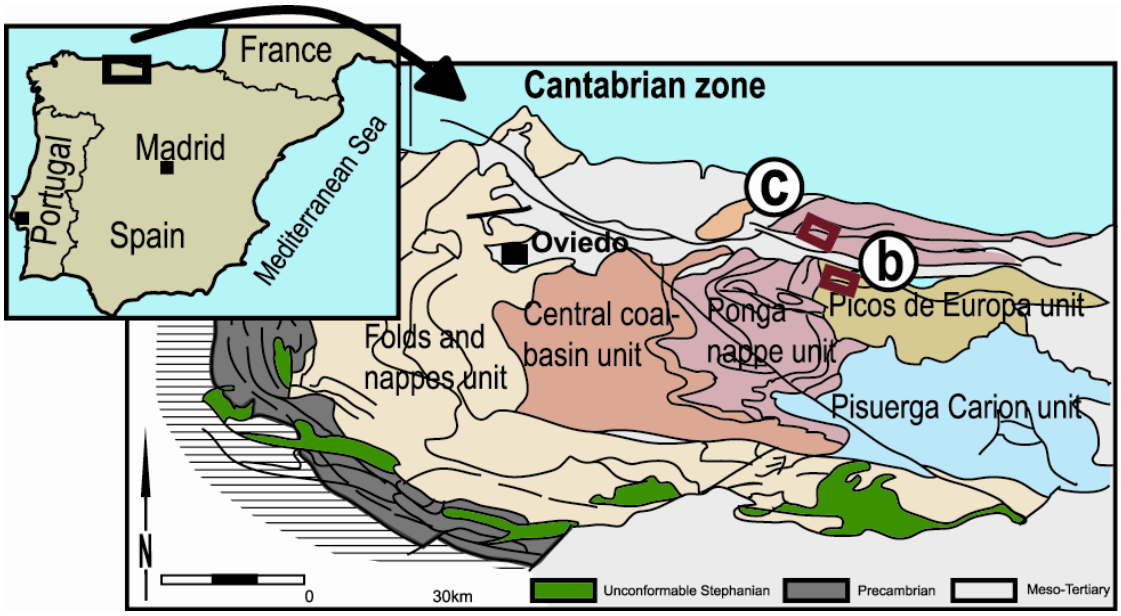
in concentration may provide additional information useful to better estimate the diffusion coefficient values.

Contribution by drs. A. M. Garavito R., dr. H. Kooi and dr. P. De Cannière.

The paleoceanographic record of epeiric carbonate margins Pennsylvanian carbonate platforms in Northern Spain

The physical and geochemical properties of modern coastal seawaters are highly variable both laterally and vertically. This primary variability, however, is rarely taken into account when dealing with geochemical data sets from fossil coastal settings.

Two high-rising, Pennsylvanian (upper Carboniferous) carbonate platforms in the Cantabrian Mountains (Northern Spain), rotated tectonically to near-vertical, were investigated for their paleoceanographic record. The concave to sigmoid fossil carbonate slopes, rising 500 to over 850 meter above the toe-of-slope allow for a reconstruction of depth variations in seawater properties. Particular attention was paid to the paleo-water-column stratification (thermocline, upwelling events etc.). Our working approach involves three different types of carbonate material. These are: low-Mg brachiopod shells, being most resistant against diagenetic alteration, radiaxial and radial fibrous marine cements, and matrix micrites. In order to resolve possible depth variations in seawater geochemistry, shelf-break to toe-of-slope transects (time-lines following the paleo-seafloor) have been sampled on both slopes.



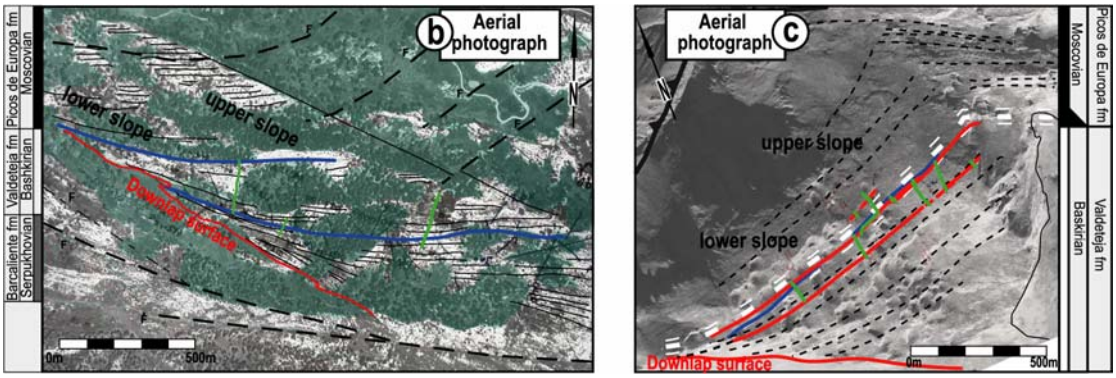


Figure 3.23: a. Overview of geotectonic units in the Cantabrain zone. Study areas are indicated with red-coloured frames. b: Aerial photograph of the Las Llacerias high-rising carbonate platform that comprises the Picos de Europa formation (Moscovian). Platform-to-slope sampling transects are indicated in blue, stratigraphic sections in green. c: Aerial photograph of the Sierra del Cuera high-rising carbonate platform that records the Valdeteja (Bashkirian) and Picos de Europa (Moscovian) formations. Platform-to-slope sampling transects are indicated in red and blue, stratigraphic sections in green.

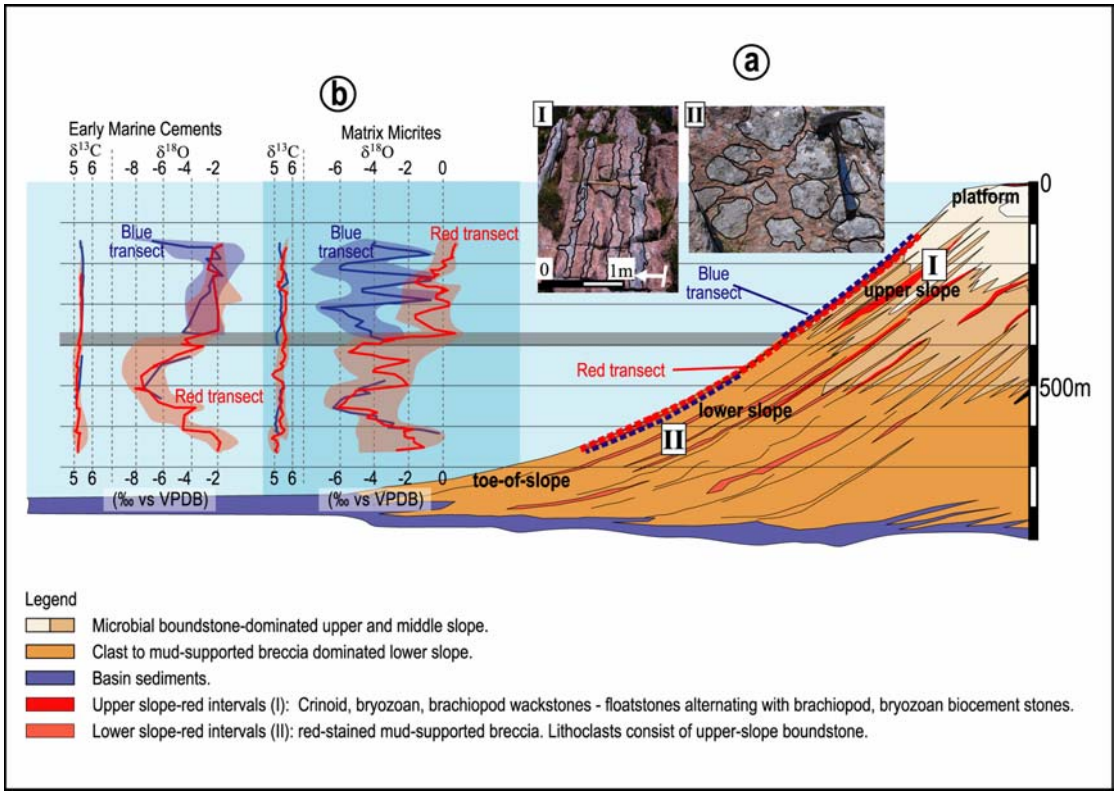


Figure 3.24. Facies model and stable isotope transects of Sierra del Cuera carbonate platform. A: Facies model (modified after Della Porta et al. (2003)) and isotope sampling transects.
B: Stable isotopes vs. water depth transect. Lines are 3-moving averages, colored areas represent data range. Note the constant $\delta^{13}C$ with paleo-water-depth and the changing $\delta^{18}O$, in particular at 380m.

The geochemical data obtained so show intriguing, depth-related patterns in oxygen-isotopic composition that cannot be explained by facies control or diagenetic resetting. A preliminary explanation is the presence of warm, high-salinity bottom water resulting in a strongly layered ocean. In contrast, the carbon-isotope data show uniform values in the 800 m depth transect but vary strongly in the shallow platform top domain.

Another exciting aspect is the environmental change (water depth, upwelling pulses etc.) with time. The Sierra de Cuera flank is characterized by red, perhaps condensed intervals that locally reach 30 m in stratigraphic thickness and alternate with grey sedimentary rocks reflecting the 'normal' depositional mode. Based on the sedimentological context and facies analysis, these red intervals reflect periods of sea-level highstand (maximum flooding intervals). The carbon and oxygen-isotope transects following the red intervals basinwards differ characteristically from those that are sampled in the grey flank deposits.

This is a contribution to EUROMARGINS project ESF 01-LEC-EMA11F.

Contribution by drs. B. van der Kooij, dr. A. Immenhauser, dr. T. Steuber, dr. J. Bahamonde, dr. M. Hagmaier, dr. E. Samankassou, dr. O. Merino Tomé

Absolute temperature records and rainfall patterns from tropical speleothems

The Amazon Basin is under influence of the Inter Tropical Convergence Zone (ITCZ). Seasonal shifting of the ITCZ causes a change in precipitation reflected in the isotopic signal of rainwater (figure 3.25). The isotopic signal recorded in the stalagmite is, when there is a large hydrological reservoir, the weighted annual mean isotope value of the rain water. Therefore stalagmites from Peruvian caves on the eastern flanks of the Andes are used to reconstruct a rainwater isotopic record from the Last Glacial Maximum (21.000 yrs BP) to the present day.

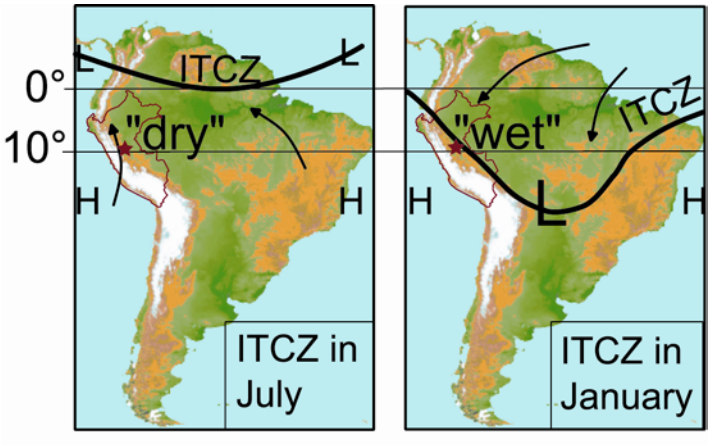


Figure 3.25. Shift of the ITCZ-zone over South America during wet (January) season and dry (July) season. The arrows indicate the direction of the Northeasterly trade winds.

Monitoring data

From September 2003 to October 2004 a monitoring project was carried out in the Peruvian 'Cueva de las Lechuzas'. This cave, located close to the town Tingo Maria at 700 meter altitude (S 09˚19'44.4", W 76˚01'37.5"), was selected for its potential for Amazonian paleoclimate reconstruction. At the foothills of the Andes this area is one of the wettest parts of the Amazon basin with up to 3800mm of annual rainfall. The migration of the ITCZ over the area results in a strong seasonal contrast, with maximum rainfall in January and minimum rainfall in August. Average isotope composition of rain water differs significantly between wet and dry season. To investigate the influence of precipitation

on the drip rate a tipping bucket is installed. A very stable drip rate is recorded at out main monitoring site, providing evidence for a large groundwater reservoir that buffers seasonal variations in precipitation. At this site, seasonal stable isotope variation of drip water lies in a narrow range. However, other tipping buckets in the same cave, recording relatively high drip rates, clearly show seasonal variation in water supply, suggesting these drips were fed by another, much smaller reservoir.
When the drip rate is constant, an average isotopic value is expected over the year, not influenced by seasonal changes during periods of excessive rainfall. The underground reservoir buffers and mixes these seasonal variations.

Age model

A stalagmite was taken from this cave and a ~1cm thick slice was cut and polished at the Vrije Universiteit Amsterdam (VUA). Thin sections were made and a light microscope was used to check the petrography. Five samples were measured on a TIMS for U-Th disequilibrium age-dating. Ages are in chronological order and show a relatively constant growth pattern of the stalagmite, refuting large hiatuses or diagenetic overprints.

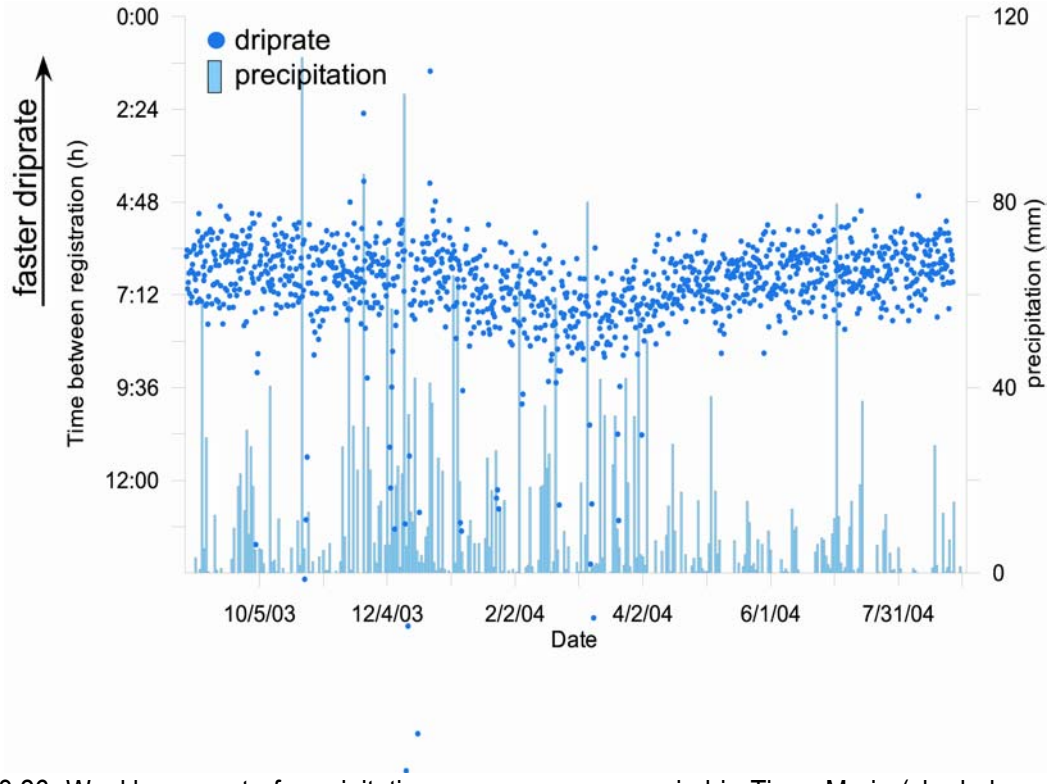


Figure 3.26. Weekly amount of precipitation over a one-year period in Tingo Maria (shaded area). Dots are individual drip water counts registrated by a drip counter installed in the cave. It registers every ~5ml formed by drips of a stalagtite. The average registration time is approximately 7 hours and remains very stable over the whole year although the amount of precipitation changes drastically.

Millennial stable isotopic record

A 0.5 cm spatial resolution series was drilled spanning the last 4800 year. The obtained record shows a clear shift to lighter isotope values at around 4000BP. The climate changed to wetter conditions because the $\delta^{18}O$ of rainwater in Western

Amazonia is mainly controlled by the amount of precipitation. This shift is in good agreement with other proxy records of rainfall from that region (Rowe and Dunbar, 2004; Tapia et al., 2003) which are explained by a southward migration of the ITCZ. This hypothesis implies that Western Amazonia became wetter during this transition which fits well with the observed shift to lower $\delta^{18}O$ values in our profile at 4000 years BP. Around ~1700 BP a change to heavier oxygen isotopes is seen indicating dryer conditions.

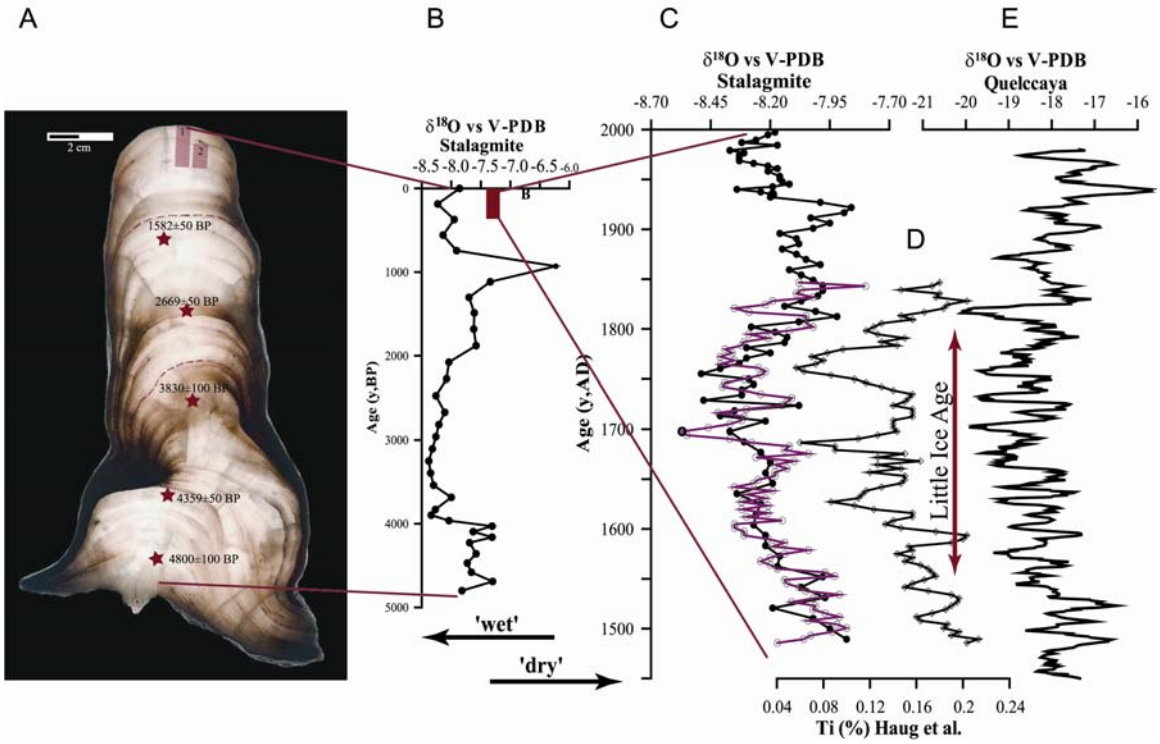


Figure 3.27. (A) Slab from the used stalagmite, the positions of U-Th ages are indicated by red stars. (B) A stable isotope curve at 1-cm resolution. (C) Isotope records of two microdrilled series that are indicated as red areas in (A). They show clear correlation with (D) the Ti-record from the Cariaco Basin, Venezuela by Haug et al. (2001) and (E) the stable isotope record from an ice core at Quelccaya, Peruvian Andes by Thompson et al. (1986).

Decadal stable isotope record

Besides millennial scale records speleothems can also provide decadal scale climate information using a microsampling technique. Two detailed stable isotope records start at 1500 AD (figure 3.27c). Both microdrilled series show the same range in $\delta^{18}O$ and the same overall pattern. Both series show a shift to lower $\delta^{18}O$ values, interpreted as a wetter period, between 1550 and 1800 AD, the 'little Ice Age'. The oxygen isotope record from the Quelccaya ice core (Thompson et al., 1986) shows the same shift towards lighter isotope values during this period. Haug et al. (2001) recognises the 'little Ice Age' over exactly the same time-span at Cariaco Basin. In our records the transition from drier to wetter conditions around 4000 years BP and the 'little ice age' are interpreted as a period of increased precipitation due to the

southward migration of the Intertropical Convergence Zone (ITCZ). Haug et al. (2001) also suggested a southward migration of the ITCZ that led to dryer climatic conditions in Cariaco Basin. Our aim is to construct a continuous isotopic record providing information on precipitation and absolute temperatures for the Amazon Basin for the last 20.000 year.

Fluid inclusions

To reconstruct absolute temperatures we use the paleotemperature equation by Kim and O'Neil (1997).

- $1000\ln\alpha = 18.03\ (1000/T)-32.42$
- $\alpha=[1000+\delta^{18}O_{calcite}]/[1000+\delta^{18}O_{water}]$

To solve this equation the $\delta^{18}O$ of carbonate as well as the $\delta^{18}O$ from drip water must be known. Fossil drip water is trapped in the intercrystalline pores during stalagmite formation. These fluid inclusion waters may provide original δD and $\delta^{18}O$ values of original drip water. In cooperation with several other European labs the Vrije Universiteit Amsterdam has developed special extraction techniques for fluid inclusion water. Due to the technical improvements on the mass-spectrometry field is it now possible to accurately measure small amounts of water (<1µl) on stable isotopes. This development holds the promise to achieve accurate paleo-temperature records from stalagmites.

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Contribution by drs. M. van Breukelen and dr. H. B. Vonhof.

“A Leaking Ocean”

Within the Dutch Mixing of Agulhas Ring Experiment (MARE) project (CLIVAR, NWO), scientists from various institutes focus on the ocean region south of Africa. Here, large amounts of water flow from the Indian Ocean, in the form of large eddies of water (also referred to as “Agulhas rings”), into the South Atlantic Ocean (Fig.3.28). This transport of warm and salty water plays an important role in the global ocean circulation pattern. Modelling studies indicate that and increase of this so called ‘Agulhas leakage’ is thought to lead to a stronger thermohaline circulation, causing more heat and salt to be transported towards the North Atlantic region. Decreases of the leakage reduces the thermohaline circulation and results in less heat being transported to the North Atlantic and northwestern Europe. In order to further quantify the role of the Indian – Atlantic connection in the general ocean circulation, several research cruises to this region were carried out within the MARE project. During these expeditions a large Agulhas ring, which was named ‘Astrid’, was monitored for a one-year period. Besides measurements on temperature, salinity, chlorophyll and rotational velocity of the ring, plankon samples were taken at various depths in the water column, inside, at the boundary and outside ring ‘Astrid’. The plankton samples showed that the Agulhas water contained a characteristic Indian Ocean assemblage. Apparently, the warm water species of the Indian Ocean (Fig. 3.29) are transported into the South Atlantic Ocean via the Agulhas current and rings. This ‘modern’ observation appeared very useful in the reconstruction of the history of the Agulhas leakage. Analyzing sediment cores located in the southeastern corner of the South Atlantic Ocean, just south of the city of Cape Town, indicate that during the Late Pleistocene (the last 500 000 years) the leakage history was characterized by high variability. Enhanced leakage occurred during present and past inter-glacial period and was largely reduced, or even ceased almost completely, during glacial intervals (Figure

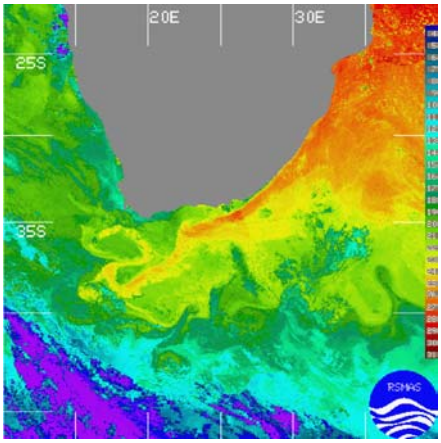


Figure 3.28. Satellite image of the sea surface temperature south of Africa. The warm Agulhas current is clearly visible on the east side of the African continent. Agulhas ring 'Asrtid' is visible at “the tail” of this current.

Figure 3.29 A scanning electron microscope image of the species Globigerinoides ruber. This is one of the species characteristic for the warm Indian Ocean Agulhas water.

3.30).

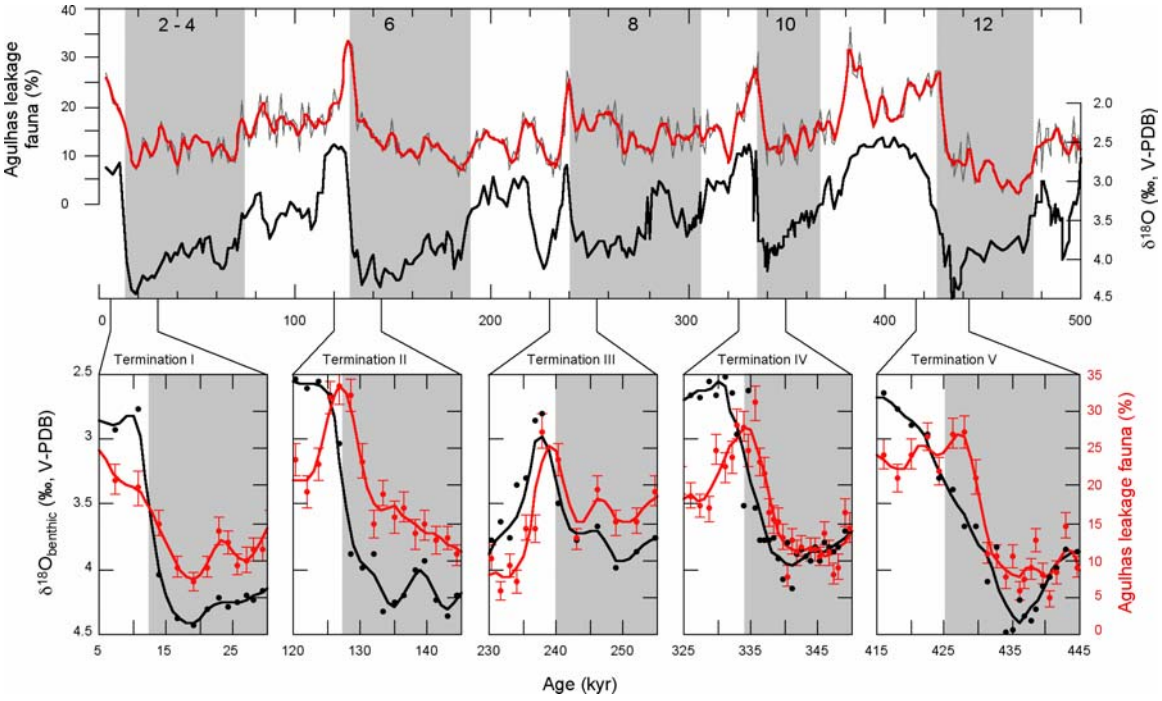


Figure 1.30. The history of Agulhas leakage as reflected in fauna proxies in sediments (modified after Peeters et al., 2004, Nature. Vol.430, p 661-665,). The upper panel shows the oxygen isotope composition of the benthic foraminifer Cibicides wuellerstorfi, largely indicating global ice-volume, and (in red) the relative abundance of fauna associated with Agulhas leakage.Thist is the sum of the relative abundance of Indian Ocean species of planktic foraminifera. An increase of Agulhas fauna is taken as evidence for increased Indian-Atlantic transport. The lower panels are enlargements for the major glacial terminations of the Late Pleistocene (I – V) and show that the onset of Agulhas leakage started during late glacial conditions. They reached maxima during the second half of the terminations. Maxima in Agulhas leakage helped boost the ocean and global climate into the inter-glacial mode of circulation. Numbers on the top of the figure refer to glacial Marine Isotopic Stages.

Although the onset of increased leakage was found to start during late glacial conditions, maxima in the Agulhas leakage were recorded during the second half of the past five major de-glaciations. This indicates that the flow of Indian Ocean water into the Atlantic has played a central role in the timing of inter-hemisphere ocean circulation and climate changes. It is concluded that the leaking of the Indian Ocean into the South Atlantic, via the Agulhas corridor south of Africa, should be considered as an important marine amplifier for the 100.000 year glacial-interglacial cycle that is so the characteristic for the late Pleistocene climate.

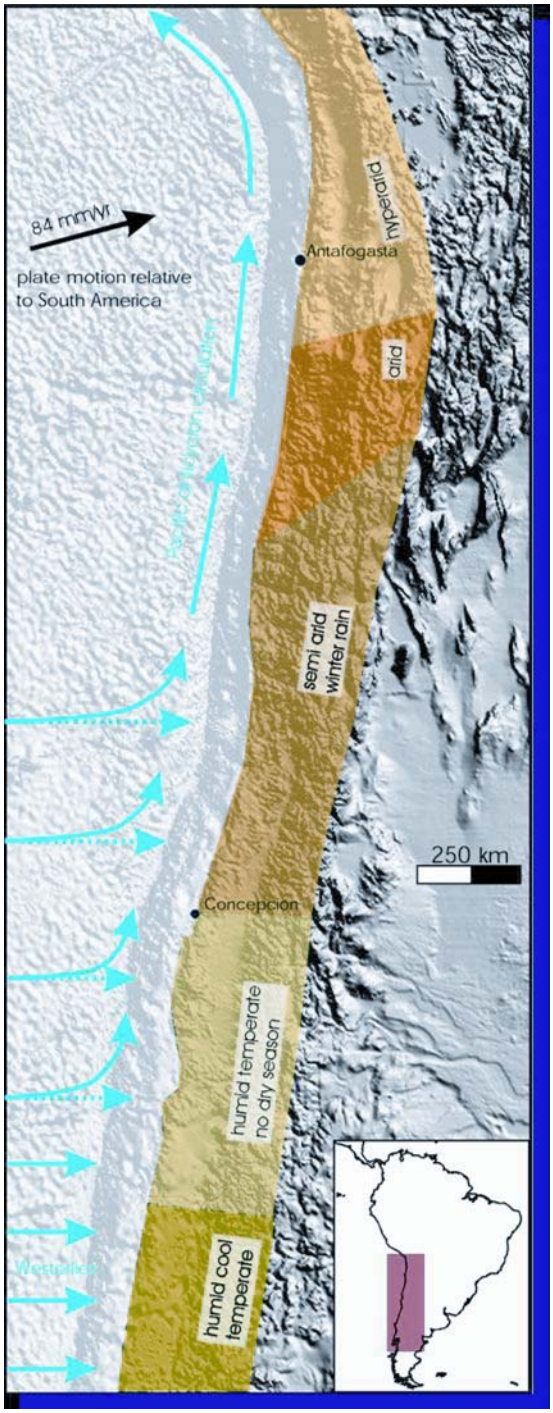
Contribution by dr. F.J.C. Peeters.

Denudation dynamics in response to climate: A case study from the Coastal and Andean Cordillera of Chile

Aim of study

This study aims at quantifying the influence of climate on denudation rates in the region between the Pacific and the western flank of the Chilean Andes, i.e. latitudes ~20° to 40° S (Fig. 3.31). Spatially and temporally a very uniform large-scale plate tectonics forces characterized the chosen region where the Nazca Plate is subducted, slightly oblique, beneath the South American Plate. The coupling of the subducting plate and the overriding plate is influenced by trench sedimentation and ridge collision such that only some local and temporal variations of the stress field are present. The uniform distribution of the compressional and shear stress tectonic forces along the straight North-South subduction zone is in marked contrast to the large climatic gradient. Climate ranges from hyper-arid (North) to humid temperate climate (South) (Fig.3.31). Interestingly this climatic gradient is known to have persistent for over the last 10 Ma. From offshore sedimentary records along the Chilean coast climatological influences on weathering and erosion in the source areas onshore are well documented and the presence of climatic threshold conditions for erosion in the sources areas is indicated. Likewise the Coastal Escarpment that is so prominent in the hyper-arid North essentially disappears in the humid South and the average elevation of the Coastal Cordillera decreases from 1000 to 200 m (Fig.3.31 and 3.32). However, because of the feedback between denudation and uplift the topography is only a qualitative measure.

To quantify regional denudation rates and their temporal evolution and to link them to their tectonic and/or climatic causes the combination of low-temperature thermochronology such as (U-Th)/He and fission-track in apatite and exposure age dating (^{21}Ne and ^{10}Be in quartzes) are used. Iso-elevation and vertical profiles along strike of the Coastal and Andean Cordillera for low-temperature thermochronology provide quantitative insight of the denudation of the uppermost ~1-4 km (Fig. 3.32). Meanwhile, exposure age dating of rivercut surfaces, and soils and fluvial sediments from drainage systems cross-cutting from East to West the Andean realm, are dated to determine recent uplift rates and long-term exhumation rates respectively (Fig. 3.33). The results obtained for each of the present-day climatic zones will allow arriving to an understanding in how far the topographically visible N-S regional trends in climate driven denudation are followed by compensating tectonic uplift. Moreover, results might aid also to identify an eventual global climate signal in the regional landscape evolution. Changes of the latitudinal distribution of climatic zones -due to global climate variations- might be more clearly revealed in areas that experienced a change from arid to wet conditions in the past.



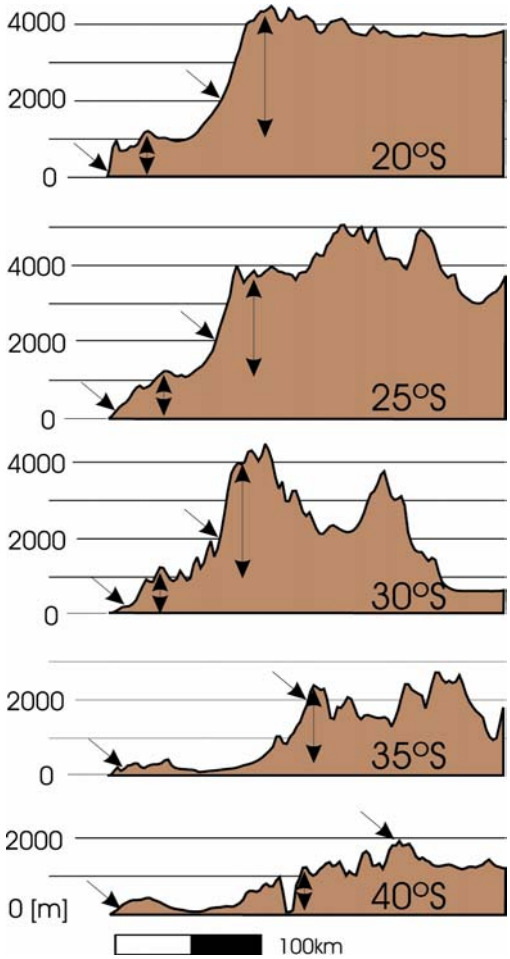


Figure 3.31: Left hand figure: DEM SW-South America (GEOTOPO 30). The approximate limits of the present day climatic conditions in the study area are colour shaded. Prevailing wind directions are indicated with blue arrows. Please note that present day climatic influences in the study area are exclusively from the Pacific weather system. The black arrow on the oceanic (Nazca-) plate indicates the present day rate and direction of convergence. This rate is valid throughout the entire N-S extent of the study area, i.e. 20-40°S.
Right hand figure: W-E profiles at 20°, 25°, 30°, 35° and 40°S. Oblique arrows schematically indicate the position of sampling sites for the 200m and 2000 m iso-elevation profiles for (U-Th)/He dating. Vertical double pointed arrows indicate topography suitable for vertical (U-Th)-He profile sampling. Please note (i) the topographic change along the coast and (ii) the retreat of the western edge of the Andes and (iii) the overall reduction topography towards the South, which is most pronounced south of 30°S, coinciding with significant accumulation of sediments in the accretionary wedge of the trench (south of 33°S).

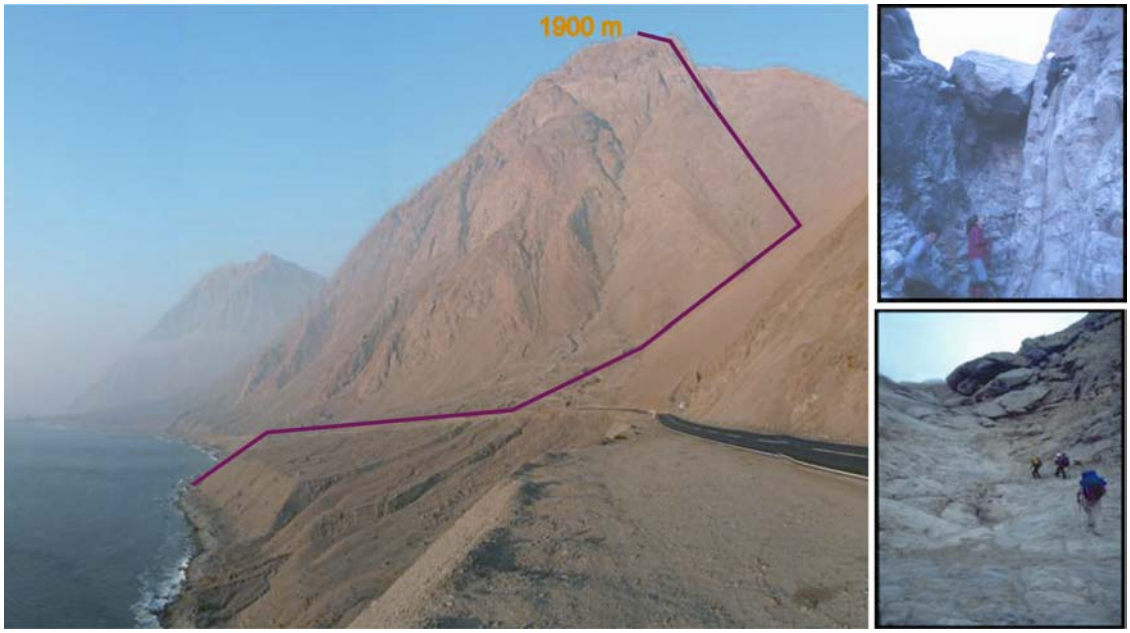


Figure 3.32: Photograph of the coastal cliff in Tocopilla (Atacama Desert domain northern Chile). Left photos: During sampling of a vertical profile on the cliff for low-temperature thermochronology.

Figure 3.33: Photograph of the gorge of Río Loa (above) and its old fluvial plain (below) during sampling for cosmogenic nuclides in northern Chile (right).

Methodology

Low-temperature thermochronology dating provides information about the evolution of tectonic processes and denudation rates of the uppermost 1-4 km. The (U-Th)/He method uses the temperature sensitivity of He-retention in apatite, typically between 40-80°C though dependent on crystal size and cooling rate (Farley 2002). Whilst, the fission-track method makes use of the temperature retentivity of tracks, formed by the fission of 238U, which takes place only below ~110°C (Gallagher et al., 1998).
Cosmogenic nuclides are a well-established tool to date surface processes. The concentration of isotopes such as ^{21}Ne, produced by exposure of mineral such as quartzes to cosmic rays, are used to determine local erosion and regional denudation rates (e.g., van der Wateren and Dunai, 2001).

Preliminary results

Preliminary results of this study provide two new and crucial pieces of information to our understanding on the evolution of the Coastal Cordillera. Firstly, onset of uplift in northern Chile took place at ~44 Ma, followed by a short period of significant erosion. During this period a landscape of subdued relief was formed. Arid conditions were established soon after in Early Oligocene times (Dunai et al., 2005). Very low erosion rates of less than 0.5m/My have persisted since. These findings are compatible with the hypothesis that the onset of aridity in northern Chile could be the reason, rather than the consequence, of uplift of the high Andes during the Miocene (Lamb and Davis, 2003). Climate-controlled sediment starvation is thought to cause high shear stress, focusing the plate boundary stresses that support the high Andes. The second important evidence relates to denudation rates obtained for each of the climatic zones in Chile. They show a regional trend with the highest denudation rates found in the semi-arid areas, with up to 200m/My. Recurrent changes in vegetation cover in these transitional zones –related to global climate change- could explain greater rates of erosion. In contrast in humid areas, despite higher rates of precipitation, continuous vegetation cover seems to slow down erosion at geological time scales. In the humid southern Chile average erosion rates are found to be about 100m/Ma.

Contribution by dr. Joachim Juez-Larré and dr. Tibor Dunai.

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Modeling the effects of a spatial lithospheric strength transition on foredeep evolution

Introduction

Lateral variations in lithospheric strength have been used often in flexural modeling (both 2D and 3D) in order to better fit the observed basement deflections, typically supported by gravity data. This is essentially a “snap-shot” of the role of lithosphere strength in determining the present day geometry. In contrast, we investigated the

effects of a spatial change in lithospheric strength on the evolution of the foredeep of an advancing orogen.
Transitions in lithospheric strength are common in the foreland of orogens and are quite variable as to the width of the transition zone and the magnitude of the strength difference. Former passive margins, for instance, will display strength changes distributed over widths of several tens to few hundreds of kilometers. Other transitions may originate from juxtaposition or accretion of pieces of lithosphere with different properties and may be characterized by a much larger gradient than former passive margins. Across a lithospheric strength transition, the response to (orogenic) loading, and thus the geometry of the foredeep, will change because of the different flexural response of weak and strong plates. Loading of a weak plate will result in high amplitude, short wavelength deflection, whereas a strong plate is characterized by shallower and wider basin geometry.

Model strategy and setup

Using a 2D finite difference elastic thin plate model, we investigated the effect of different transition widths and strength contrasts on evolving foredeep geometry and fiber stress. We express the strength or rigidity of the plate by its effective elastic thickness Te.

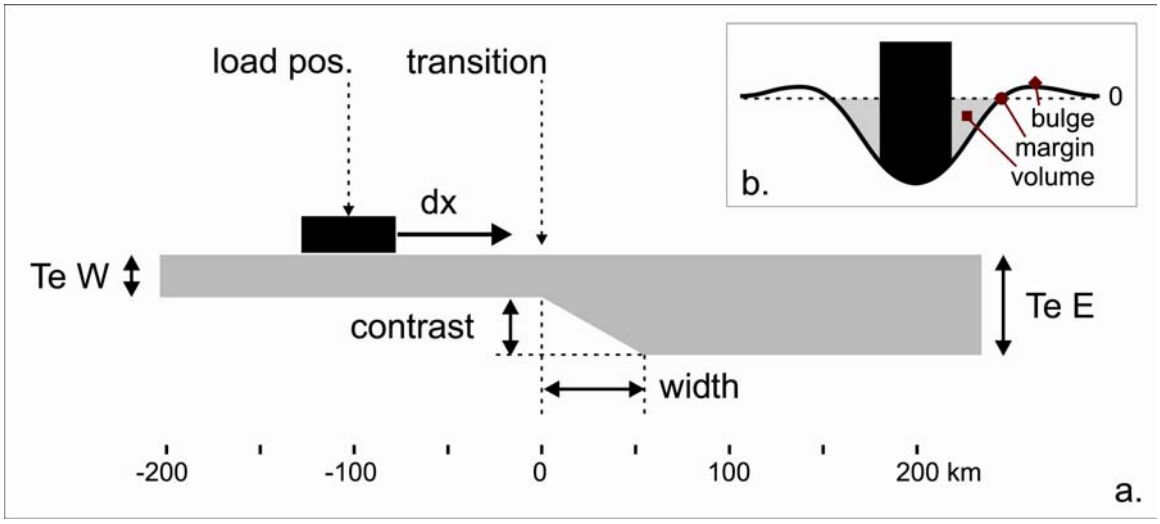


Figure 3.34. (a) Model setup. Continuous plate, Te west < Te east. A constant load is displaced towards the east by 10 km increments, its position is defined by its center. Transition location is defined by its western initiation. Tested parameters are shown in italics. Te = effective elastic thickness. (b) Variables used to quantify basin geometry.

Basin geometry is quantified by the basin width (position of the basin margin with respect to the load), bulge elevation and volume (or cross sectional area in this 2D setup). Maximum fiber stress (σ_{xx}) is calculated as a function of plate curvature. The results discussed in the next section apply to a 20 km wide transition from a Te of 15 km in the west, to a Te of 40 km in the east. These values and the modeling in general were inspired by the East Carpathians and their foreland, which features an oblique transition between the Moesian platform in the west and the strong East European Craton in the east.

Model results

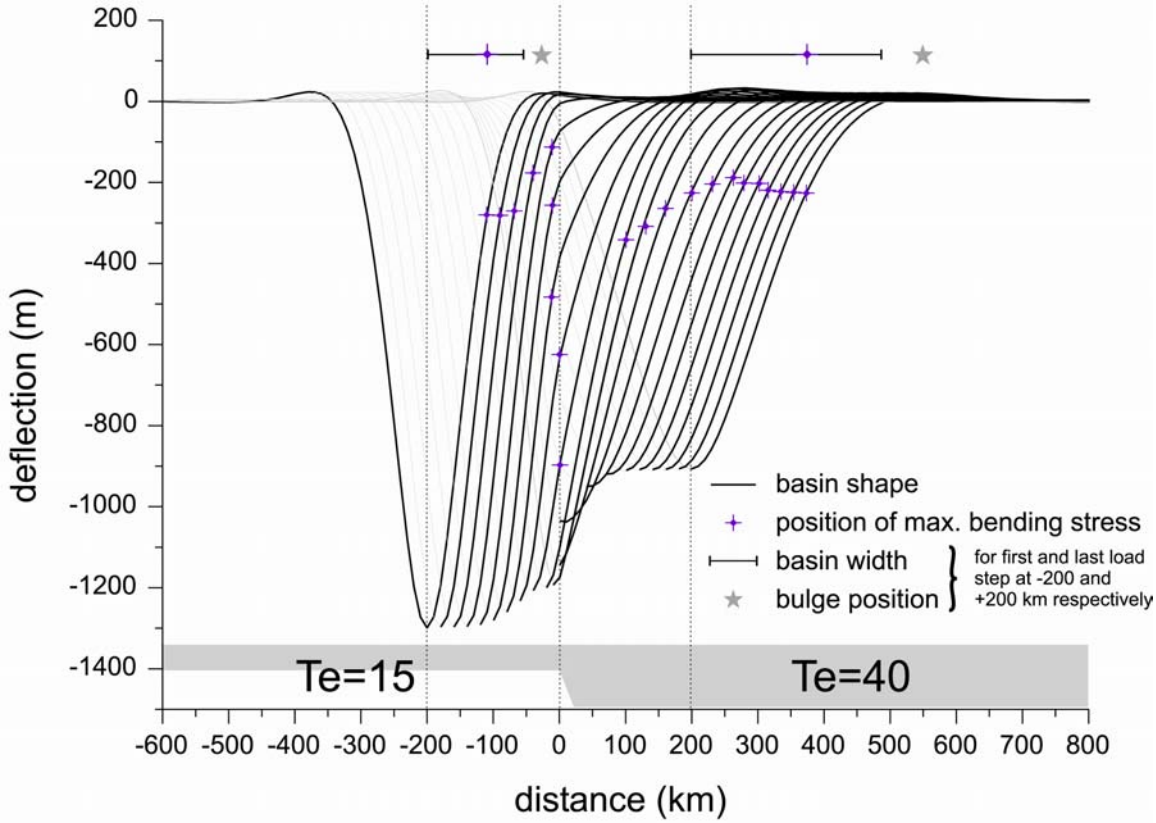


Figure 3.35. Basin shape for 20 load steps across transition width of 20 km. Initial basin shape (load at x=-200 km) represents the equillibrium for Te of 15 km. Final load position (load at x=200 km) results in Te40 equilibrium shape.

The changing shape of the deflected plate across the transition is clear from figure 2. It shows the change from a narrow, deep basin to a wider, shallower one. Changes in bulge elevation are evident. The position of the maximum bending stress is influenced by the transition as well: it is concentrated along the transition for a large number of load steps.

Normalized values for basin geometry and bending stress are shown in figure 3.36.
As the load moves from west to east, the flexural response changes from the Te15 to the Te40 equilibrium values. For the basin width and volume this means that they have to increase. However, this increase is not gradual but subdivided in two stages, separated by a period of quiescence. The bulge elevation will decrease as the strong plate is characterized by smaller flexural amplitude. Again, the decrease is not gradual: the bulge elevation first drops well below the Te15 and the Te40 equilibrium values, then increases to a magnitude larger than its initial one, before finally settling at its Te40 equilibrium value. The position of the maximum bending stress is related to the wavelength of the basin. Its position with respect to the load should therefore increase by the same amount as the basin width. The model results show that after an initial increase, the distance of the maximum bending stress with respect to the load

actually decreases. In fact its position is constant, fixed at the strength transition, while the load is approaching. Finally, it moves to its new equilibrium position at very large rates.

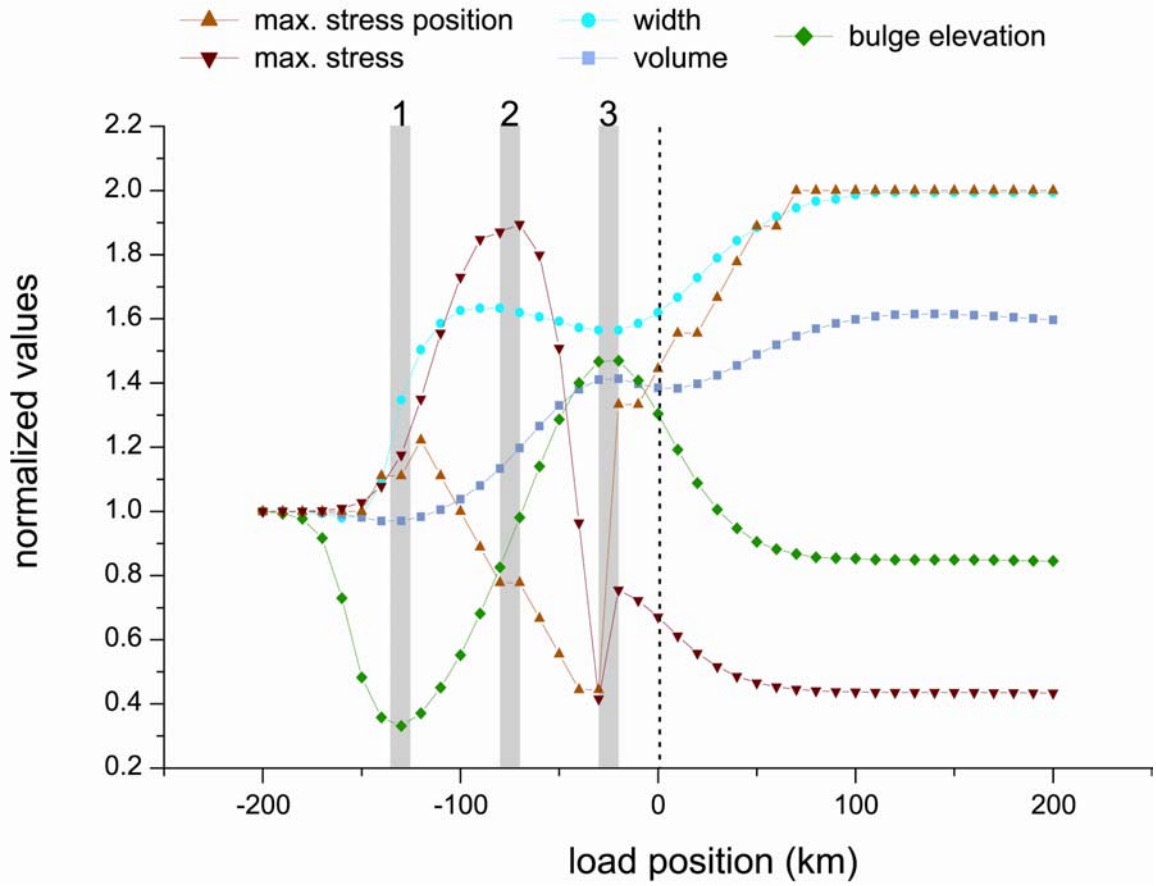


Figure 3.36. Normalized values for basin geometry and bending stress as a function of load position, for a 20 km wide transition from an elastic thickness (Te) of 15 km in the west to Te of 40 km in the east. Numbered grey columns indicate correlating events discussed in the text. Vertical dashed line indicates position of the Te transition.

The maximum rate of basin widening corresponds to the minimum bulge elevation (1). Maximum bending stress (2, in this case almost twice its initial value!) occurs when its position is constant along the strength transition, the basin width has reached a sub maximum value, and the bulge elevation and volume are increasing at their highest rates. Finally (3), maximum bulge elevation occurs when basin width is still stable, volume has reached a sub maximum and the stress position moves away from the transition. After the load has moved across the strength transition, all parameters settle to their new equilibriums.

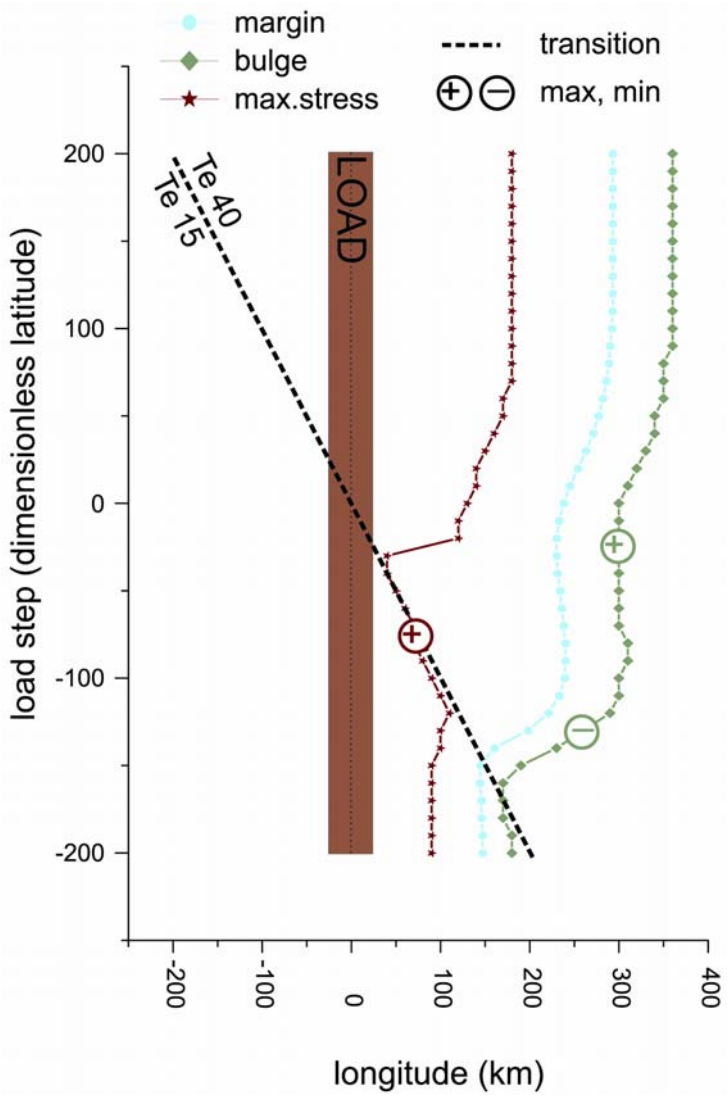


Figure 3.37. Position of bulge top, basin margin and maximum fiber stress in a synthetic map view with respect to the position of the load and the strength transition. Also showing positions of maximum and minimum bulge elevation and maximum bending stress.

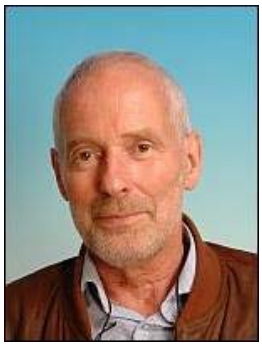
These relations are again displayed in figure 3.37, where the load step (which in reality represents different time steps) along the vertical axis is tentatively replaced by dimensionless latitude or northing, creating a synthetic map view. On top of the positions of the bulge and maximum bending stress, the position of their respective maximum and minimum values are indicated. An important observation is that the position of the maximum bending stress does not coincide with the bulge at any time, and is strongly controlled by the position of the strength transition.

Though the magnitudes of the changes and the load positions for which they occur are unique to the specific transition contrast and width, the correlations we discussed apply to all tested contrasts and transition widths. The larger the strength contrast and the smaller the transition width, the more pronounced the effects are. This work is in progress; we will additionally focus on the relation with and relative importance with respect to other basin forming mechanisms as well on the applicability of the results in understanding the evolution of the East Carpathian foredeep.

Contribution by drs. K.A. Leever, dr. G. Bertotti, dr. B.P. Zoetemeijer, prof. dr. S.A.P.L. Cloetingh

Chapter 4 Special Features

With the resignation of Prof. dr. Jan W. de Leeuw as director of the Royal Netherlands Institute for Sea Research (Royal NIOZ) per 1st July, NSG had to say farewell to its founding chairman of the board, Prof. dr. Johan Meulenkamp, when he took over the job of director of Royal NIOZ. Johan always has acted as the anchorman and a bridge-builder between the UU and VU.

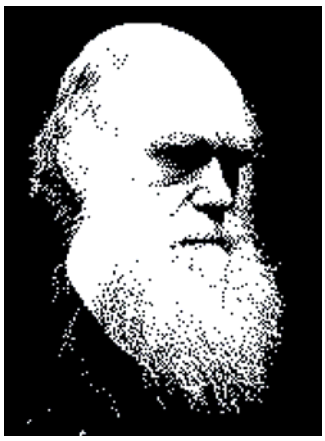


Johan is succeeded by Prof. dr. Gert as Chairman of the Board and by Prof. dr. Bert van der Zwaan as head of the research group Stratigraphy and Paleontology.

The highest possible award in science in The Netherlands, the NWO Spinoza prize, was awarded to Prof. dr. ir. Jaap Sinninghe Damsté for his outstanding work in biogeochemistry. The Spinoza price exists of 1.5 million Euro for research and a bronze statue of the Dutch philosopher Spinoza, awarded by the Dutch Organization for Scientific Research (NWO). The NWO-Spinoza prize is awarded to Dutch scientists who are at the very top of the research profession. The laureates are internationally renowned and are an inspiration to young scientists. Every year, 3 to 4 scientists are selected from all fields of sciences.

At the 2004 European Geosciences Union Conference Dr. F. Hilgen was awarded the Milutin Milankovitch Medal for his original and pioneering contributions to the intercalibration of the radioisotopic and astronomical time scales up to the Miocene.

His astronomical time scale for the Mediterranean Plio-Pleistocene based on tuning cyclic sedimentary cycles to astronomical target curves produced substantially older ages (by up to 12%) for magnetic reversal boundaries than in then existing polarity time scales. The new time scale was soon adopted however and now underlies the standard geological time scale for the youngest time interval of Earth's history. His research and that of his co-workers convincingly demonstrate that a single oscillatory climate system which operates independent from glacial cyclicity is responsible for sedimentary cycle formation in the Mediterranean over at least the last 13.5 million years, both in the marine as well as in the continental realm. The detailed comparison between the cyclic stratigraphic record and astronomical target curves allowed discriminating the most accurate astronomical solution from a geological point of view while the much increased resolution in time-stratigraphic correlations proved indispensable in demonstrating cause and effect relationships in geological studies



In 2004 the Darwin Center for Biogeology was launched. The Darwin Center integrates excellent research groups into one national institute. In view of the Dutch situation of having a knowledge network concentrated over a small geographical area, all groups can remain in their respective institutes and will simultaneously be able to organize inter-institutional research efficiently. The following institutions are participating in the Darwin Center:
Utrecht University, Vrije Universiteit Amsterdam, Netherlands Institute of Ecology, Royal Netherlands Institute for Sea Research, Radboud University Nijmegen and Wageningen University and Research Centre.
The Scientific director of the Darwin Center is Prof. dr. Bert van der Zwaan.

Reaccreditations: In January 2004 ISES has been reaccredited for the period 2004-2008.

ISES

ISES will mainly use the funding for the second period for the support of young talent,

focusing on the four Integrated Programmes of ISES: the North-Atlantic margin, Ned-seis, the Pannonian Basin and the Mediterranean.

In June 2004 NSG has been reaccredited for the period 2005-2010. As has been stated in the report for the KNAW, NSG will focus its efforts on PhD training.

EUROPROX was awarded a second term in 2004. This term is a transitional phase between the first three years and the final four and a half years. In 2005 fourteen new projects start in Bremen.

Chapter 5 Course Curriculum

Advanced training of PhD students forms a key issue in the NSG mission. PhD training is accomplished through active participation of PhD students in co-supervision of MSc programmes of the participating faculties and through participation in a number of selected high-level courses from the NSG Curriculum. The NSG courses form an integrated part of the entire PhD programme. To this purpose a contract is signed between each PhD student and NSG invoking a commitment of 12 full-time study weeks to be spent on NSG short courses. In addition a limited number of introductory courses is offered through the MSc programme and can be selected on an individual basis.

The NSG Course curriculum is directed towards training of practical skills and frontline developments in modern Earth Sciences. Besides NSG staff, leading international scientists acted on invitation of NSG as course instructors on these courses

Since 1999 NSG co-operates in ISES with the research schools CTG (Centre for Technical Geoscience) and VMSG (Vening Meinesz Research School of Geodynamics). In 2004 NSG initiated the ISES PhD training programme, open for PhD's of the three participating schools.

Co-operation within the EUROBASIN School enabled NSG PhD students to participate in the advanced EUROBASIN course curriculum.

With the establishment of ECOLMAS, a joint venture between EUROPROX, NEBROC, NSG and RCOM, PhD students have been enabled to participate in the advanced ECOLMAS/EUROPROX curriculum.

NSG Courses 2004

Seismic imaging of sedimentary structures
Volkhardt Spiess, Sebastian Krastel, Hanno von Lom, Tilmann Schwenk, Lars Zühlsdorff (RCOM) EUROPROX/NEBROC/NSG/RCOM course
17 participants

Introduction to climate modelling
Andre Paul, Gerrit Lohmann, Michael Schulz, (GeoB), Hans Renssen (VUA)
16 – 19 February 2004, Bremen
EUROPROX/NEBROC/NSG/RCOM course
15 participants

Basin Analysis
Sierd Cloetingh, Jeroen Kenter (VUA)
30 March - 10 May 2004, Amsterdam
NSG/EUROBASIN course
12 participants

Precambrian
Cees Passchier (Mainz/VUA), Adrian Immenhauser and Jan Wijbrans, (VUA)
19-23 April 2004, Amsterdam
NSG course
6 participants

Map grids and datums in GIS and GPS applications - all around the world
Gábor Timár, Dept. of Geophysics Eötvös University of Budapest, Hungary
26-29 April 2004, Amsterdam
NSG/EUROPROX course

6 participants

Selected Applications of Isotope Methods in Marine Geochemistry and Biogeochemistry
Prof. Marc Alperin, Dept. of Marine Sciences, University of North Carolina
10-14 May, Utrecht
NSG/EUROPROX course
20 participants

Biogenic silica in the ocean
Oscar Romero, Gerhard Fischer, et al.
26-28 May 2004, Bremen
RCOM course
19 participants

Nummerical methods in geomechanical modelling
Tristan Cornu, and Christophe Pascal (ENTEC, VUA)
26-27 May 2004, Amsterdam
NSG/ENTEC course
5 participants

Long continental paleoclimate records over multiple Glacial-Interglacial cycles from cyclic fluvial deposits in subsiding lowland settings (Pannonian Basin).
Annamária Nádor, Hungarian Geological Survey
2 June 2004, Amsterdam
NSG/EUROPROX course
15 participants

Oral presentation skills
Marieke de Boer (Marieke de Boer Training and Coaching, Amersfoort)
25 and 28 October 2004, Utrecht
NSG course
6 participants

Studying neotectonics with plate motion, seismological and GPS data: theory and practice
Seth Stein
9 and 11 November 2004, Amsterdam
ISES/NSG/VMSG/CTG course
7 participants

Greenhouse Climate and Carbon Cycle Dynamics: Lessons from the early Cenozoic
James Zachos et al.
11-12 November 2004, Bremen
EUROPROX/RCOM course
14 participants

Introductory Course in Marine Sciences
Fred Jansen (Royal NIOZ), Torsten Bickert (RCOM), et al.
15-26 November 2004, Texel
NEBROC course
16 participants

Large Meteorite impacts in the History of Planet Earth.
Jan Smit, VUA, Christian Koeberl, Univ. of Vienna, Sandro Montanari, Coldigioco Italy
24-27 November 2004, Amsterdam, excursion K/T Boundary Limburg
NSG/EUROPROX course
18 participants

Chapter 6 Networks and Workshops

NSG is strongly embedded in the networks of the international Earth Science community, as witnessed by the large number of joint publications, the large number of foreign students joining the NSG course curriculum, the active role of NSG scientists in national and foreign academia, editorial boards and organisations (see Appendix III). NSG's active role in international partnerships has been widely recognised and resulted in a significant number of EU grants, a number of formal co-operation agreements and a leading position of NSG scientists in a several international networks.

NSG participation in international Networks

EU Fluid Inclusions Network
JUMP Egyptian Network
INTAS Programmes:
- Fluid regime at depth
- PTt paths and fluid regime
- Meteorites
- Fluid-mineral equilibria

Fission Track Network
Antaride Network
Argon Geochronology Network
Peri-Tethys Programme
International Geological Correlation Programme (IGCP)
MILUPOBAS programme
EUROPROBE
- PANCARDI
- EURORIFT

EUCOR-URGENT
EUROBASIN School
International Lithosphere Programme
Task Force "Origin of Sedimentary Basins"
European Consortium for Ocean Drilling
European Lake Drilling Programme (ELDP)
ESF Network on impact processes
MAST II Paleoflux
MAST III Pace
Ocean Drilling Programme
Erasmus Networks
EUROPROX: European Graduate College "Proxies in Earth History"
PROPER: Marie Curie training site "PROxies in Paleoclimatology: Education and Research"
CESOP: Coordinated European Surface Ocean Palaeo-estimation
TEMPUS Network
EU Human Capital and Mobility Networks
- MIOMAR
- Ptolemais Programme

IUGS –IGCP programmes
CoMCoM network
STOPFEN Sea-level, temperature and ocean circulation: past present and future non-linear feedbacks.

Chapter 7 Key data on Ph.D. students and Post-docs

NSG Personnel

Two hundred and four researchers were actively involved in NSG in 2004, of which 110 were located at Vrije Universiteit Amsterdam and 94 at Utrecht University. The NSG personnel comprise a total of 87 PhD students, 48 Postdoctoral fellows and 69 permanent staff. The large percentage of PhD students motivates a strong emphasis on PhD training through advanced short courses (see Chapter 5) and co-supervision of graduate students.
NSG has a strong international focus, as expressed by the international origin of PhD students and Post-docs.

NSG Personnel

	Staff	Post-doc	PhD Total	PhD Ongoing	PhD Started	PhD Completed	Total
Tectonics VU	11	7	9	2	3	4	**27**
Petrology VU	5	1.5	3.5	2	1	0.5	**10**
Isotope Geochemistry VU	4	6.5	8	2	4	2	**18.5**
Sedimentology VU	5	1	7	4	0	3	**13**
Paleoecology and Paleoclimatology VU	6	7	12.5	12	0	0.5	**25.5**
Hydrogeology VU	9	1	4	3	0	1	**14**
Quaternary Geology VU	1	0.5	1	0	0	1	**2.5**
Sedimentology UU	3	0	2	2	0	0	**5**
Stratigraphy and Paleontology UU	8	6.5	14	9	2	3	**28.5**
Palaeoecology UU	7	4	10	7	0	3	**21**
Geochemistry UU	10	13	16	10	4	2	**39**
Total:	**69**	**48**	**87**	**53**	**14**	**20**	**204**
VU	41	24.5	45	25	8	12	**110.5**
UU	28	23.5	42	28	6	8	**93.5**

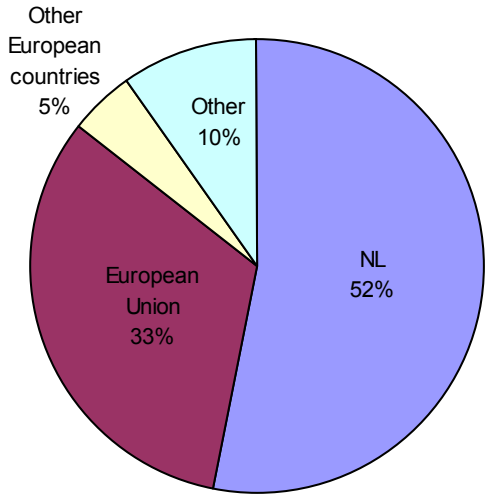
Table 1 NSG Personnel

PhD students

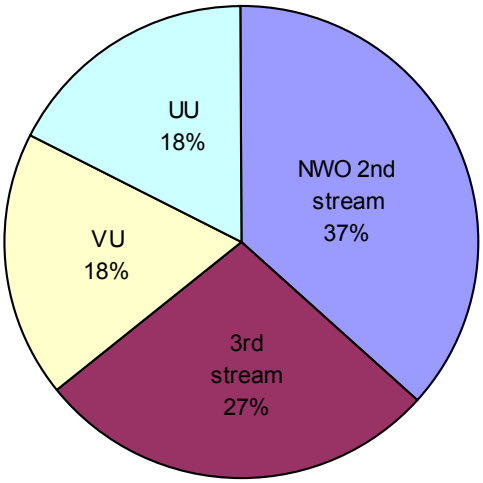
Twenty PhD students successfully defended their thesis, whereas 14 new students started their PhD research. The majority of the PhD's are Dutch (52%), but the percentage is slightly decreasing in favour of PhD students from non-European countries.

NWO funded 37% of the PhD students (was 39% in 2003); the percentage of Third-Stream funding has increased from 31% in 2002 to 34% in 2003, but decreased to 27% in 2004. UU and VUA both funded 18% of the PhD students in 2004. In 2003 these percentages were 15 and 12 respectively.

Origin of NSG PhD's

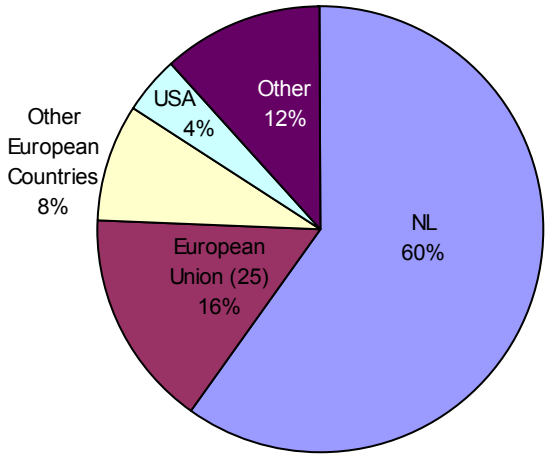


Funding of PhD projects

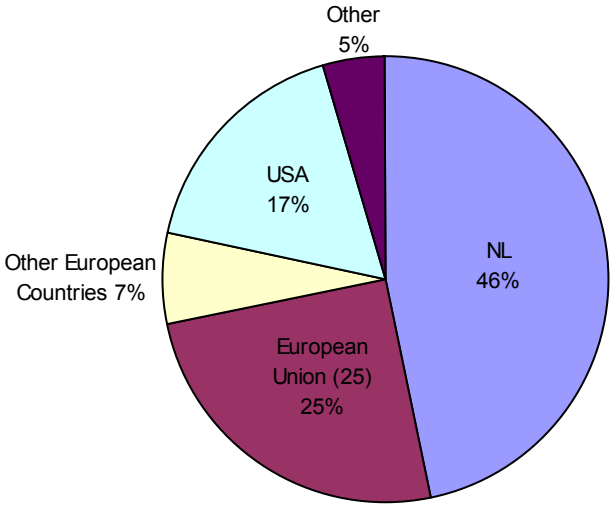


The trend towards a more international job market is persisting; 40% of the former NSG graduates (from 1992 to 1999) found employment outside the Netherlands of which 16% in the EU, 8% in other European countries, 4% in the USA and 12% in other countries. Fifty-four percent of the former NSG PhD's that graduated since 2000 found employment outside the Netherlands (25% in the EU, 7% in other European countries, 17% in the USA and 5% in other countries).

Location of employment of former NSG PhD's, PhD's, 1992-1999



Location of employment of former NSG since 2000



Summary of PhD output and duration per commencing cohort (table)

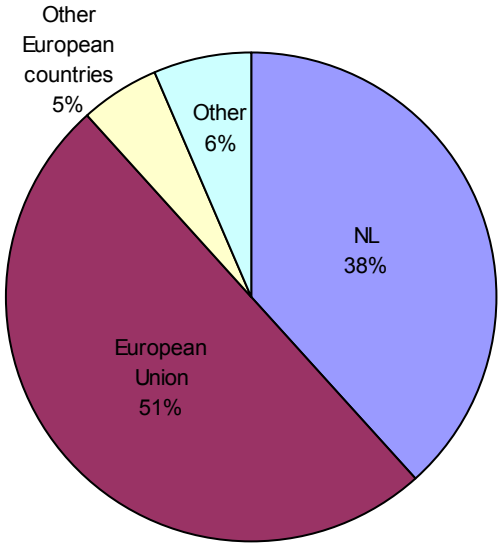
Cohort	# PhD's	4 year	5 year	6 year	7 year	>7 year	Average duration	stopped	Ongoing[2)]
1991	5	0 %	60 %	60 %	60 %	100 %	6.9 [3)]	0	0
1992	10	0 %	40 %	80 %	80 %	80 %	5.2	1	1 [3)]
1993	11	18 %	36 %	73 %	82 %	82 %	5.0	2	0
1994	21	14 %	38 %	86 %	91 %	95 %	5.0	1	1
1995	17	6 %	29 %	65 %	83 %	88 %	5.3	2	0
1996	8	50 %	88 %	88 %	88 %	88 %	4.9	0	1 [3)]
1997	8	8 %	39 %	62 %	62 %	[1)]		2	1
1998	22	27 %	59 %	73 %	[1)]			1	5
1999	16	19 %	56 %	[1)]				2	4
2000	12	50 %	[1)]					2	4
2001	21	5 % (<4yr)						0	20

[1)] in 2004, this category is not relevant for this cohort
[2)] at present still pursuing a PhD project
[3)] a relatively large fraction of NSG's PhD students is employed elsewhere and combines the PhD project with a full-time job. These PhD's have been included in the above table and bias the results towards a longer duration.

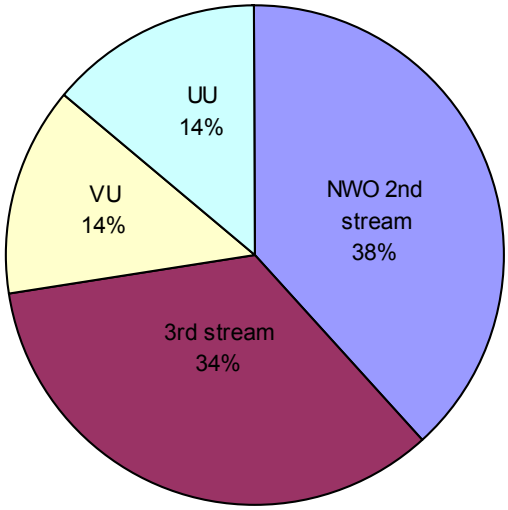
Post-docs

After a substantial increase in non-Dutch European Post-docs from 41% in 2001 to 58% in 2003, this percentage has slightly decreased to 56% in 2004. Statistics also show a slightly increase in non-European Post-docs, from 3% in 2002, 5% in 2003 to 6% in 2004. Sixty-two percent of the Post-docs is foreign, showing the international character of the NSG Research School.

Origin of Post-docs research



Funding of Post-doc



Post-doc Research funding changed with respect to 2001. The Third-Stream funding increased from 14% (2001), 29% (2002) to 36% in 2003, and slightly decreased to 34% in 2004. The Second-Stream funding is decreasing since 2001 (48%), but NWO still remains the most important funding agency with 38%. UU and VUA funding both contribute 14%.

Enclosures

Enclosure I: NSG PERSONNEL

Part A: Scientific Staff

Tectonics VU

Prof. dr. S.A.P.L. Cloetingh
Prof. dr. H. Doust*
Dr. W.W.W. Beekman
Dr. G. Bertotti
Dr. C. Biermann
Dr. D. Nieuwland
Dr. D. Sokoutis
Dr. H. Stel
Dr. R.A. Stephenson
Dr. E. Willingshofer
Dr. B.P. Zoetemeijer

Petrology VU

Prof. dr. G.R. Davies
Drs. F.F. Beunk
Drs. K. Linthout
Dr. M.A. Zakrzewski
Dr. P. Vroon

Isotope Geochemistry VU

Prof. dr. P.A.M. Andriessen
Dr. T. Dunai
Dr. M. ter Voorde
Dr. J.R. Wijbrans

Sedimentology VU

Prof. dr. J. Smit*
Dr. A.R. Fortuin (ad interim department head)
Dr. A. Immenhauser
Dr. J.A.M. Kenter
Dr. J.M. Woodside

Paleoecology and Paleoclimatology VU

Prof. dr. D. Kroon
Prof. dr. T.C.E. van Weering*
Dr. G.M. Ganssen
Dr. S.R. Troelstra
Dr. O. van der Plassche
Dr. H.B. Vonhof

Hydrogeology VU

Prof. dr. J.J. de Vries
Prof. dr. J.P. Stuyfzand**
Dr. B.M. van Breukelen
Dr. A.A. van de Griend
Drs. J. Groen
Dr. C.J. Hemker
Dr. H. Kooi
Dr. Ir. E. Seyhan
Drs. P.M.H. Smit

Quaternary Geology VU

Dr. R.T. van Balen

Sedimentology UU

Prof. dr. P.L. de Boer
Dr. W. Nijman
Dr. G. Postma

Stratigraphy and Palaeontology UU

Prof. dr. J.E. Meulenkamp
Prof. dr. G.J. van der Zwaan
Prof. dr. Th. Wong*
Dr. H. de Bruijn
Dr. A.J. van der Meulen
Dr. F.J. Hilgen
Dr. W.J. Zachariasse
Dr. L.J. Lourens

Palaeoecology UU

Prof. dr. A.F. Lotter
Prof. dr. J.W. de Leeuw**
Prof. dr. J.H.A. van Konijnenburg-van Cittert
Prof. dr. H. Visscher (emiritus)
Dr. H. Brinkhuis
Dr. J. van der Burgh
Dr. W.M. Kürschner

Geochemistry UU

Prof. dr. P.S.J. Van Cappellen
Prof. dr. G.J. de Lange **
Prof. dr. J.W. de Leeuw**
Prof dr. ir. J.S. Sinninghe Damsté**
Dr. T. Behrends
Dr. ir. J.P.G. Loch
Dr. J.J. Middelburg
Dr. P.A.G. Regnier
Dr. ir. C.P. Slomp from 1-9-04**
Dr. S.P. Vriend

* strategic professor
** part-time ordinary professor

Enclosure I: NSG PERSONNEL
Part B: Post-docs

Tectonics VU

Dr. G. Bada (Hungary)
Dr. T. Cornu (France)
Dr. D. Garcia-Castellanos (Spain)
Dr. C.G.E.M. Gumiaux (France)
Dr. L. Matenco (Romania)
Dr. C. Pascal (France)
Dr. A. Saintot (France)

Petrology VU

Dr. A. Schersten (Sweden)
Dr. J. Zinke (Germany, jointly with Paleoecology and Paleoclimatology VU)

Isotope Geochemistry VU

Dr. K.P. Boessenkool
Dr. G. Ruiz (France)
Dr. M. Elburg
Dr. J. Juez-Larre (Spain)
Dr. J. O'Connor (Ireland)
Dr. H. Qiu (China)
Dr. K.F. Kuiper (jointly with Stratigraphy and Paleontology UU)

Sedimentology VU

Dr. S. Dupré (France)

Paleoecology and Paleoclimatology VU

Dr. P. Anand (India)
Dr. S.J.A. Jung (Germany)
Dr. K. Kreissig (Germany)
Dr. F.J.C. Peeters
Dr. M.A. Prins
Dr. H. Renssen (jointly with Quaternary Geology VU)
Dr. J. Zinke (Germany, jointly with Petrology VU)
Dr. P. Ziveri (Italy)

Hydrogeology VU

Dr. ir. G.H.P. Oude Essink

Quaternary Geology VU

Dr. H. Renssen (jointly with Paleoecology and Paleoclimatology VU)

Stratigraphy and Palaeontology UU

Dr. J.A. van Dam
Dr. I.A.P. Duijnstee
Dr. N.T. Jannink
Dr. T.J. Kouwenhoven
Dr. K. Kuiper (jointly with Isotope Geochemistry VU)
Dr. Y.A. van Lith
Dr. M. Rogerson (UK)

Palaeoecology UU

Dr. H. Cremer (Germany)
Dr. O. Heiri (Switzerland)
Dr. M.L. Kloosterboer-van Hoeve
Dr. F. Wagner

Geochemistry UU

Dr. J.T. Abell
Dr. A. Dählmann
Dr. A.W. Dale
Dr. A. Hübner
Dr. A.M. Laverman
C.D. Meile (till 01-03-04)
Dr. C.E. Pallud
Dr. I.J. Poole
Dr. G.J. Reichart
Dr. D. Rodriguez Aguilera
Dr. ir. C.P. Slomp (till 1-9-04)
Dr. M. Thullner
Dr. M. Wolthers

Enclosure I: NSG PERSONNEL
Part C: PhD Students

Tectonics VU

A. Bochin MSc. (Russia)
Drs. V.F. Bense (jointly with Quaternary Geology VU and Hydrogeology VU)
Drs. J. Foeken (jointly with Isotope Geochemistry VU)
Drs. Lopes Cardozo (jointly with University Louis Pasteur, Strasbourg)
Drs. K.A. Leever
Drs. Gordon N. Oakey
Drs. G. Peters MSc (jointly with University of Karlsruhe)
Drs. J. Smit (jointly with Université de Rennes 1)
M. Tarapoanca MSc (Romania)
Ir. S. Tigrek (Turkey)
M. Tilita MSc. (Romania, jointly with University of Bucharest)
Drs. G. Worum MSc (Hungary)

Petrology VU

Drs. J.C. Zwaan
N. Simon MSc (Germany, jointly with Isotope Geochemistry, VU)
Drs. M. Morell MSc (France)
Drs. D. Wiggers de Vries

Isotope Geochemistry VU

Drs. C. Bouman
Drs. J. Foeken (jointly with Tectonics, VU)
Drs. P.S. van Heiningen
N. Simon MSc (Germany, jointly with Petrology, VU)
Drs. A. Tchalikian MSc (France)
J. Corkery MSc(USA)
A. Biarc MSc (France)
B. Ghorbal MSc (France)
Drs. S. Merten

Sedimentology VU

Drs. H. Braaksma
Drs. B. van der Kooij
A.C. Ocampo Uria MSc (USA/Colombia)
Drs. S. Purkis (U.K.)
U. Sattler MSc (Austria)
V. Zampetti MSc (Italy)
T. Zitter MSc (France)

Paleoecology and Paleoclimatology VU

B. Balestra MSc (Italy, jointly with University of Florence)
Drs. M. van Breukelen
Drs. J.M. Brijker (jointly with University of Bremen)
S.M.H. Conan MSc (France)
V. Epplé MSc (Germany, jointly with University of Bremen)
J.A. Estévez MSc (Venezuela)
Drs. R.J.G. Kaandorp
R. Klöcker MSc (Germany, jointly with University of Bremen)
N. Loncaric MSc (Croatia)
Drs. F. Mienis
Drs. M. Saher
Drs. A. Schulp
Drs. A. Wiersma
I. Wilke MSc (Germany, jointly with University of Bremen)
A.J. Wright BSc (U.K.)

Hydrogeology VU

Drs.V.F. Bense (jointly with Tectonics VU and Quaternary Geology VU)
A.M. Garavito Rojas MSc (Colombia)
O. Obakeng MSc (Botswana)
Drs. V.E.A. Post
Drs. P.J. van Rossum

Quaternary Geology VU

Drs.V.F. Bense (jointly with Tectonics VU and Hydrogeology VU)

Sedimentology UU

Drs. A.P. van den Berg van Saparoea
Drs. M. van Dijk

Stratigraphy and Palaeontology UU

Drs. H. Abels
Drs. J. Becker
Drs. F.P. Huiskamp
Drs. K. Hordijk
Drs. K. Koho (Finland)
Drs. G. Kuhlmann
Drs. R.W. Kruk
Drs. E. van der Laan
Drs. I.R. De Lugt
Drs. A. van der Molen
Drs. L. de Nooijer
Drs. M. Schweizer
Drs. E. Snel
Drs. E. Tuenter

Palaeoecology UU

M. Dolezych-Mikolai MSc (Germany)
Drs. T.H. Donders
Drs. T.B. van Hoof
Drs. L.L.R. Kouwenberg

Drs. A. Liu
Drs. A.M. Oosting
Drs. A. Sluijs
Ir. W. Soepboer
Drs. M. Sprangers
Drs. J. Warnaar

Geochemistry UU

S. Arndt MSc (Germany)
S.C. Bonneville MSc (France)
R.W. Canavan MSc (USA)
Drs. J.W. Claessens
K. Heister MSc (Germany)
C. Hyacinthe MSc (France)
T. Jilbert MSc (England)
P. Jourabchi MSc (Canada)
S. Loucaides MSc (Cyprus)
V. Mastalerz MSc (France)
D. Menzel MSc (Germany)
D.W.F. Naafs MSc (Germany)
G. Nehrke MSc (Germany)
A.M. Reitz MSc (Germany)
C. Spiteri MSc (Malta)
Drs. N. Walraven

Enclosure II: KEY DATA ON PhD RESEARCH AND POST-DOCS
Part A: Ongoing PhD research in 2004

Tectonics VU

Name:	Drs. K.A. Leever
Promotor:	Prof. dr. S.A.P.L. Cloetingh
Co-Promotor:	Dr. G.V. Bertotti
Subject:	Neotectonic development of an active foreland basin (Focsani Basin, Romania)
Funding:	First Stream: VU and ISES
Started:	1 February 2003

Name:	Drs. G. Peters MSc
Promotor:	Prof. dr. S.A.P.L. Cloetingh
	Prof. dr. M. Granet (Karlsruhe)
Subject:	Activity of faults in the Northern Upper Rhine Graben
Funding:	Third stream: EUCOR-urgent, ENTEC)
Started:	1 May 2002

Name:	Drs. J.H.W. Smit
Promotor:	Prof. dr. S.A.P.L. Cloetingh
	Prof. dr. J.P. Brun (Rennes)
Co-Promotor:	Dr. D. Sokoutis
Subject:	Analogue modeling of young continental rifts and collision tectonics
Funding:	First stream: ISES
Started:	1 February 2000

Petrology VU

Name:	Drs. J.C. Zwaan
Promotor:	Prof. dr. J. Touret
Subject:	Gemmological, mineralogical and fluid inclusion studies of the Sandawana emerald deposit, Zimbabwe.
Funding:	Third Stream: NNM
Started:	1 September 1996

Name:	Drs. M. Morell
Promotor:	Prof. dr. G.R. Davies
Co-Promotor:	Dr. D.G. Pearson, University of Durham
Subject:	Modification of Cratonic Lithoshere by major tectono-magmatic events: implications for the survival of Archaean Cratons
Funding:	Second Stream: NWO
Started:	1 September 2003

Isotope Geochemistry VU

Name:	A. Tchalikian MSc
Promotor:	Prof. dr. P.A.M. Andriessen
Subject:	Modifidation of cratonic lithosphere by major tectono-magmatci events: implications for the survival of Archaean Cratons
Funding:	Second Stream: WOTRO/NWO
Started:	1 September 2003

Name:	Drs. P.S. van Heiningen
Promotor:	Prof. dr. P.A.M. Andriessen
Subject:	Neogene Andean landscape evolution
Funding:	Second stream: NWO/WOTRO

Started: 1 August 2001

Sedimentology VU

Name: Drs. H. Braaksma
Promotor: Prof. dr. W. Schlager
Co-Promotor: Dr. J.A.M. Kenter
Subject: Integration and calibration of petrophysical -, sedimentological -, and high-resolution seismic information from "Field Laboratories"
Funding: First Stream: ISES
Started: 15 May 2000

Name: Drs. B. van der Kooij
Promotor: Prof. dr. P.A.M. Andriessen
Co-Promotor: Dr. A. Immenhauser
Subject: Paleo-oceanography of Carboniferous carbonate margins
Funding: Second stream: NWO (Euromargins)
Started: 15 March 2003

Name: A.C. Ocampo Uria MSc
Promotor: Prof. dr. J. Smit
Subject: Geology and emplacement Mechanisms of Chicxulub crater deposits: an analogue for Mars impact ejecta
Funding: Third Stream (ESA/NASA)
Started: 15 February 2002

Name: U. Sattler MSc
Promotor: Prof.dr. W. Schlager
Co-Promotor: Dr. A. Immenhauser
Subject: Exposure and flooding of carbonate platforms
Funding; First Stream: ISES
Started: 5 February 2001

Paleoecology and Paleoclimatology VU

Name: B. Balestra MSc
Promotor: Prof. dr. D. Kroon
Prof. dr. S. Monechi
Co-Promotor: Dr. P. Ziveri
Dr. S.R. Troelstra
Subject: Reconstruction of Late Quaternary surface current dynamics in the Denmark Strait.
Funding: Third Stream: University of Florence
Started: 1 May 2001

Name: Drs. M. van Breukelen
Promotor: Prof. dr. D. Kroon
Co-Promotor: Dr. H.B. Vonhof
Subject: Speleothem climate records: reconstructing ITCZ migration and El Niño –scale climate variation in the Peruvian Andes.
Funding: Second stream, WOTRO
Started: 1 June 2003

Name: Drs. J.M. Brijker
Promotor: Prof. dr. D. Kroon
Prof. dr. R. Schneider
Co-Promotor: Dr. S.J.A. Jung
Subject: Holocene climate change in the tropical region of Indonesia
Funding: Third Stream: EUROPROX, DFG/NWO/State of Bremen
Started: 1 April 2002

Name: S.M.H. Conan MSc
Promotor: Prof. dr. J.E. van Hinte
Co-Promotor: Dr. G.J.A. Brummer (NIOZ)
Subject: Calibration of planktonic foraminiferal proxies for palaeoproductivity and its seasonal variability as found in the NW Indian Ocean monsoonal upwelling system.
Funding: Second Stream: NWO/ALW
Started: 15 September 1994

Name: J.A. Estévez MSc
Promotor: Prof. dr. J.E. van Hinte
Subject: Geohistory analysis of late Cenozoic sections in Venezuela
Funding: Third Stream: Petroleos de Venezuela-Cied
Started: 1 April 2000

Name: Drs. R.J.G. Kaandorp
Promotor: Prof. dr. J.E. van Hinte
Prof. dr. D. Kroon
Co-Promotor: Dr. G.M. Ganssen
Dr. H.B. Vonhof
Subject: Molluscan stable isotope growth-band records of seasonality in modern and past Amazonian climates.
Funding: Second stream: WOTRO
Started: 1 August 1998

Name: R. Klöcker MSc
Promotor: Prof. dr. D. Kroon
Prof. dr. R. Henrich
Co-Promotor: Dr. G.M. Ganssen
Subject: Proxies of modern Indian Ocean pelagic carbonates, budget and preservation potential
Funding: Third Stream: EUROPROX, DFG/NWO/State of Bremen
Started: 1 November 2001

Name: N. Loncaric MSc
Promotor: Prof. dr. D. Kroon
Co-Promotor: Dr. G.J.A. Brummer (NIOZ)
Subject: Ecology of living planktonic forminifera in the Benguela system.
Funding: Third Stream: NIOZ
Started: 1 July 1999

Name: Drs. F. Mienis
Promotor: Prof. dr. Tj. Van Weering
Co-Promotor: Prof. dr. D. Kroon
Subject: Cold water carbonate mountains
Funding: Third and Second Stream, NIOZ and NWO (Euromargins)
Started: 1 July 2003

Name: Drs. M.H. Saher
Promotor: Prof. dr. D. Kroon
Subject: High-frequency climate records and comparison of MIS 5e and 1
Funding: First Stream: VU
Started: 1 October 2001

Name: Drs. A. Schulp
Promotor: Prof. dr. D. Kroon
Subject: Mosasaur taxonomy and ecology
Funding: Third stream: Natuurhistorisch Museum Maastricht
Started: 1 August 2002

Name: Drs. A. Wiersma
Promotor: Prof. dr. D. Kroon
Co-Promotor: Dr. H. Renssen
Subject: Nature and Origin of Millennial-scale Climate Variability: new insights from numerical modelling and geological data
Funding: Second stream, NWO
Started: 15 January 2003

Name: I. Wilke MSc
Promotor: Prof. dr. D. Kroon
Prof. dr. G. Wefer
Co-Promotor: Dr. T. Bickert
Dr. F. Peeters
Subject: The $\delta^{13}C$ of Dissolved Inorganic Carbon (DIC) and its incorporation in planktic foraminifera.
Funding: Third Stream: EUROPROX, DFG/NWO/State of Bremen
Started: 1 November 2001

Name: A.J. Wright BSc
Promotor: Prof. dr. D. Kroon
Co-Promotor: Dr. O. van de Plassche
Subject: Ocean-climate variability in the North Atlantic since AD 0
Funding: First Stream: VU
Started: 1 September 2001

Hydrogeology VU

Name: Drs. P.J.van Rossum
Promotor: Prof. dr. P.J. Stuyfzand
Subject: Origin and behavior of arsenic in soil and groundwater in western Netherlands.
Funding Third Stream: Co-operation Province Noord Holland.
Started: 1 October 1992

Name: A-M. Garavito MSc
Promotor: Prof. dr. J.J. de Vries
Subject: Chemically and electrically coupled transport in groundwater systems
Funding: Second Stream: NWO/SKB (TRIAS)
Started: 1 October 2001

Name: O. Obakeng MSc
Promotor: Prof. dr. J.J. de Vries
Subject: Moisture transport through Kalahari sand
Funding: Third Stream: Botswana Geological Survey
Started: 1 October 2003

Sedimentology UU

Name: Drs. A.P. van den Berg van Saparoea
Promotor: Prof. dr. P.L. de Boer
Co-Promotor: Dr. G. Postma
Subject: The dual control of sediment flux and rate of sea-level change
Funding: First Stream: UU
Started: 1 February 2001

Name: Drs. M. van Dijk
Promotor: Prof. dr. P.L. de Boer
Co-Promotor: Dr. G. Postma
Subject: Empirical and laboratory studies on the evolution of alluvial fan and delta distributaries through autocyclic and allocyclic (climate, tectonics, sea-level) forcing.

Funding: Third Stream: EU: Eurodelta project and US-Eurostrataform project
Subject: The time-space process-based alluvial architecture model and its application to the Holocene Rhine Meuse delta, The Netherlands
Funding: Second Stream: NWO Meervoud
Started: 1 October 2003

Stratigraphy and Palaeontology UU

Name: Drs. J. Becker
Promotor: Prof. dr. J.E. Meulenkamp
Co-Promotor: Dr. F.J. Hilgen
Subject: Oscillations in the sub-Milankovitch frequency band in marine successions of the Mediterranean Plio-Pleistocene
Funding: Second Stream: NWO (PIONIER)
Started: 1 September 1999

Name: Drs. F.P. Huiskamp
Promotor: Prof. dr. J.E. Meulenkamp
Co-Promotor: Dr. F.J. Hilgen
Subject: Annual laminations in Milankovitch cycles as a mean to reconstruct seasonal aspects of the annual cycle
Funding: Second Stream: NWO (PIONIER)
Started: 1 March 1999

Name: Drs. R.W. Kruk
Promotor: Prof. dr. J.E. Meulenkamp
Co-Promotor: Dr. W.J. Zachariasse, Dr. F.J. Hilgen
Subject: The middle Miocene climate transition from a Mediterranean perspective.
Funding: First Stream: UU
Started: 1 February 2001

Name: Drs. E. van der Laan
Promotor: Prof. dr. J.E. Meulenkamp
Co-Promotor: Dr. F.J. Hilgen
Subject: (Non)stationarity of phase relations between climate system components and orbital forcing.
Funding: Second Stream: NWO (PIONIER)
Started: 1 March 1999

Name: Drs. K. Koho
Promotor: Prof. dr. G.J. van der Zwaan
Subject: (Paleo-) Ecology of canyon systems.
Funding: First stream, UU
Started: 1 November 2003

Name: Drs. I.R. de Lugt
Promotor: Prof. dr. Th. Wong, Prof. dr. J.E. Meulenkamp
Subject: Stratigraphical and structural setting of the Paleogene sediments in the Dutch part of the North Sea Basin.
Funding: Third Stream: NITG/TNO
Started: 1 December 1998

Name: Drs. L.J. de Nooijer
Promotor: Prof. dr. G.J. van der Zwaan, Prof. dr. J.E. Meulenkamp
Co-Promotor: Dr. I.A.P. Duijnstee
Subject: The influence of rivers on marine ecosystems
Funding: Third Stream: TNO-NITG/BGKC
Started: 15 March 2002

Name: Drs. M. Schweizer

Promotor: Prof. dr. J.E. Meulenkamp, Prof. dr. G.J. van der Zwaan
Subject: Evolution, molecular phylogeny and microhabitat occupation of Cibicidoides and Uvgerina.
Funding: First and Second Stream: UU/NWO
Started: 1 September 2001

Name: Drs. E. Snel
Promotor: Prof. dr. J.E. Meulenkamp
Co-Promotor: Dr. W.J. Zachariasse
Subject: Mediterranean Gateways
Funding: First Stream: UU
Started: 1 August 1998

Palaeoecology UU

Name: Drs. M. Dolezych-Mikolai
Promotor: Prof. dr. H. Visscher
Co-Promotor: Dr. J. van der Burgh
Subject: Palaeoecological studies of Lignite origination in peat-swamps in the Lausitz, Germany.
Funding: Third Stream: Independent
Started: 1 August 1998

Name: Drs. T.H. Donders
Promotor: Prof. dr. H. Visscher
Co-Promotor: Dr. F. Wagner
Subject: Long-term records of dry/wet spells in ENSO key areas.
Funding: Second Stream: NWO/ALW
Started: 1 September 2001

Name: Drs. A.J. Liu
Promotor: Prof. dr. A.F. Lotter
Prof. dr. J.T.A. Verhoeven
Co-Promotor: Dr. R. Bobbink
Dr. W.M. Kürschner
Subject: Historic records of carbon and nitrogen enrichment of organic matter in wetland ecosystems: a novel approach to study the effects of environmental change on carbon and nutrient cycling.
Funding: First Stream: UU
Started: 1 February 2002

Name: Drs. A. Sluijs
Promotor: Prof. dr. A.F. Lotter
Co-promotor: Dr. H. Brinkhuis
Prof. dr. J.W. de Leeuw (UU/NIOZ)
Subject: The fate of carbon after a massive carbon injection: the Paleocene-Eocene Thermal Maximum as an analogue to anthropogenic carbon input.
Funding: First Stream: UU and Third Stream: LPP Foundation, NITG-TNO
Started: 1 July 2003

Name: Ir. W. Soepboer
Promotor: Prof. dr. A.F. Lotter
Co-promotor: Dr. W.M. Kürschner
Subject: Modelling of land-cover changes for the past two millennia
Funding: First Stream: UU and Second Stream: NWO/ALW
Started: 1 April 2002

Name: Drs. M. Sprangers
Promotor: Prof. dr. A.F. Lotter
Co-Promotor: Dr. H. Brinkhuis

Subject: High resolution Holocene land-sea correlation offshore NW Iberia; a marine palynological approach.
Funding: First Stream: UU
Started: 1 October 2001

Name: Drs. J. Warnaar
Promotor: Prof. dr. H. Visscher
Co-Promotor: Dr. H. Brinkhuis
Subject: Climatic implications of the onset Antarctic separation
Funding: Second Stream: NWO/ALW
Started: 1 September 2001

Geochemistry UU

Name: S.C. Bonneville MSc
Promotor: Prof. dr. P.S.J. Van Cappellen
Co-Promotor: Dr. T. Behrends
Subject: Redox reactivity and bioavailability of iron oxyhydroxides
Funding: NWO TRIAS
Started: 1 January 2001

Name: R.W. Canavan MSc
Promotor: Prof. dr. P.S.J. Van Cappellen
Co-Promotor: Dr. ir. C.P. Slomp
Subject: Trace metal dynamics in freshwater sediments: response to progressive salinization
Funding: RIZA / UU
Started: 12 November 2001

Name: Ir. J.W. Claessens
Promotor: Prof. dr. P.S.J. Van Cappellen
Subject: Surface chemical properties of anaerobic bacteria
Funding: PIONIER / NWO / UU
Started: 1 October 2001

Name: K. Heister MSc
Promotor: Prof. dr. P.S.J. Van Cappellen
Co-Promotor: Dr. ir. J.P.G. Loch
Subject: Chemically and electrically coupled transport in clayey soils and sediments
Funding: NWO TRIAS
Started: 1 April 2001

Name: C. Hyacinthe MSc
Promotor: Prof. dr. P.S.J. Van Cappellen
Subject: Mineralogical and geochemical controls on Iron and Manganese reduction in freshwater and saltwater environments
Funding: UU
Started: 1 January 2000

Name: P. Jourabchi MSc
Promotor: Prof. dr. P.S.J. Van Cappellen
Co-Promotor: Dr. P. Regnier
Subject: New approaches to reactive-transport modeling of complex biogeochemical systems
Funding: PIONIER / NWO / UU
Started: 1 September 2001

Name: Vincent Mastalerz
Promotor: Prof. dr. G.J. de Lange
Co-Promotor: dr. A. Dählmann
Subject: Origin and biogeochemical processes of mud, fluids and gas at Mud Expulsion Sites in the eastern Mediterranean

Funding: NWO / EU-margins
Started: 1 September 2003

Name: G. Nehrke MSc
Promotor: Prof. dr. C.H. van der Weijden
Co-Promotor: Dr. P.R. van der Linde
Subject: Partitioning of cadmium and barium between seawater and calcite
Funding: UU
Started: 1 February 1998

Name: A.M. Reitz MSc.
Promotor: Prof. dr. G.J. de Lange
Subject: Sapropel-related paleoceanographic studies in sediments of the eastern Mediterranean
Funding: NWO/ALW
Started: 1 May 2001

Name: C. Spiteri MSc.
Promotor: Prof. dr. P.S.J. Van Cappellen
Co-Promotor: Dr. ir. C.P. Slomp
Subject: Modeling of biogeochemical processes in subterranean estuaries
Funding: PIONIER UU
Started: 1 January 2003

Enclosure II: KEY DATA ON PhD RESEARCH AND POST-DOCS
Part B: Started PhD research in 2004

Tectonics VU

Name:	A. Bochin MSc.
Promotor:	Prof. dr. S.A.P.L. Cloetingh
Subject:	Upper crustal structure of the Vrancea Zone and Focsani Basin from high density seismic and potential field data
Funding:	First Stream: ISES
Started:	1 September 2004

Name:	G.N. Oakey MSc.
Promotor:	Prof. dr. S.A.P.L. Cloetingh
Subject:	Cenozoic Evolution and Lithosphere Dynamics of the Baffin Bay-Nares Strait Region of Arctic Canada and Greenland
Funding:	First Stream: ISES
Started:	1 September 2004

Name:	M. Tilita MSc.
Promotor:	Prof. dr. S.A.P.L. Cloetingh
Subject:	Neogene tectonic evolution of the Transsylvanian basin: inferences from basin analysis and modelling studies
Funding:	First Stream: ISES
Started:	1 September 2004

Petrology VU

Name:	Drs. D. Wiggers de Vries
Promotor:	Prof. dr. G.R. Davies
Co-Promotor:	Dr. D.G. Pearson, University of Durham Dr. G. Bulanova, University of Bristol
Subject:	Understanding the processes that control diamond formation and their growth histories: a mineralogical, carbon, nitrogen and Pb-Os isotope study.
Funding:	First stream
Started:	1 September 2004

Isotope Geochemistry VU

Name:	A. Biarc MSc.
Promotor:	Prof. dr. P.A.M. Andriessen
Subject:	Uplift and denudation dynamics of the Northern European margin system
Funding:	Second Stream: NWO
Started:	1 May 2004

Name:	B. Ghorbal MSc.
Promotor:	Prof. dr. P.A.M. Andriessen
Subject:	Tectono-morphic history of Mountain-Basin systems in Morocco; Europe-Africa convergence zone
Funding:	First Stream: ISES
Started:	1 May 2004

Name:	Drs. S. Merten
Promotor:	Prof. dr. P.A.M. Andriessen
Subject:	Neotectonic development of mountain belts and adjacent foreland basins: Dating the exhumation of the Romanian Carpathians, estimating amounts of

	erosion and establishing quantitative relations with subsidence in the Focsani Depression
Funding:	First Stream: ISES
Started:	1 May 2004

Name:	J. Corkery MSc.
Promotor:	Prof. dr. P.A.M. Andriessen
Subject:	Low temperature geochronology South Central Eastern Alps
Funding:	First Stream
Started:	1 August 2004

Stratigraphy and Paleontology UU

Name:	Drs. H. Abels
Promotor:	Prof. dr. G.J. van der Zwaan
Co-Promotor:	Dr. F. Hilgen
Subject:	Long-period orbital signatures in Neogene continental and marine successions
Funding:	Second Stream: NOW/ALW
Started:	1 January 2004

Name:	Drs. K. Hordijk
Promotor:	Prof. dr. G.J. van der Zwaan
Co-Promotor:	Dr. A.J. van der Meulen
Subject:	Evolution, paleoecology and spatial distribution of Miocene resident and transient community members of the Ochotonidae (Lagomorpha, Mammalia) from North-Central Spain.
Funding:	First Stream: UU
Started:	1 May 2004

Geochemistry UU

Name:	Drs. S. Arndt
Promotor:	prof. dr. P.S.J. Van Cappellen
Co-Promotor:	dr. P. Regnier
Subject:	Development of a numerical biogeochemical model for tidal estuaries coupling carbon, nitrogen and particulate matter dynamics
Funding:	UU
Started:	1 April 2004

Name:	T. Jilbert, MSc.
Promotor:	Prof. dr. G.J. de Lange
Subject:	Abrupt late holocene climatic change in laminated Eastern Mediterranean
Funding:	UU
Started:	25 October 2004

Name:	S. Loucaides, MSc.
Promotor:	Prof. dr. P.S.J. Van Cappellen
Co-Promotor:	Dr. ir. C.P. Slomp
Subject:	Si-cycle along the land-ocean continuum
Funding:	EU - Si-Webs
Started:	1 July 2004

Name:	Drs. N. Walraven
Promotor:	Prof. dr. P.S.J. Van Cappellen
Subject:	Historical and future lead pollution in the Netherlands
Funding:	UU
Started:	1 September 2004

Enclosure II: KEY DATA ON PhD RESEARCH AND POST-DOCS
Part C: Completed PhD research in 2004

Tectonics VU

Name:	Dr. V. Bense
Promotor:	Prof. dr. J.J. de Vries
	Prof. dr. S.A.P.L. Cloetingh
Co-promotor:	Dr. R.T. van Balen
Subject:	Influence of fault systems in the Peel area (Netherlands) on hydrogeological conditions and evolution.
Funding:	First Stream VU: Co-operation with Hydrology and Quaternary Geology and Geomorphology VU
Finished:	16 September 2004

Name:	Dr. J.P.T. Foeken
Promotor:	Prof. dr. P.A.M. Andriessen
	Prof. dr. S.A.P.L. Cloetingh
Co-pormotor:	Dr. G. Bertotti
	Dr. T.J. Dunai
Subject:	Tectono-morphology of the Ligurian Alps and adjacent basins (NW Italy)
Funding:	ISES
Finished:	21 June 2004

Name:	Dr. G.G.O. Lopes Cardozo
Promotor:	Prof. dr. S.A.P.L. Cloetingh
	Prof. dr. M. Granet
Subject:	3-D geophysical imaging and tectonic modeling of the active tectonics of the Upper Rhine Graben Region
Funding:	ISES
Finished:	11 May 2004

Name:	Dr. M. Tarapoanca
Promotor:	Prof. dr. S.A.P.L. Cloetingh
	Prof. dr. C. Dinu
Co-promotor:	Dr. G. Bertotti
	Dr. L.V. Matenco
Subject:	Architecture, 3D geometry and tectonic evolution of the Carpathians foreland basin.
Funding:	ISES
Finished:	13 April 2004

Name:	Dr. S. Tigrek
Promotor:	Prof. dr. S.A.P.L. Cloetingh
	Prof.dr.ir. J.T. Fokkema
	Dr.ir. E.C. Slob
Subject:	Seismic evidence of tectonic stresses. Implications for basin reconstruction
Funding:	ISES
Finished:	5 October 2004

Name:	Dr. G. Worum
Promotor:	Prof. dr. P.A.M. Andriessen
	Prof. dr. S.A.P.L. Cloetingh
Subject:	Modelling of fault reactivation potential and quantification of inversion tectonics in the southern Netherlands
Funding:	Second stream: NWO/
Finished:	30 September 2004

Petrology VU

Name: Dr. N.S.C. Simon
Promotor: Prof.dr. G.R. Davies
Prof. dr. P.A.M. Andriessen
Subject: The formation and modification of cratonic lithosheric roots.
Funding: Second Stream: ALW-NWO.
Finished: 15 June 2004

Isotope Geochemistry

Name: Dr. C. Bouman
Promotor: Prof. dr. P.A.M. Andriessen
Co-promotor: Dr. T. Elliot
Dr. P.Z. Vroon
Subject: Lithium Isotope systematics at subduction zones. Vrije Universiteit Amsterdam
Funding: Second Stream: NWO
Finished: 18 May 2004

Name: Dr. N.S.C. Simon
Promotor: Prof. dr. P.A.M. Andriessen
Prof. dr. G.R. Davies
Subject: The formation and modification of cratonic lithosheric roots.
Funding: Second Stream: ALW-NWO
Finished: 15 June 2004

Name: Dr. J.P.T. Foeken
Promotor: Prof. dr. P.A.M. Andriessen
Prof. dr. S.A.P.L. Cloetingh
Co-Promotor: Dr. G. Bertotti
Dr. T.J. Dunai
Subject: Tectono-morphology of the Ligurian Alps and adjacent basins (NW Italy)
Funding: First stream: ISES
Finished: 21 June 2004

Sedimentology VU

Name: Dr. S.J. Purkis
Promotor: Prof. dr. W. Schlager
Co-Promotor: Dr. J.A.M. Kenter
Subject: Remote sensing of reefs and associated environments
Funding: Third Stream
Finished: 25 May 2004

Name: Dr. T. Zitter
Promotor: Prof. dr. W. Schlager
Co-Promotor: Dr. J.M. Woodside
Subject: Mud volcanoes and fluid emissions in Eastern Mediterranean neotectonic zones
Funding; Second Stream: NWO
Finished: 23 March 2004

Name: Dr. V. Zampetti
Promotor: Prof. dr. W. Schlager
Subject: Seismic expression of exposure and flooding on carbonate platforms
Funding; First Stream: VU
Finished: 2 November 2004

Paleoecology and Paleoclimatology VU

Name:	Dr. V. Epplé
Promotor:	Prof. dr. G. Wefer
	Prof. dr. D. Kroon
Subject:	High resolution seasonal $\delta^{18}O$ records of bivalves (*Arctica islandica*) from the North Sea
Funding:	Third Stream: DFG
Finished:	12 December 2004

Hydrogeology VU

Name:	Dr. V.F. Bense
Promotor:	Prof. dr. J.J. de Vries
	Prof. dr. S.A.P.L. Cloetingh
Co-Promotor:	Dr. R.T. van Balen
Subject:	Influence of fault systems in the Peel area (Netherlands) on hydrogeological conditions and evolution.
Funding:	First Stream VU: Co-operation with Tectonics VU
Finished:	16 September 2004

Name:	Dr. V.E.A. Post
Promotor:	Prof. dr. J.J. de Vries
Co-Promotor:	Dr. H. Kooi
Subject:	Reconstruction of the hydrogeological evolution during the Holocene in the Netherlands coastal area.
Funding:	Third Stream: Co-operation NITG/TNO, NWO-NEESDI programme
Finished:	6 January 2004

Quaternary Geology

Name:	Dr. V.F. Bense
Promotor:	Prof. dr. J.J. de Vries
	Prof. dr. S.A.P.L. Cloetingh
Co-Promotor:	Dr. R.T. van Balen
Subject:	Influence of fault systems in the Peel area (Netherlands) on hydrogeological conditions and evolution.
Funding:	First Stream: VU, co-operation with Hydrogeology VU
Finished:	16 September 2004

Stratigraphy and Palaeontology UU

Name:	Dr. G. Kuhlman
Promotor:	Prof. dr. Th. Wong
	Prof. dr. J.E. Meulenkamp
Subject:	High resolution stratigraphy of Upper Cenozoic marine deposits in the northern part of the Dutch off-shore area.
Funding:	Third Stream: Wintershall Noordzee B.V.
Finished:	8 september 2004

Name:	Dr. E. Tuenter
Promotor:	Prof. dr. J.E. Meulenkamp
Co-Promotor:	Dr. F.J. Hilgen
Subject:	Modelling of astronomically induced climate variations in the Mediterranean.
Funding:	Second Stream: NWO (PIONIER)
Finished:	27 september 2004

Name:	Dr. A. van der Molen
Promotor:	Prof. dr. Th. Wong
Copromotor:	Prof. dr. J.E. Meulenkamp
Subject:	development and seismostratigraphy of the Chalk
Funding:	Third Stream:

Finished: 1 January 2004

Palaeoecology UU

Name: Dr. L.L.R. Kouwenberg
Promotor: Prof. dr. H. Visscher
Co-Promotor: Dr. W.M. Kürschner
Subject: Application of conifer needles in the reconstruction of Holocene CO_2 levels.
Funding: Second Stream: NWO/ALW
Finished: 16 January 2004

Name: Dr. A.M. Oosting
Promotor: Prof. dr. A.F. Lotter
Co-Promotor: Dr. H. Leereveld
Subject: Palaeoenvironmental and palaeoclimatic changes in Australia during the mid-Cretaceous.
Funding: Third Stream: James Cook University, Townsville, Australia / LPP Foundation
Finished: 30 September 2004

Name: Dr. T.B. van Hoof
Promotor: Prof. dr. H. Visscher
Co-Promotor: Dr. W.M. Kürschner
Subject: Coupling between atmospheric CO_2 and temperature during the last millenium.
Funding: Second Stream: NWO/ALW
Finished: 6 December 2004

Geochemistry UU

Name: Dr. D.F.W. Naafs
Promotor: Prof. dr. J.W. de Leeuw
Co-Promotor: Dr. P.F. van Bergen
Subject: Resistent organic matter in soils: what is it and how is it determined?
Funding: First Stream: UU
Finished: 4 March 2004

Name: Dr. D. Menzel
Promotor: Prof. dr. ir. J.S. Sinninghe Damsté and prof. dr. J.W. de Leeuw
Co-Promotor: Dr. P.F. van Bergen
Subject: Palaeo-environmental conditions during the deposition of eastern Mediterranean sapropels
Funding: First Stream: UU
Finished: 1 Oktober 2004

Enclosure II: KEY DATA ON PhD RESEARCH AND POST-DOCS
Part D: Employment of PhD's since 1992

Tectonics VU

Dr. M.J. de Ruig (1992), Shell Expro, London.
Dr. T. Peper (1992), Shell Expro, Aberdeen.
Dr. B.P. Zoetemeijer (1993) KNAW fellow, VU.
Dr. W.W.W. Beekman (1994), Post-doc VU.
Dr. J.D. van Wees (1994), 1994 - 1995: Shell Research, Rijswijk; 1996 – present NITG-TNO.
Dr. P.H.M. Reemst (1995), Post-doc University of Bergen (Norway), present at NAM, NL.
Dr. R.T. van Balen (1995), lecturer Vrije Universiteit Amsterdam.
Dr. P.A. van der Beek (1995), present lecturer Grenoble.
Dr. M. Gölke (1996), Post-doc VU (1996-1997), present post-doc Karlsuhe Univ.
Dr. M.E. Jansen (1996), Shell Expro, Aberdeen.
Dr. G. Spadini (1996), Agip, Milano, Italy.
Dr. M. ter Voorde (1996), Post-doc VU.
Dr. M.E. Heeremans (1997) Post-doc Oslo University
Dr. L. Matenco (1997) Lecturer Bucharest University/ Post-doc VUA
Dr. A.C. Lankreijer (1998) NSG Executive Secretary VU, Research Manager VUA
Dr. T. den Bezemer (1998), NAM, the Netherlands
Dr. G. Bada (1999), GeoMega Consultants Budapest
Dr. D. Ciulavu (1999), Assistant professor, Bucarest University
Dr. R. Huismans (1999), Post-doc fellow, Dalhousie University Canada
Dr. L. Lenkey (1999), Post-doc University of Budapest
Dr. G. Stapel (1999), NAM, the Netherlands
Dr. P. Szafian (1999), GeoMega, post-doc, Budapest
Dr. E. Willingshofer (2000), lecturer Vrije Universiteit Amsterdam
Dr. T. Skar (2000), Post-doc University of Bergen, Norway
Dr. A. Abadi (2002), Petroleum Research Centre Tripoli, Libya
Dr. B. Andeweg (2002), Public Relations Fac. Of Earth and Life Sciences VUA
Dr. J. Dirkzwager (2002), Post-doc University Karlsruhe
Dr. I.C. Kroon (2002), NITG-TNO
Dr. L. Sarmiento Rojas (2002), Instituto Colombiano del Petroleo, Colombia
Dr. J. van Wijk (2002), Scripps Institution of Oceanography, USA
Dr. S. Dupré (2003), Post-doc Vrije Universiteit Amsterdam
Dr. J. Gaspar-Escribano (2003), Post-doc University of Madrid
Dr. G.G.O. Lopes Cardozo (2004) Shell
Dr. M. Tarapoanca (2004), Post-doc University of Bucharest
Dr. S. Tigrek (2004) Shell
Dr. G. Worum (2004) Post-doc University of Hungary

Petrology VU

Dr. J.A. van Duin (1992) Management and business organization.
Dr. H.A. Jelsma (1993), Strategic Planning Group, DeBeers, S. Africa
Dr. I.T.M. Dobbe (1994), GeoScience Centre, DeBeers, S. Africa.
Dr. A.A.H.A.A. Al-Boghdady (1995), Permanent staff member Menoufia University, Egypt.
Dr. J.M. Huizenga (1995), Tenured staff member Rand Afrikaans University, Johannesburg, S. Africa.
Dr. P. Zambezi (1995), Permanent staff member, University of Zambia
Dr. M. Moree (1998) Information technology consultant, The Netherlands
Dr. M. Griselin (2001). Post doc. MPI Mainz, Germany.
Dr. C. Bouman (2004) Application Scientist demonstrator, Thermo-FinniganMAT, Germany
Dr. N.S.C. Simon (2004) Post doc, Physics of Geological Processes University of Oslo, Norway.

Isotope Geochemistry VU

Dr. J.J. Beetsma (1995), Software engineer, Pink Elephant.
Dr. M.H.E.J. Rohrman (1995) part-time contracts (NWO and VU), Software engineer, UK.
Dr. A. Koppers (1998), Post-doc Scripps Institute of Oceanography, La Jolla, CA USA.

Dr. C.A.E. Sanders (1997), Geological consultancy, UK.
Dr. A. Heumann (1999), Post-doc Vrije Universiteit Amsterdam
Dr. T. van Soest (2000), Post-doc Lawrence Berkeley Research Laboratory, Berkeley, USA.
Dr. P. Bruns (2000), Swiss Patent Office Switzerland, Bern Switzerland.
Dr. B. Carrapa (2002), Post-doc Vrije Universiteit Amsterdam, Humbold Fellowship, GFZ Potsdam, Germany
Dr. K Kooi-de Bruine (2002), ALW-NWO, den Haag
Dr. K.F. Kuiper (2003), post-doc, UU/ISES
Dr. B. Hendriks (2003), post-doc, NGU, Norway
Dr. J. Juez-Larre (2003), post-doc, Vrije Universiteit Amsterdam
Dr. N.S.C. Simon (2004), post-doc, Geol. Institute, Norway
Dr. C. Bouman (2004), Thermo Electron (Bremen) GmbH

Sedimentology VU

Dr. H. Bosscher (1992), Shell Research, Rijswijk.
Dr. A.E. Campbell (1992), TNO, Delft.
Dr. A. Sprenger (1992), system programmer SARA.
Dr. W.G.H.Z. ten Kate (1992), Scientific staff VU.
Dr. A.J.W. Everts (1994), Shell Research, Rijswijk.
Dr. J. Stafleu (1994), software engineer (NL)
Dr. E.W. Zwart (1995), software engineer (NL)
Dr. R.E. Erlich (1999), Amoco Production Co., Houston
Dr. G. Bracco Gartner (2000), Post-doc University of Miami, USA.
Dr. E. Adams (2001), Post-doc Massachusetts Insitute of Technology, USA.
Dr. R.L. van Dam (2001), Post-doc New Mexico Tech, USA.
Dr. F. Maurer (2003),
Dr. E.H van den Berg (2003), Post-doc University of Cambridge.
Dr. G.P. Della Porta (2003), Post-doc, Universität Potsdam
Dr. S. Purkis (2004), Remote Sensing, Nova Southeastern University, USA
Dr. V. Zampetti (2004), Science coordinator ECORD
Dr. V.F. Bense (2004), post-doc, Indiana University, Bloomington, USA.

Paleoecology and Paleoclimatology VU

Dr. K. Beets (1992), lecturer VU
Dr. L. Moodley (1992), Post-doc NIOO
Dr. J.J. Ottens (1992), KNMI
Dr. A. Kleijne (1993) part-time consultant
Dr. L. Witte (1993), NITG-TNO.
Dr. P. Saager (1994), RIZA.
Dr. H. van de Poel (1994), consultant (Toulouse).
Dr. P.J. van de Paverd (1995) Science translator
Dr. S. de Rijk (1995), RIZA
Dr. W. van der Werff (1996), Post-doc Liverpool
Dr. S. van Kreveld-Alfane (1996), Shell
Dr. H.B. Vonhof (1998), lecturer VU
Dr. A. Lototskaya (1999), Scientific Editor
Dr. A. Broerse (2000), Post-doc Southampton
Dr. E. Ivanova (2000), Rijkswaterstaat
Dr. J.W.J. Jagt (2000), NNM Maastricht
Dr. F. Peeters (2000), Post-doc VUA
Dr. W. Renema (2002), Naturalis (National Museum for Natural History)
Dr. E. Mulder (2003), Naturadocet (Provincial Museum for Natural History)
Dr. B.B. Klosowska (2003), unemployed.

Hydrogeology VU

Dr. A. Gieske (1992), assistant professor ITC Enschede
Dr. P.J. Stuyfzand (1993), hydrochemist KIWA Water Research, professor Chem. Hydrology VU Amsterdam
Dr. C.R. Meinardi (1994), research scientist RIVM, Bilthoven

Dr. S.W.M. Peters (1995), research scientist IVM-VU, Amsterdam
Dr. Z. Duan (1996), research scientist University New Brunswick, Canada
Dr. J.C. Herweijer (1997), consultant GWSol, Lafayette, USA
Dr. C.S. Ting (1997), associate professor, Pingtung University of Science and Technology, Taiwan
Dr. E.T. Selaolo (1998), principal hydrogeologist, Botswana Geological Survey
Dr. S.O. Los (1998), University of Maryland/ NASA Greenbelt Centre
Dr. T.W. Hobma (1999), associate professor, ITC Enschede
Dr. J.C. Gehrels (1999), research scientist NITG/Delft University, Delft
Dr. C.J. Hemker (2000), assistant professor Vrije Universiteit
Dr. M.J. van Bracht (2001), head groundwater division NITG/TNO
Dr. B.M. van Breukelen (2003), lecturer VUA.
Dr. E.H. van den Berg (2003), post-doc University of Cambridge.
Dr. P.W. Bogaart (2003), post-doc Wageningen University.
Dr. H. Verweij (2003), TNO-NITG.
Dr. V.E.A. Post (2004), assistant professor, VU Amsterdam, Earth Sciences.
Dr. V.F. Bense (2004), post-doc, Indiana University, Bloomington, USA.

Sedimentology UU

Dr. M. Situmorang (1992), Marine Geological Institute, Bandung, Indonesia
Dr. J.H. Baas (1993), Univ. of Bergen, Norway
Dr. H. de Haas (1997), NIOZ
Dr. van Leussen (1993), RWS
Dr. H. Moechtar (1994), Geological Research and Development Centre, Bandung, Indonesia
Dr. A.P. Oost (1995), RIKZ
Dr. O. Sztanó (1994), Staff member at Department of Geology, Eötvös University, Budapest, Hungary.
Dr. A.J.F. van der Spek (1994), NITG
Dr. G.J. Weltje (1994), TU Delft
Dr. J.J.P. Zijlstra (1994), Post-doc (STW) Department of Geochemistry UU
Dr. M.A. Prins (1999), Post-doc VU.
Dr. J. Cleveringa (2000), RIKZ
Dr. M.W.I.M. van Heijst (2000), Rijkswaterstaat afd. Grondstoffen (AD)
Dr. J.B. Stuut (2001), Post-doc Research Center Ocean Margins, Bremen, Germany

Stratigraphy and Palaeontology UU

Dr. J.P. van Dijk (1992), AGIP, Milano, Italy.
Dr. L.J. Lourens (1994), Lecturer UU.
Dr. R.P. Speijer (1995), Geosciences Bremen.
Dr. J. van der Made (1995), Post-doc Museo Nacional de Ciencias Naturales, Madrid.
Dr. M. Wilpshaar (1995), Geological Consultancy, Netherlands.
Dr. H.C. de Stigter (1996), NIOZ.
Dr. R.H.B. Fraaye (1996), director Museum De Ammonietenhoeve, Boxtel.
Dr. G.D. van den Bergh (1997) NIOZ.
Dr. J.A. van Dam (1997), Post-doc UU.
Dr. L.W. van den Hoek Ostende (1999), National Museum of Natural History, Leiden.
Dr. T.J. Kouwenhoven (2000), Post-doc UU.
Dr. M. den Dulk (2000), Geoconsultant
Dr. H. Abdul Aziz (2001), Post-doc UU.
Dr. I.A.P. Duijnstee (2001), Post-doc UU.
Dr. N.T. Jannink (2001), Post-doc UU.
Dr. S. Ernst (2002), Post-doc Laboratoire de Géologie, Université d'Angers, France
Dr. S. Langezaal (2003), consultancy (ADROMI)
Dr. K. Kuiper (2003), Post-doc UU/ISES

Palaeoecology UU

Dr. H. Brinkhuis (1992), Lecturer UU
Dr. J. Mateus (1992), Botanical Museum Lisbon

Dr. I.M. van Waveren (1993), Natural History Museum Leiden
Dr. H. Leereveld (1995), proprietor restaurant 'De Grië', Isle of Terschelling
Dr. P. Lutat (1995), professor of geology, Univ. Bangkok, Thailand.
Dr. H. Veld (1995), geological Consultancy Netherlands, collaborator NITG
Dr. G.J.M. Versteegh (1995), Post-doc NIOZ, post-doc Univ. Bremen, Germany
Dr. D. Zevenboom (1995), Biology teacher
Dr. W.M Kürschner (1996), Lecturer UU
Dr. C.D.M. Mulder (1996), staff RIVM
Dr. R.J. Poort (1996), staff Water and Environment Branch, Provincial Government of Utrecht
Dr. C.A.F. Zonneveld, (1996), lecturer Faculty of Geosciences, Univ. Bremen, Germany
Dr. A. Santarelli (1997), geography teacher
Dr. J. Targarona (1997), Post-doc Univ. Barcelona, Spain
Dr. O.A. Abbink (1998), TNO-NITG
Dr. J.A.A. Bos (1998) Post-doc VU
Dr. J.H.J. Joosten (1998) lecturer Univ. Greifswald, Germany
Dr. F. Wagner (1998) Post-doc UU
Dr. F.P.M. Bunnik (1999), TNO-NITG
Dr. W.D. Becker (2000), collaborator Kölner Inst. für Ur- und Frühgeschichte, Germany
Dr. M.L. Kloosterboer-van Hoeve (2000), Post-doc UU
Dr. C.V. Looy (2000), Post-doc Smithsonian Institution, Washington, D.C., USA
Dr. K.P. Boessenkool (2001), Post-doc University of Cardiff, U.K.
Dr. E.M. Crouch (2001), Post-doc Institute of Geological and Nuclear Sciences, Lower Hutt, New Zealand
Dr. L.L.R. Kouwenberg (2004), Post-doc Field Museum of Natural History, Chicago, USA
Dr. A.M. Oosting (2004), Consultant RPS Hydrosearch, U.K.
Dr. T.B. van Hoof (2004), Post-doc UU

Geochemistry UU

Dr. H.F. Passier (1998), geohydrochemicus TNO-NITG, sectie Grondwaterbeheer
Dr. G.A. van den Berg (1998), projectmedewerker RIZA
Dr. B.M. Loescher (1999) postdoc Cambridge University, UK
Dr. I.A. Nijenhuis (1999), Research Scientist Shell, Rijswijk
Dr. G.J.J. Zwolsman (1999), Staff member RIZA - Dordrecht
Dr. J.L.T. Hage (1999), research scientist Corus
Dr. G. Hollman (1999), Richter Fast Lane, Consultant
Dr. G. Steenbruggen (1999), ALW-NWO Program Officer
Dr. S.J. Schenau (1999), staff member CBS consulting
Dr. I.O. Höld (2000), research scientist Philips
Dr. J. van Heemst (2000), research scientist Micromass, USA
Dr. A.P. Schmidt (2000), research scientist Corus
Dr. P. Blokker (2000), research scientist Heineken
Dr. Th.J.S. Keijzer (2000), postdoc Geochemie (UU)/geochemist Tauw environmental consulting
Dr. A. Rutten (2001), IT function at Min. OandW, The Netherlands
Dr. M.M.M. Kuijpers (2001), postdoc Max Planck Institute for Marine Microbiology, Bremen, Germany
Dr. M.M.C.H. Grutters (2002), research scientist Shell Houston, USA
Dr. G. Mol (2002), IMAG, afdeling Dier en Milieu, Universiteit Wageningen
Dr. M.A.T.M. Broekmans (2002), Geological Survey Norway
Dr. C. van der Zee (2002), postdoc Free University of Brussels, Belgium
Dr. F.A. Koning (2002), postdoc (K)NIOZ, Texel
Dr. M.T.J. van der Meer (2002), postdoc Montana State University, USA
Dr. E. Schefuss (2003), post-doc University of Bremen, Duitsland
Dr. B.E. van Dongen (2003), post-doc University of Bristol, Groot-Brittannie
Dr. M. Wolthers (2003), postdoc Geochemie (UU)
Dr. R.H. Smittenberg (2003), post-doc Masachuchetts Institute for Technology (MIT), USA
Dr. C.D Meile (2003), Assistant Professor, Dept Marine Sciences, University of Georgia, Athens, USA
Dr. N. Hartog (2003), postdoc Earth Sciences, University of Waterloo, Canada

Dr. D.F.W. Naafs (2004), geochemist, Flow Assurance, Shell

Enclosure II: KEY DATA ON PhD RESEARCH AND POST-DOCS
Part E: Post-doc projects

Tectonics VU

Name: Dr. G. Bada
Subject: Neotectonics of the Pannonian basin natural laboratory
Funding: First Stream: ISES
Started: 1 June 2002

Name: Dr. T. Cornu
Subject: Integrated analysis of continental rifting and environmental tectonics (ENTEC)
Funding: Third Stream: EU, IHP
Started: 10 January 2000

Name: Dr. D. García-Castellanos
Subject: Nummerical modeling of coupled lithosphere-surface processes
Funding: First Stream: ISES
Finished: 1 September 2004

Name: Dr.. C.G.E.M. Gumiaux
Subject: Imaging the Western Mediterranean margins: a key target to understand the interaction between deep and shallow processes
Funding: Second Stream: NWO, Third Stream: Western mediterean
Started: 15 September

Name: Dr. L. Matenco
Subject: Miocene to Recent evolution of the Carpathian foredeep, the Focsani Depression and the Carpathian foreland.
Funding First Stream: ISES
Started: 1 April 2003

Name: Dr. C. Pascal Candas
Subject: Tectonic modeling of rifting: the permo-carboniferous rifting of NW Europe lithosphere
Funding: Third Stream: EU, IHP
Started: 1 January 2000

Name: Dr. A.N. Saintot
Subject: Late Paleozoic plate tectonics and basin evolutionin the southern East European Craton: an intergrated basin study approach
Funding: Second stream: NWO/ALW
Started: 1 january 1999

Petrology VU

Name: Dr. J. Zinke
Subject: Palaeo-proxy development
Funding: STOPFEN, TMR EU frame-work 5
Started: 1 May 2003

Name: Dr. A. Schersten
Subject: MC-ICP-MS technique development
Funding: First stream
Started: 1 June 2004

Isotope Geochemistry VU

Name: Dr. K.P. Boessenkool
Subject: The climatic evolution of the South America in relation to Andean landscape evolution: Neogene to recent reconstruction of two drainage basins in Eastern Peru
Funding: WOTRO
Started: 1 April 2002

Name: Dr. J. O'Connor
Subject: High resolution Ar-Ar dating
Funding: First Stream: VU
Started: 1 October 2003

Name: Dr. J. Juez-Larre
Subject: Denudation dynamics in response to climate
Funding: Second Stream: ALW/NWO
Started: 1 July 2003

Name: Dr. K. Kuiper
Subject: Introduction of an astronomically dated standard in Ar/Ar dating and intercalibration with the U/Pb system
Funding: Second Stream:
Started: 1 June 2004

Name: Dr. G. Ruiz
Subject: Neogene landscape evolution of drainage basins in the Eastern Andean and Subandean Cordilleras, Peru
Funding: Second Stream: WOTRO/NWO
Started: 1 February 2003

Name: Dr. M. Elburg
Subject: Isotopic provenance studies using LA-MC-ICP-MS: implications for large-scale tectonic processes
Funding: Second Stream: ISES
Started: 1 May 2004

Name: Dr. H. Qui
Subject: The occurrence of the extraneous ^{40}Ar withing the minerals of the eclogite rocks from the Dabie Mountains, China
Funding: Second Stream: KNAW
Started: 1 September 2004

Sedimentology VU

Name: Dr. S. Dupré
Subject: Geophysical signature of eastern Mediterranean Seafloor Environments
Funding: Second Stream: NWO (Euromargins)
Started: 1 July 2003

Paleoecology and Paleoclimatology VU

Name: Dr. M.A. Prins
Subject: Ice-ocean interaction on the Greenland margin.
Funding: Second Stream: NWO/ALW
Started: 1 April 1999

Name: Dr. P. Ziveri
Subject: Coccolithophorid evolutionary biodiversity and ecology network (CODENET)

Funding: Third Stream: EU
Started: October 1998

Name: Dr. S.J.A. Jung
Subject: Tracing rapid monsoon change across the northwestern Arabian Sea: dust provenance as a monitor of teleconnective climate variation over the last 30 kyr
Funding: Second Stream: NWO/ALW
Started: 1 July 2002

Name: Dr. K. Kreissig
Subject: Isotopic composition determination of the lithic sediment fraction from core 929 (NW Arabian Sea, off Somalia) for the Holocene using TIMS to indicate past climate in a area effected by a coupled Asian and African monsoon.
Funding: Third Stream: Finnigan, EU Marie Curie
Started: 1 August 2002

Name: Dr. F.J.C. Peeters
Subject: CESOP: Coordinated European Surface Ocean Palaeo-estimation Collaboration
Funding: Third stream, EU
Started: 1 June 2002

Name: Dr. P. Anand
Subject: Study of shell mass, $\delta^{18}O$ and Mg/Ca in planktonic and benthic foraminifera from the Arabian Sea: from production to preservation
Funding: First stream: VU
Started: 15 June 2003

Name: Dr. J. Zinke
Subject: STOPFEN: Sea level, temperature and ocean circulation, past and Future: a European Network. Corals in the Indian Ocean
Funding: Third stream, EU
Started: 1 May 2003

Name: Dr. H. Renssen
Subject: Nature and origin of millennial-scale climate variability
Funding: Second Stream/NWO
Started: ? 2002

Hydrogeology VU

Name: Dr. ir. G.H.P. Oude Essink
Subject: Crystallisation technologies for prevention of salt water intrusion
Funding: Third stream: EU (CHRYSTECHSALIN) and NITG-TNO
Started: 1 May 2002

Quaternary Geology

Name: Dr. H. Renssen
Subject: Nature and origin of millennial-scale climate variability
Funding: Second Stream/NWO
Started: ? 2002

Stratigraphy and Palaeontology UU

Name: Dr. J.A. van Dam
Subject: The Late Vallesian crisis: it's significance to understanding long term changes in terrestrial ecosystems.
Funding: Second stream: NWO/ALW

Started: 1 April 2003

Name: Dr. I.A.P. Duijnstee
Subject: Benthic foraminifers: proxies of current velocity and organic influx?
Funding: First Stream: UU
Started: 1 May 2001

Name: Dr. N.T. Jannink
Subject: Benthic foraminifers: proxies of current velocity and organic influx?
Funding: First Stream: UU
Started: 1 May 2001
Finished: 1 July 2004

Name: Dr. K. Kuiper
Subject: Introduction of an astronomically dated standard in Ar/Ar dating and intercalibration with the U/Pb system
Funding: Second Stream: NWO
Started: 1 June 2004

Name: Dr. T.J. Kouwenhoven
Subject: Deep-water ventilation and evolution of modern infaunal species of benthic foraminifera in relation to constriction of the Tethyan Seaway.
Funding: First Stream: UU
Started: 1 May 2000

Name: dr. Y.A. van Lith
Subject: Interactions between foraminifera, diatoms, and bacteria: implications for sediment properties and biogeochemical cycling
Funding: First Stream: UU
Started: 1 September 2004

Name: Dr. M. Rogerson
Subject: (Paleo-) Ecology of canyon systems
Funding: Third Stream: Shell
Started: 1 September 2003

Palaeoecology UU

Name: Dr. H. Cremer
Subject: Diatoms as proxies of environmental change in freshwater and marine systems
Funding: First Stream: UU
Started: 1 September 2001
Subject: Holocene winter precipitation and summer temperatures in the Central Alps: reconstructing long-term NAO indices.
Funding: Second Stream: NWO/ALW
Started: 1 September 2004

Name: Dr. O. Heiri
Subject: Holocene winter precipitation and summer temperatures in the Central Alps: reconstructing long-term NAO indices.
Funding: Second Stream: NWO/ALW
Started: 1 August 2003

Name: Dr. M.L. Kloosterboer-van Hoeve
Subject: Stratigraphic and paleoenvironmental analysis of the Neogene in the subsurface of the Netherlands; a palynological approach.
Funding: Third Stream: NITG-TNO
Started: 1 juli 2002

Name: Dr. F. Wagner
Subject: The relation between atmospheric CO_2, solar irradiance and ENSO activity during the last millennium.
Funding: Second Stream: NWO Vernieuwingsimpuls
Started: 1 June 2001

Geochemistry UU

Name: Dr. J.T. Abell
Objective: Linking organic carbon composition, availability and quantity to variations in denitrification rates
Funding: First Stream: PIONIER / UU
Started: 1 July 2003

Name: Dr. A. Dählmann
Objective: Geochemical features of Eastern Mediterranean Mud Dome fluid and gas vent areas
Funding: Second Stream: NWO / ALW
Started: 1 July 2001

Name: Dr. A.W. Dale
Objective: Anaerobic oxidation of methane in marine sediments
Funding: Third Stream: EU / METROL
Started: 1 April 2003

Name: Dr. A. Hübner
Objective: Geochemistry of suspended and sinking matter in anoxic brine basins, eastern Mediterranean
Funding: Third Stream: EU / BIODEEP
Started: 1 January 2003

Name: Dr. A.M. Laverman
Objective: Relating microbes and biogeochemical process rates -response to environmental perturbations
Funding: Second Stream: NWO - VENI
Started: 1 January 2003

Name: Dr. C.D. Meile
Objective: Quantifying reactive transport in redox-stratified environments
Funding: Second Stream: IPPU / NWO-PIONIER
Started: 1 March 2003 (22 September 2003) till 1March 2004

Name: Dr. C.E. Pallud
Objective: Sulphate reduction along an estuarine gradient
Funding: Second Stream: NWO / PIONIER
Started: 16 April 2001

Name: Dr. I.J. Poole
Objective: Compound-specific stable carbon isotope analyses of fossil and modern wood constituents: A new technique for palaeoclimatic reconstructions
Funding: independed
Started: 1 September 2000

Name: Dr. G.J. Reichart
Objective: Trace metal incorporation in biogenic carbonates
Funding: Second Stream: NWO / PIONIER Hilgen (50%)
Started: 7 October 2003

Name: Dr. D. Rodríguez Aguilera
Objective: Application of knowledge based reactive transport model to Si diagenesis

Funding: Third Stream: METROL 50% / Si-Webs 50%
Started: 1 July 2003

Name: Dr. ir. C.P. Slomp
Objective: Where groundwater meets the ocean: modelling of biogeochemical processes in subterranean estuaries
Funding: Second Stream: KNAW
Started: 1 June 2001
Finished: 1 September 2004

Name: Dr. M. Thullner
Objective: Biogeochemical complexity
Funding: Second Stream: NWO
Started: 1 October 2003

Name: Dr. M. Wolthers
Objective: Radionuclide immobilization by bentonite, describing the role of accessory minerals with a mixed-component surface model
Funding: Third Stream: ANDRA
Started: 15 May 2003

Enclosure II: KEY DATA ON PhD RESEARCH AND POST-DOCS
Part F: Results of Second and Third Stream

Tectonics VU

Second Stream
PhD research: 7 months
Post-doc research: 15 months

Third Stream
PhD research: 40 months
Post-doc research: 24 months

Petrology VU

Second Stream
PhD research: 16 months

Third Stream
Post-doc research: 12 months

Isotope Geochemistry VU

Second Stream
PhD research: 54 months
Post-doc research: 52 months

Sedimentology VU

Second Stream
PhD research: 22 months
Post-doc research: 13 months

Third Stream
PhD research: 41.5 months

Paleoecology and Paleoclimatology VU

Second Stream
PhD research: 34 months
Post-doc research: 24 months

Third Stream
PhD research: 129 months
Post-doc research: 44 months

Hydrogeology VU

Second Stream
PhD research: 12 months

Third Stream
PhD research: 6 months
Post-doc research: 6 months

Quaternary Geology VU

Second Stream
Post-doc research: 8 months

Sedimentology UU

Third Stream
Post-doc research: 12 months

Stratigraphy and Palaeontology UU

Second Stream
PhD research: 24 months
Post-doc research: 47 months

Third Stream
PhD research: 22 months
Post-doc research: 12 months

Palaeoecology UU

Second Stream
PhD research: 47 months
Post-doc research: 28 months

Third Stream
PhD research: 33 months
Post-doc research: 12 months

Geochemistry UU

Second Stream
PhD research: 72 months
Postdoc research: 36 months

Third Stream
PhD research: 18 months
Postdoc research: 28 months

Enclosure III: EXTERNAL CO-OPERATION
Part A: Research Networks and International Collaboration

Tectonics VU

EUCOR-URGENT
- University of Basel (Prof. S. Schmid)
- University of Karlsruhe (Prof. B. Heck)
- ETH Zurich (Prof. G. Kahle)
- BRGM (Dr. Th. Winterer)
- NITG-TNO (Dr. C. Pagnier)
- University of Bonn (Prof. H. Neugebauer)

Environmental Earth System Dynamics Research Project
- University of Basel (Prof. J. Dercourt)
- University of Strasbourg (Prof. M. Granet)
- University of Freiburg (Frof. J. Behrmann)
- University of Vienna (Dr. K. Decker)

Peri-Tethys Programme
- Université Pierre et Marie Curie, Paris (Prof. J. Dercourt)
- Institute Français du Pétrole, Rueil-Malmaison (Dr. F. Roure)
- University of Bucharest (Prof. C. Dinu)
- Moscow State University (Prof. A. Nikishin)

International Geological Correlation Programme (IGCP) - Rift Basins
- University of Basel (Prof. P.A. Ziegler)
- University of Leeds (Dr. M. Wilson)
- Tervuren (Dr. D. Delvaux; Dr. J. Klerkx)
- University Complutense de Madrid (Prof. A. Arche; Dr. G. de Vicente)

EUROPROBE
- Institute of Physics of the Earth, Russian Academy of Sciences, Moscow, Russia (Dr. V. Mikhailov, Dr. E. Smolyaninova)
- GEON, Moscow, Russia (Dr. S. Kostyuchenko)
- University of Moscow, Russia (Prof. A. Nikishin)
- Geological Institute, Vilnius, Lithuania (Dr. G. Skridlaite)
- Geological Survey of Lithuania, Vilnius, Lithuania (Dr. S. Sliaupa)
- Institute of Geological Sciences, Academy of Sciences of Belarus, Minsk, Belarus (Dr. A. Kovkhuto, Prof. dr. R. Garetsky)
- Institute of Geophysics, National Academy of Sciences of Ukraine, Kyiv, Ukraine (Prof. dr. V. Starostenko, Dr. T. Yegorova, Dr. I. Pashkevich)
- Ukrgeofisika, Kyiv, Ukraine (Dr. S.M. Stovba, Dr. E. Dvorjanin)
- Institute of Geological Sciences, Bucharest, Romania (Dr. A. Seghedi)
- Polish Geological Survey, Warsaw, Poland (Dr. M. Narkiewicz, Prof. dr. R. Dadlez)
- University of Uppsala, Sweden (Dr. C.J. Juhlin)
- University of Lund, Sweden (Dr. S. Bogdanova)
- University of Lausanne, Switzerland (Dr. J. Mosar)
- University of Basel, Switzerland (Prof. P.A. Ziegler)
- ETH Zurich, Switzerland (Dr. Y. Podlachikov)
- University of Paris-Sud, France (Dr. M. Sebrier)
- CNR, Turin (Dr. R. Polino)
- University of Houston, Texas, USA (Dr. K. Poplavski)
- Cornell University, NY, USA (Dr. J. Knapp)
- University of Vienna, Austria (Dr. K. Decker)
- Geological Survey of Czech Republik (Dr. J. Francu)
- Charles University, Praha, Czech Republik (Dr. K. Schulmann)
- Slovak Academy of Sciences (Dr. M. Bielik)
- Comenius University, Bratislava, Slovakia (Dr. M. Kovac)
- University of Bucharest, Romania (Dr. V. Mocanu)
- University of Salzburg, Austria (Prof. dr. C. Tomek, Prof. dr. F. Neubauer)

- University of Krakow, Poland (Dr. N. Oszczypko)
- Polish Geological Survey, Warsawa, Poland (Dr. P. Krzywiec)

Eurobasin School

- P. and M. Curie Univ., Paris (Prof. J. Angelier, Prof. J. Dercourt)
- Royal Holloway Univ. London (Prof. D. Blundell)
- Inst. Francais du Petrole (Dr. F. Roure)
- Univ. of Bergen, Norway (Prof. R. Gabrielsen)
- Geomare Sud, Napoli (Prof. dr. B. d'Argenio)
- Univ. of Barcelona, (Prof. dr. M. Marzo)

International Lithosphere Programme, task force *Origin of Sedimentary Basins*

- Institute Français du Pétrole, Rueil-Malmaison (Dr. W. Sassi)
- Institute Geomare, Naples (Prof. B. d'Argenio)
- Eötvös University, Budapest (Prof. F. Horváth)
- University of Rennes (Prof. J. P. Brun)
- Norsk Hydro, Oslo (Dr. B. Rasmussen)
- Norsk Hydro, Bergen (Dr. A. Nottvedt; Dr. R. Karpuz)
- University of Barcelona (Dr. J.A. Muńoz; Prof. M. Marzo)
- CSIC, Barcelona (Dr. M. Fernandez, Dr. M. Torné)
- Tel Aviv University (Prof. Z. Ben-Avraham)
- University of Karlsruhe (Prof. K. Fuchs; Prof. F. Wenzel)
- University of Palermo (Prof. R. Catalano)
- Stanford University (Prof. M. Zoback)
- University of Oslo (Prof. O. Eldholm)
- University Pierre et Marie Curie (Prof. E. Burov)

Petrology VU

- GEUS, Copenhagen (DK)(Dr. P.U. Appel) and Cheltenham and Glouchester Colege (UK) (Prof. H. Rollinson): ISUA Project (Greenland). Fluids in Archean (oldest) undeformed seafloor altered basalts.
- EU SOPFEN Network: Bern (CH) Prof. T. Staucher, Cambridge (UK) Prof. H. Elderfield FRS, CEREGE-Aix-en-Provence (Fr) Prof. E. Bard, ETH Zurich (CH) Prof. A. Halliday FRS, , Oxford (UK) Dr. G. Henderson, Prof. W-C. Dullo, IFM-GEOMAR, Kiel (D).
- Members of Kaapvaal Project: DTM Washington (USA), Prof. E. Hauri, Prof. R. Carlson, Prof. D. James, Durham (UK), Dr. D.G. Pearson, Edinburgh (UK), Prof. B. Harte, Cape Town (S.A.) Prof. M. de Wit, Prof. J. Gurney.Dr. C. Smith, DeBeers GeoScience Centre, S. Africa, Dr. H. Jelsma DeBeers Exploration Division, S.Africa.
- EU Permo-Carboniferous Rifting in Europe Network: Leeds (UK) Prof. M. Wilson, Oslo (N) Prof E.-R. Neumann.
- Siberian Diamond Petrogenesis: Yakutian Institute (Russia) Dr. A. Smelov, Dr. Z. Spetsius ALROSA (Russia).
- Stromboli Volcanism: Dr. S. Tommassini, Dr. L. Francalanci, Firenze (It).
- Si Isotope Callibration: Damien Cardinal, Royal Museum for Central Africa, Tervuren, Belgium, Dr. B. Reynolds, Institut fur Isotopengeologie und Mineralische Rohstoffe, ETH Zentrum, Zurich, Switzerland.
- University Paris 6, (Prof. R. Kienast)
- Damas University, Syria (Prof. A. Bilal). Volcanous and mantle xenoliths in the Syrian rift.

INTAS projects (EU)

- Institute Mineralogy – Petrography Novosibirsk, Russian Acad. Sciences. Siberian Branch (Dr. A. Tomilenko and V. Chupin). Fluid regime at depth (Lower crust and upper mantle) and during the early stage of the formation of continents (from the study of fluid /melt inclusions in rock forming minerals.
- Department of Petrology, State University of Moscow, (Prof. L. Perchuk) Fluid rock interaction in incipient (arrested) charnokites from SriLanka.
- Lab. Mineralogie, Museum Histoire Naturelle, Paris (Dr. C. Perron), Search of extra terrestrial material in meteorites

Isotope Geochemistry VU

Formal collaboration agreements:
- Department of Earth Sciences, University of Rennes, France
- Department of Geology, University of Bergen, Norway
- GeoForschungZentrum, Potsdam, Germany

Networks:
- EFTAN European Fission Track Analysis Network
- EUROMARGINS: University of Oslo: Prof. dr. J.I. Faleide; GFZ Potsdam, Germany; Prof. dr. B. Horsfield; University of Renes, France: Prof. dr. J.P. Brun.

Pilbara Project:
Curtin University, Perth, Dr. D.R. Nelson
Geological Survey of Western Australia, Dr. H. Hickman
Australian Geological Survey Organization, Dr. R. Blewett
Department of Structural Geology, Utrecht University, Prof. dr. S.H. White

Intercalibration of Radio Isotope and Astronomical Timescales:
Berkeley Geochronology Center, Dr. P.R. Renne, dr. A. Deino
Geological Survey of Canada, dr. M. Villeneuve

Fission Track Analysis and cooling rates of the Eastern Cordillera and western Cordillera of the Andes. ESPOL, Guayaquil, Equador, OSTROM, France

Isotope timescale intercalibration:
Berkeley Geochronology Center, Dr. P.R. Renne,
GSC Ottawa, Dr. M Villeneuve
MIT, Dept. of Earth, Atmospheric and Planetary Sciences, Dr. S. Bowring,
Utrecht University, Institute of Earth Sciences University Utrecht, Dr. F.J Hilgen

Bilateral collaboration:
- University of Bucharest: Prof. C. Dinu. Tectono-thermal evolution of the Transsylvanian basin and the east Carpathina mountain belt.
- University of Warchau, Europrobe, Polish Trough Project.
- University of Madrid, Prof. dr. Vincente, Prof. dr. J. Lopez Ruiz.

University of Rennes, Geology of Dabie Shan, Prof. B.M. Jahn
- University of Bergen Norway, North Atlantic Domain Project, Prof. R. Gabrielsen.
- University of Stockholm, Geomorphotectonic evolution of the Mid and North Sweden domes, Prof. K. Lidmar Bergstrom.
- GEUS Copenhagen, tectonic evolution of Yemen, Dr. B. Willigers.
- University of Pavia, Dr. A. di Giulio, Tertiary Piemonte Basin Project.
- University of Barcelona, Prof. J.A. Monuz, Catalan Coast Ranges.
- CNR laboratory for research on Continental Mountain Chains, Dr. R. Polino, Tertiary Piemonte Basin project
- Norsk Hydro, NPD, Dr. B. Larson.
- Geological Survey of Finland, Espoo, Prof. dr. I. Kukkonen
- IFP, Subtrap consortium Prof. dr. F Roure
- Max Planck Institut fuer Kernphysik, Heidelberg
- NGU, Bergen, Norway
- University of Jena, Dr. H. von Eynatten, Detrital micas ages from the Swiss Molasse Basin.
- University of Kiel, and GEOMAR, Dating of Seamounts for plate velocity measurements, Dr. J. O'Connor, Prof. P. Stoffers (Rockall Project, north Atlantic Ocean, Hula Program, Emperor-Hawaii Seamount Chain, Musicians Seamount Chain, Paganini Program, Galapagos Hotspot)
- Institut für Geowissenschaften Christian-Albrechts-Universität, Kiel, Precise dating of seamounts as a key to understanding Hotspot Volcanism, Prof. dr. P. Stoffers
- Geological Survey of Peru, INGEMMET
- Chinese Academy of Sciences, Guangzhou Institute of Geochemistry, UHP metamorphism in Dabie Shan and Qingling, Central China, Dr. H-N Qiu

- Lancaster University, I.E.N.S., Department of Environmental Science, Isotope provenance of clastic sediments from de Himalayan Orogeny, Dr. Y. Najman.

Sedimentology VU

- Univ. of Innsbruck (Prof. dr. Brandner) Dynamics of Triassic carbonate platforms
- Univ. of Amiens (dr. L. Loncke) Slope instabilities and associated fluid flows
- Univ. of Ferrara (Prof. dr. Bosellini) Rhythmicity of Triassic sediments
- Univ. of Malaga, Spain (Dr. Carmen Salas) Cold seep fauna (ANAXIPROBE)
- Univ. Paris XI, France (Dr. André Poisson) Stratigraphy of Anaximander Mountains
- Univ. Pierre et Marie Curie, France (Dr. Catherine Pierre) Mediterranean Ridge and associated mud volcanoes and fluid seeps (MEDINAUT, PRISMED-II, MEDINETH, MEDIFLUX)
- IFREMER Centre de Brest, France (Dr. Jean-Paul Foucher) Mediterranean Ridge and associated mud volcanoes and fluid seeps (MEDINAUT, PRISMED-II, MEDINETH, MEDIFLUX)
- Institut Français du Petrole, France (Dr. Frans van Buchem) – Middle Cretaceous of Oman; (Dr. Eric Deville, Dr. Alain Prinzhofer) Mediterranean Ridge and associated mud volcanoes and fluid seeps (MEDIFLUX)
- Ecole Normale Supérieure, France (Dr. Pierre Henry) Mediterranean Ridge and associated mud volcanoes and fluid seeps (MEDINAUT, PRISMED-II, MEDINETH), and Tectonics of the Anaximander Mountains (Dr. Nicolas Chamot-Rooke) Tectonics of the Anaximander Mountains
- IRD Centre de Villefranche-sur-Mer, France (Dr. Jean-François Dumont) Stratigraphy of Anaximander Mountains
- Géosciences Azur, France (Dr. Jean Mascle) Mediterranean Ridge and Florence Rise and associated mud volcanoes and fluid seeps (MEDINAUT, PRISMED-II, MEDINETH, ANAXIPROBE, MEDIFLUX)
- Dokuz Eylul University, Izmir, Turkey (Prof. dr. Mustafa Ergun: Prof. dr. Gunay Cifci) Mud volcanoes and fluid seeps, neotectonics of the eastern Mediterranean
- Moscow State University (Dr. Mikhail Ivanov, Dr. Anatoly Limonov) Mediterranean Ridge and associated mud volcanoes and fluid seeps (TTR, MEDINETH, ANAXIPROBE)
- University of Lille, France (Geoffroy Mahieux) Integration and calibration of shallow high-resolution seismic data, wireline logs, cores and outcrops in the Upper Jurassic of the Boulonnais, northern France)
- University of Rennes, France (Dr. Jean Noel Proust) Integration and calibration of shallow high-resolution seismic data, wireline logs, cores and outcrops in the Upper Jurassic of the Boulonnais, northern France)
- University of Oviedo, Spain (Dr. Juan Bahamonde) Carboniferous high-rising carbonate platforms in Asturias, northern Spain, as outcrop analogs for subsurface Pricaspian reservoirs
- Cardiff University, U.K. (Prof. dr. Paul Wright) Porosity Development in Permo-Carboniferous Platform Margins
- ETH Zurich, Switzerland (Dr. Flavio Anselmetti) Petrophysics of young carbonates
- Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, U.S.A. (Dr. Phil Kramer) Ground verification of coral reef substrate by using Satellite Imagery
- University of Kansas, Lawrence KS, USA (Prof. P. Enos)
- Sequence Stratigraphy of Recent carbonate plateaus
- Rosenstiel School of Marine and Atmospheric Studies, University of Miami
- Participation to Ocean Drilling Programme, Leg 166 (Bahamas)
- Moscow State University, Russia: ANAXIPROBE-95 expedition.
- Ocean Drilling Programme: Participation to Leg 160
- UNESCO-IUGS-CLIP (Climates of the past) Pleistocene, Sumba, Indonesia
- University of Moscow, Russia: Stratigraphy and sea level in Cretaceous in Central Russia and the Crim.
- Istanbul Technical University, Dolenz Eylul University, Turkey and Piri Reis Foundation.
- Eidgenössische Technische Hochschule Zürich, Switzerland (Prof. H. Weissert)

- Ruhr-Universität Bochum (Dr. T. Steuber), Germany, High-resolution paleoclimatology from rudist low-Mg calcite
- Brown University, USA (Prof. dr. R.K. Matthews), Middle Cretaceous sea-level history, origin and reconstruction
- Moscow State University, Russia (Dr. Mikhail Ivanov, Dr. Anatoly Limonov) Mediterranean Ridge and associated mud volcanoes and fluid seeps (TTR, MEDINETH, ANAXIPROBE)
- University of Hawai (Dr. R. Zeebe), Modelling of seawater geochemistry
- University of Montpellier (Dr. Philipe Pezard), Petrophysics and Hydrology of Mallorca
- CEREGE, Aix en Provence (Dr. Gilbert Camoin), Petrophysics and Hydrology of Mallorca
- ChevronTexaco, San Ramon USA (Dr. Mitch Harris), Digital Outcop Analog database (WODAD)
- ExxonMobil, Houston, USA (Dr. Jim Weber), Carbonate play concepts in transtensional rift settings, north Afriica
- University of `Marrakech (Prof. Chelai), Extraction of quantitative sedimentary body models, Lower Jurassic, Djebel Bou Dahar, Morocco
- Integrated Ocean Drilling Program (IODP)
- European Consortium for Ocean Research Drilling (ECORD)
- EuroCORES for
- European Collaboration for Implementation of Marine Research on Cores (EuroMARC)
- Bureau of Economic Geology (BEG), Austin, Texas, USA (Dr. Charlie Kerans)

Paleoecology and Paleoclimatology VU

- Autonomous University of Barcellona Alkenones calibration
- EU CESOP 5th framework: CESOP with Cambridge, Bergen, Bremen, Barcelona, Gif-sur-Yvette.
- European Consortium for Ocean Drilling (ECOD) Scientific Committee (ESCO), delegate. Participant ODP leg
- Geological Survey of Canada - Atlantic
- Geological Survey Denmark. NE Atlantic palaeoceanography.
- Geological Survey Peru. **INGEMMET**
- In UNESCO Floating University context with University of Moscow. Mediterranean research/Atlantic
- In US Global Change programme context with University of S. Carolina:
  - Biogeochemical fluxes in S. California Bight.
- In IOP context with Univ. of Marseilles.
- **CEREGE** Aix-en-Provence: Indian Ocean Paleoclimate
- Lamont Doherty Earth Observatory: Paleoclimate Gulf of Aden ODP leg proposal
- MGI Bandung. East Kalimantan Project
- Natural Hisyory Museum London and ETH Zurich Global coccolithophoid biogeography
- **Van Gogh** programme with University of Montpellier II: Climate reconstruction based on Rhinoceros teeth
- University of Edinburgh. Co-operation DNA studies **Denmark Strait Expedition**
- University of Gdansk. Co-operation diatoms **Denmark Strait Expedition**
- University of Bremen. Benguela/Somalia upwelling systems. GeoB.**ENDICI** Co-operation, European Graduate College “Proxies in Earth History”, **EUROPROX**
- University of Bergen. **ENDICI/IMAGES** Co-operation. N.Atlantic paleoceanography
- University of Kiel. **ENDICI** co-operation. N. Atlantic paleoceanography
- University of Canberra. Indo-Pacific Gateways. **IMAGES**
- University of Milan. Erasmus-Socrates European Program Cooperation calcareous nannoplankton
- University of Milan-Bicocca. Cooperation **BIODEEP**, Eastern Mediterranean particle flux and ecology.
- University of Santa cruz, Preparation **ODP** leg 208
- University of Edinburgh. Cooperation DNA studies
- Universities of Firenze and Palermo. **Erasmus** and **Socrates** research
- WHOI. JGOFS and OFP, Ocean Flux Alkenones calibration
- Williams College, Trace Elements

Hydrogeology VU

- University of Botswana, Gaborone (Prof. M. Modisi)/Botswana Geological Survey (Dr. E.T. Selaolo), Botswana: Groundwater recharge in the Kalahari Beds and the Karoo Supergroup
- University of Witwatersrand (Prof. B.Th. Verhagen)/ University of Orange Free State (Prof. G. van Tonder), South Africa: Groundwater recharge processes in the Kalahari environment
- NAMWATER, Windhoek (Dr. W. Seimons): Groundwater recharge in ephemeral river valleys in the Namib-desert
- IRD (ORSTOM), Montpellier, France (Dr. C. Leduc): (Sub-)Sahara groundwater processes
- Albert-Ludwigs University, Freiburg (Prof. C. Leibundgut): Application of tracers in arid-zone hydrology
- Friedrich Schiller University, Jena (Prof. W-A. Flugel) : Hydrology and Environment Program, Limpopo catchment
- China University of Geoscience, Wuhan (Prof. Zhang Renquan): Water-/salt balance modelling in semi-arid Yanqi Basin
- Research Institute for Groundwater, Cairo (Dr. O. Gaame)/Desert Research Institute, Cairo (Prof. A. Shata): Paleohydrology of the Nile Delta and recent salinization and land subsidence
- Ocean Floor Drilling Project/Shell/Schlumberger: Fresh and brackish groundwater on the continental shelf; ocean water interaction
- Surinam Geological Survey/University of Algarve, Portugal (Drs. T.Y. Stigter):Fossil and recent fresh offshore groundwater
- Scripps Institution of Oceanography, La Jolla, USA (Prof. D. Hilton): Application of noble gas isotopes in hydrology
- University of Gent (Dr. K. Walraevens): Hydrogeochemical modelling of paleowaters in Tertiairy coastal aquifers
- Institute of Hydrology, Wallingford , UK (Prof. M.W. Edmunds: Geochemical processes in paleowaters (desert and near-shore conditions)
- National Research Council, Canada (Dr. G. van der Kamp): Landsubsidence and deformation processes
- Oxford University, UK (Dr. G.E. Tucker): Stream network evolution modelling
- National Pingtung University of Science and Technology, Taiwan (Prof. C-S Ting): Fanglomerate hydrogeology and artificial recharge
- Erftverband, Bergheim/Rheinbraun, Koln, Germany (Dr. V. Schenk, Dr. Th. Oswald: Hydrogeology of faults in the Roer Valley Graben
- New Mexico Institute of Mining and Technology (Fluids and Faults Group), Socorro, USA (Dr. J.M.H. Hendrickx): Fluid flow and faults processes in unconsolidated sediments
- University of Maryland, USA / NASA Biospheric Sciences Branch, Greenbelt (Dr. S.O. Los): Earth Observation: Global vegetation and climate
- University of Heidelberg, Germany (Prof. dr. W. Aeschbach-Hertig): noble gasses
- NASA Goddard Space Flight Centre, Hydrological Sciences Branche, Greenbelt, USA (Dr. M. Owe): Modelling soil moisture from passive microwave satellite data
- IGBP/NOPEX (Prof. Sven Haldin, University Uppsala; Dr. Paolo Pampaloni, CNR-IROE, Florence): Hydrological cycle North-European forest; satellite microwave research
- IGBP/EFEDA (Prof. H-J. Bolle, Berlin; Dr. J. Bromley, Wallingford; Prof. M. R. Llamas, Madrid): Desertification research in the Mediterranean (satellite and field observation)
- University of Sheffield (Prof. D. Lerner): Groundwater pollution and remediation in urban areas
- University of Bern (Dr. J.D. Kramers): Application of isotope tracers in groundwater pollution and remediation studies
- Technical University of Denmark (Prof. T.H. Christensen): In situ bio-remediation of subsurface pollution
- Harriot-Watt University, Edinburgh (Dr. C. Hern): Structures and Hydrogeological properties of dune sediments

- KIWA Water Research (Ir. J.W. Kooiman, dr. A. Meuleman, prof. dr. ir. D. van der Kooij, dr. ir. G.J. Medema, etc.): artificial recharge, river bank filtration, ASR, behaviour of pathogens in aquifers, removal of organic micropollutants, salinisation of aquifers.
- Indiana University, Bloomington (Prof. M. Person): offshore groundwater.

Sedimentology UU

- Woodward-Clyde, Talahassee, USA (Dr. Alan W. Niederoda; Dr. Christopher W. Reed)
- University of Sydney (Dr. P. Cowell)
- MIOMAR project. Collaboration with Universities of Cambridge (UK), Bergen (N), Montpellier, Louvain-la-Neuve, Bordeaux, Athens, Salamanca.
- Indian Ocean (ALW-Pakomin I). Collaboration with Universities of Cardiff (UK), Southampton (UK) and British Geological Survey.

Stratigraphy and Palaeontology UU

Co-operation with:

- Universities of Madrid (Computense), Lyon, München, Wien and with MTA (Geological Survey Turkey). Cenozoic continental biostratrigraphy.
- Bundesanstalt für Geowissenschaften und Rohstraffe (Federal Geological Survey (BGR), Hanover, Germany).
- Universities of Bordeaux and Jerusalem.
- Palaeobiology and palaeoecology
- Ptolemais programme (NWO/ALW).
- University of Athens and Geological Survey, Hanover.
- ESF-EEDEN network (Environments and Ecosystem Dynamics of the Eurasian Neogene)
- Joint field trips / sampling campaigns.
- Indian Ocean / Arabian Sea Programme.
- Bundesanstalt für Geowissenschaften und Rohstroffe (Federal Geological Survey (BGR), Hanover, Germany)
- CoMCoM network; Continental – Marine Correlation in the Mediterranean
- University of Athens (Greece)
- University of Salamanca (Spain)
- University of Parma (Italy)
- University of Madrid (Spain)
- University of Chiety (Italy)
- Geological Institute Bucharest (Romania)
- Russian Academy of Sciences (Russia)
- Geological Survey, Rabat (Morocco)

Palaeoecology UU

Cooperation with:

- Atlantic Geoscience Center, Dartmouth, Nova Scotia, Canada (Dr. G.L. Williams)
- Australian GeoSciences Organisation (AGSO, Canberra; Dr. N. Exon, Dr. C. Foster)
- CNRS-CEREGE, Aix-en-Provence, France (Dr. Y. Touchard)
- Florida State University, Tallahassee, USA (Dr. T.R. Janecek)
- Geological Survey of Alaska, Anchorage, USA (Dr. T.S. White)
- Geological Survey of Denmark and Greenland (Prof. dr. N.J. Anderson)
- GEOMAR, Kiel, Germany (Dr. D. Nuernberg)
- Humboldt University of Berlin, Germany (Dr. B. Mohr)
- Institute of Geological and Nuclear Sciences, Wellington, New Zealand (Dr. D.C. Mildenhall, Dr. C. Hollis)
- Lamont-Doherty Earth Observatory, Palissades, USA (Dr. U. Ninnemann)
- Naturmuseum Bolzano (Dr. Baumgarten)
- Rice University Houston (Prof. dr. G.R. Dickens)
- Rutgers University, NYC, USA (Prof. dr. W.A. Berggren, Prof. dr. MP Aubry)

- Scripps Inst. of Oceanography, San Diego, USA (Dr. R. Norris)
- Smithsonian, Washinton DC (Dr. S. Wing)
- Swiss Federal Institute of Environmental Science and Technology (EAWAG: Dr. M. Sturm, Dr. D.M. Livingstone)
- Swiss Federal Institute of Forest, Snow and Landscape (WSL: Dr. N. Zimmermann, Dr. H. Bürgi)
- United States Geological Survey, Reston, USA (Dr. D. Willard)
- University College London (Prof. dr. R.W. Battarbee)
- University of Aarhus (Prof. dr. B. Odgaard)
- University of Barcelona (Prof. dr. M. Canals, Prof. dr. R. Zahn)
- University of Bergen (Prof. dr. H.J.B. Birks, Prof.dr. A. Nesje, Dr. S.O. Dahl)
- University of Bern (Prof. dr. B. Ammann, Dr. W. Tinner, Dr. W.O. van der Knaap, Dr. C. Bigler)
- University of Bologna (Ravenna) (Prof.ssa. dr. L. Boni, Prof. dr. G. Gabbianelli)
- University of Bonn (Prof. dr. H.-J. Schweitzer)
- University of Botswana (Prof. dr. L. Ramberg)
- University of Bremen (Prof. dr. H. Willems, Prof. dr. G. Wefer, Dr. C. Ohlendorf, Prof.dr. B. Zolitschka)
- University of Bucharest (Dr. M. Popa)
- University of Budapest (Dr. M. Barbacka)
- University of California at Berkeley, USA (Prof. dr. W. Alvarez)
- University of California at San Diego (Dr. S.A. Schellenberg)
- University of California at Santa Barbara (Prof. dr. J.P. Kennett)
- University of California at Santa Cruz (Prof. dr. J.C. Zachos, Prof. dr. L.C. Sloan)
- University of Cardiff (Dr. C.E. Stickley)
- University of Ferrara (Prof. dr. C. Loriga Broglio, Prof.dr. R. Posenato, Dott.essa E. Kustatscher)
- University of Florida (Prof. dr. D.L. Dilcher)
- University of Hamburg (Prof. dr. K. Bandel)
- University of Heidelberg (Prof. dr. W. Shotyk, Dr. K. Koinig)
- University of Krakow (Prof. L. Stuchlik, Dr. E. Zastawniak, Mrs. J. Ziaja)
- University of Leipzig, Germany (Prof. dr. M. Melles)
- University of Leuven, Belgium (Prof. dr. N. Vandenberghe)
- University of Lund (Prof. dr. S. Björck, Dr. A. Broström)
- University of Milan (Prof. dr. M. Gaetani, Dr. L. Passoni, Prof. dr. I. Premoli-Silva)
- University of Minnesota (Prof. dr. S. Sugita)
- University of Munich (Dr. M. Kirchner)
- University of Münster (Prof. dr. H. Kerp)
- University of Nanjing (Academica Sinica) (Prof.dr. Z. Zhou, Dr. Y. Wang)
- University of Neuchâtel (Dr. T. Adatte, Prof. dr. K. Föllmi)
- University of North Carolina at Chapel Hill, USA (Prof. dr. T.J. Bralower)
- University of Prague (Prof. dr. Z. Kvacek)
- University of Purdue, Indiana (Prof.Dr. M. Huber)
- University of Southampton (Dr. E.J. Rohling, Dr. I.C. Harding)
- University of Stockholm (Dr. J. Backman)
- University of Tasmania, Antarctic Research Center (Prof. dr. A. McMinn)
- University of Tohoku, Aramaki, Japan (Dr. N. Suzuki)
- University of Townsville (Dr. W. Henderson)
- University of Tübingen, Germany (Prof.dr. V. Mosbrugger, Dr. J. Pross)
- University of Urbino (Prof. dr. R. Coccioni, Dr. S. Galeotti)
- University of Växjö (Prof.dr. M.-J. Gaillard)
- University of Wisconsin (Prof. dr. C. Kelly)
- University of Würzburg (K.-P.Kelber)
- Wesleyian University, Connecticut (Prof. dr. E. Thomas)
- Wood's Hole Oceanographic Institution (Dr. K. Bice)

Erasmus Networks

- University of Bremen (Germany)
- University of Copenhagen (Denmark)
- University of Prague (Czech Republic)
- University of Southampton (UK)
- University of Urbino (Italy)

Tempus Network
- Polish Academy of Sciences (Poland)

UNESCO/IUGS International Geological Correlation Programme (IGCP)
- Project 381: South Atlantic Mesozoic correlations

Northwest European Pollen Flora
- Collaboration with the Museum of Natural History, London (UK)
- Collaboration with the Royal Botanic Gardens, Edinburgh (UK)

Ocean Drilling Project
- Leg 113, Leg 120, Leg 171, Leg 189, Leg 198, Leg 199, Leg 207, Leg 208 (H. Brinkhuis)

NorFa POLLANDCAL Network
- Collaboration with Universities of Växjö (S), Lund (S), Aarhus (DK), Oulu (SF), Bergen (N), Tallin (EST), Exeter (UK), Hull (UK), Bern (CH)

ESF-EEDEN Network (Environments and Ecosystem Dynamics of the Eurasian Neogene)

EUROPROX

Geochemistry UU

Cooperation with:
- Alfred-Wegener Institute, Bremerhaven, Germany (prof. J. Bijma, prof. D. Wolf-Gladrow)
- Danish Hydraulic Institute, Copenhagen (dr. H.S.Vested)
- Dept of Marine Sciences, The University of Georgia, Athens, GA (dr. C. Meile)
- Free University of Brussels, Belgium (prof. L. Chou, dr. J.P.Vanderborght, dr. C. van der Zee)
- Geological Survey of Canada , Ottawa (dr. R. Garrett)
- Georgia Institute of Technology, Atlanta, USA (prof. T. DiChristina, prof. E. Ingall)
- Ifremer, Brest, France (dr. J.P. Foucher)
- Indiana University, Bloomington, USA (dr. K. Tuncay)
- Lawrence Berkeley National Laboratory, Berkeley, USA (dr. C. Steefel)
- Max Planck Institute for Marine Microbiology, Bremen (prof. B.B. Jorgensen, dr. D. de Beer)
- Purdue University , Dept. of Earth and Atmospheric Sciences, West Lafayette, USA (prof. S.J. Fritz)
- Royal Botanic Gardens, Kew , UK (dr. P. Rudall, M. Gregory, dr. H. Wilkinson)
- Southampton Oceanography Centre, UK (prof. J. Thomson, dr. D. Green, prof. C. German)
- Studiecentrum Kernenergie (SCK.CEN), Mol, Belgium (dr. De Cannière)
- Swedish Museum of Natural History (dr. D. Cantrill)
- University College Cork , Ireland (prof. J.P. O'Kane)
- University of Bayreuth , Germany (prof. S. Peiffer)
- University of Botswana , Gaborone , Botswana (dr. Ekosse, dr. Vink)
- University of Bremen, Germany (dr. C. Hensen, prof. H.D. Schulz, dr. M Zabel, dr. S Kasten)
- University of Grenoble , France (prof. L. Charlet)

- University of Guelph , Ontario , Canada (prof. P.H. Groenevelt)
- University of Leuven , Belgium (prof. S. Swennen)
- University of Milano , Italy (dr. E. Erba, prof. C. Corselli)
- University of Missouri-Rolla, Dept. Geology and Petroleum Engineering (prof. L.M. Whitworth)
- University of Münster , Germany (prof. H. Kerp)
- University of Oldenburg , Dept. Biogeochemistry , Germany (prof. H.J. Brumsack)
- University of Ottawa (prof. D. Rancourt, prof. I. L'Heureux, dr. D. Roberts)
- University of Toulouse (prof. J. Schott, dr. O. Pokrovsky)
- University of Wales , Cardiff (prof. D. Rickard, dr. I Butler)
- US Geological Survey National Center , Reston (VA) (dr. C.E. Neuzil)
- Wake Forest University , USA (dr. M. Silman)
- Western Michigan University , Dept. Geosciences, Kalamazoo , USA (dr. C. Koretsky)

EU-Research Training Network Si-WEBS

- Université de Bretagne Occidentale (UBO), Brest, France
- National Environment Research Institute (NERI), Roskilde, Denmark
- Université Pierre et Marie Curie (UPMC), Paris, France
- Free University of Brussels (ULB), Belgium
- National Center for Marine Research (NCMR), Athens , Greece
- Universität Hamburg (Uni-HH), Hamburg , Germany
- Universität Bremen (Uni-Bremen), Bremen , Germany

EU Project METROL

(METhane fluxes in ocean margin sediments: microbiological and geochemical contROL)

- Max Planck Institute for Marine Microbiology , Bremen , Germany
- Alfred Wegener Institute for Polar and Marine Research, Bremerhaven , Germany
- Biogeochemistry Research Centre, University of Bristol , England
- National Environmental Research Institute, Silkeborg , Denmark
- Geological Survey of Denmark and Greenland, Copenhagen , Denmark
- National Institute of Marine Geology and Geoecology, Bucharest , Romania
- A.O. Kovalevsky Institute of Biology of the Southern Seas, Sevastopol , Ukraine
- Statoil, Stavanger , Norway

SISCO

- Free University of Brussels , Belgium
- Ghent University , Belgium

Anaximander

- Institute of Geology and Mineral Exploration, Athens , Greece
- Technische Universitaet Berlin - Dept. Marine Technology , Berlin , Germany
- Technische Universität ITE, Clausthal , Germany
- Technical University Crete, Crete
- National Center for Marine Research, Athens , Greece
- Vrije Unversiteit, Amsterdam, The Netherlands
- CSIC - Instituto Ciencias del Mar, Barcelona , Spain

Moçambique Project

- Cooperation project of the Universidade Eduardo Mondlane, Maputo , and the Utrecht University , in the field of geology and geochemistry

Enclosure III: EXTERNAL CO-OPERATION
Part B: External functions of NSG staff – International

Tectonics VU

Prof. dr. S.A.P.L. Cloetingh
- President International Lithosphere Programme (ILP)
- Past president European Geophysical Society (EGS)
- Past Vice-President of the European Union of Geosciences (EUG)
- Advisor of the Portuguese Foundation for Scientific Research
- Chairman Earth and Cosmic Sciences Section of Academia Europaea
- Member Council Academia Europaea
- Senior Professor by special appointment of the University of Tel Aviv
- Member Steering Committee International Association of Structural/Tectonic Geologists (IASTG)
- Foreign member of the Russian Academy of Natural Sciences
- Chairman Scientific Council EUROBASIN School

Prof. dr. H. Doust
- Co-chair Industry Liaison Panel, SAS organisation IODP
- Member Scientific Advisory Board CASP (Cambridge Arctic Shelf Programme), UK

Dr. G.V. Bertotti
- EGS Vice-President for Tectonics (Solid Earth)

Dr. R.A. Stephenson
- Member EUROPROBE Scientific Steering Committee
- Project Leader EUROPROBE GeoRift Project
- Project Co-ordinator INTAS Project “Geodynamics of Late Paleozoic rift basins on the Eastern European Paltform: Pripyat-Dniepr_Donets Basin, Ukraine and Belarus”
- Project Co-ordinator INTAS Project “Relationship between pre-Jurassic intracratonic rifting and back-arc extension on the southern margin of the East European Craton”

Petrology VU

Dr. M.A. Zakrewski
- IMA-COM Commission on Ore Mineralogy of the International Mineralogical Association.
- IMA-CAM Commission on Applied Mineralogy of the International Mineralogical Association.
- ICAM International Council on Applied Mineralogy.

Dr. P.Z. Vroon
- International Group for the Calibration of Si isotope Standards.
- Co-chair AGU Session: “Application of metal stable isotopes in low-temperature geochemistry and biogeochemistry”.

Isotope Geochemistry VU

Prof. dr. P.A.M. Andriessen
- Member alderman committee of the International Fission Track community
- Foreign member of advisory and review committee of Fund for Scientific Research of Flanders, Belgium
- Officer of the European Geophysical Society, section Solid Earth
- Member management team EUROMARGINS
- Member of EUROMARGINS Programma Extended Forum
- Member Academie EUROPEA

Sedimentology VU

Prof. dr. W. Schlager
- President Society for Sedimentary Geology (SEPM)
- Member, Steering Committee, Global Sedimentary Geology Program
- External Professor of Sedimentology, University of Salzburg, Austria
- Adjunct Professor of Geology, Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, USA
- Member of Academia Europaea
- Member of Österreichische Akademie der Wissenschaften, Vienna, Austria
- Deutsche Akademie der Naturforscher (Leopoldina), Halle, Germany

Prof. dr. J. Smit
- Principal Investigator CSDP Chicxulub Scientific Drilling Project (ICDP)
- President of the Section Sedimentology, Stratigraphy and Paleontology of EGU

Dr. A. Immenhauser
- Review Panel Member of the German Research-funding Agency (DFG)
- Secretary of subdivision 'Sedimentology' EGH of EGU
- Vice-President of the Division 'Sedimentology, Stratigraphy and Paleontology of EGU
- Member of Euromargins Programme Science Forum

Dr. J.A.M. Kenter
- Chairman, ECORD Science and Support Advisory Committee (ESSAC)
- ECORD Science Planning Committee member on the IODP SPC
- Chair on the Scientific Steering Committee (SSC) of EuroCORES for European Collaboration for Implementation of Marine Research on Cores (EuroMARC)

Dr. J.M. Woodside
- Member, Executive Committee, Training Through Research Programme

Drs. S. Purkis
- Science coordinator for the European Consortium of the Ocean Drilling Program (ESCO)

Dr. Valentina Zampetti
- Science coordinator ECORD office Science Support and Advisory Committee

Paleoecology and Paleoclimatology VU

Prof. dr. D. Kroon
- Dutch representative IMAGES
- Member of EU committee (Paleostudies)
- Member of EU committee (Marion Dufresne)
- Member of Europrox organizational committee
- Co-chief Scientist ODP Leg 208

Dr. S.R. Troelstra
- Dutch representative Nansen Arctic Drilling (ODP) program
- Dutch representative IMAGES working group Western Pacific Margins

Dr. G.M. Ganssen
- President of division Climate: past, present, future at EGS (EGU)

Hydrogeology VU

Prof. dr. J.J. de Vries
- Member of the UNESCO Committee on the History of Water and Civilization
- Member of council International Water History Association (IWHA)

Prof. dr. P.J. Stuyfzand
- Member Scientific Committee Salt water Intrusion Meeting (SWIM)
- Member Scientific Committee Managed Aquifer Recharge (ISMAR)
- Member IAM-working group 'Management of Aquifer Recharge'
- Member International Water Association (IWA)

Dr. A.A. van de Griend
- Member Executive Committee IGBP/NOPEX "The Northern Hemisphere Climate Processes Land-surface Experiment (NOPEX)
- Member Program Group II, National Research Program on Air Pollution and Climate Change (NOP)
- Member programme Commission ESA SMOS satellite

Dr. C.J. Hemker
- Member Netherlands Committee for the advancement of analytical mathematical Solutions in Hydrology

Dr. H. Kooi
- Member Hydrogeology Programme Planning Group ODP
- Member Sub-committee Land and Sea Level Movement, National Geodetic Commission
- Core Member GRAPHIC (UNESCO)

Sedimentology UU

Dr. G. Postma
- Netherlands representative of ICGP-396
- Netherlands representative of ICGP-464
- Member of EuroStrataform Group

Stratigraphy and Palaeontology UU

Prof. dr. J.E. Meulenkamp
- Chairman Steering Committee ESF programme "Environments and Ecosystems Dynamics of the Eurasian Neogene"(EEDEN)
- Chairman EEDEN Working Group on Stratigraphy and Paleogeography
- Past-President and member Executive Board / national representative IUGS Regional Committee on Mediterranean Neogene Stratigraphy (RCMNS)

Prof. dr. G.J. van der Zwaan
- Member Executive Board IUGS Regional Committee on Mediterranean Neogene Stratigraphy (RCMNS)

Dr. W.J. Zachariasse
- Chairman IUGS Subcommission on Neogene Stratigraphy (SNS)

Dr. F.J. Hilgen
- Principal Investigator PIONIER programme "*Late Neogene climate variability in annual to Milankovitch frequency bands*" (1999-2004)
- Member Working Group "Cyclostratigraphy" of the IUGS Subcommission on Stratigraphic Classification (ISSC)
- Member Working Group "Miocene Time Scale" of the IUGS Subcommission on Neogene Stratigraphy (SNS)
- Secretary IUGS Subcommission on Neogene Stratigraphy (SNS)
- Member Executive Board IUGS Regional Committee on Mediterranean Neogene Stratigraphy (RCMNS)

Dr. A.J. van der Meulen

- Member Working Group on mammal paleoecology and biodiversity of the ESF programme “Environmental and ecosystem dynamics of the Eurasian Neogene” (EEDEN)

Palaeoecology UU

Prof. dr. A.F. Lotter
- Member of the Executive Committee, European Pollen Database
- Member of the European Diatom Database Initiative
- Member of the International Advisory Board of the 3rd International Limnological Congress
- Member of the POLLANDCAL core group
- Member of the scientific board of the European Graduate College “Proxies in Earth History”
- Co-chairman EUROPROX

Prof.dr. J.W. de Leeuw
- Professor Organic Geochemistry (0.0 fte), University Barcelona, Spain
- Chair Scientific Committee Hanse Wissenschaft Kolleg, Delmenhorst, Germany
- Board member European Marine Sciences (MB/ESF)
- Member Scientific Committee Alfred Wegener Institute, Bremerhaven, Germany
- Member Executive Board of Marine Board/ESF
- Chair Partnership for the Observation of the Global Oceans (POGO)
- Co-PI International Census of Marine Microbes (ICoMM)/CoML
- Member Scientific Committee Plymouth Marine Laboratory (PML), Plymouth, UK
- Chair and Co-chair Scientific and Management Audit teams of NERC marine institutes in UK

Prof.dr. J.H.A. van Konijnenburg-van Cittert
- Regional representative Netherlands in European Palaeobotanical and Palynological Society

Prof. dr. H. Visscher
- Past-president International Federation of Palynological Societies (IFPS)
- Gutachter DFG Sonderforschungsbereich 350: “Wechselwirkungen kontinentaler Stoffsysteme und ihre Modellierung”
- Member IUGS Subcommission on Triassic Stratigraphy (STS)
- Member IUGS Subcommission on Permian Stratigraphy (SPS)

Dr. H. Brinkhuis
- Member various IUGS committees and working groups on Paleogene Stratigraphy
- NEBROC Board ‘observer’
- EUROPROX Board member

Dr. W.M. Kürschner
- Member IUGS Sub commission on Carboniferous Stratigraphy
- Member IUGS Sub commission on Trias Stratigraphy

Geochemistry UU

Prof. dr. G.J. de Lange
- Co-chief scientist Mimes expedition
- Chief scientist PaleoPars expedition
- Member review committee Southampton Oceanography Centre / Challenger Division of Sedimentary Processes

Prof. dr. J.W. de Leeuw
- Professor of Geochemistry, University of Barcelona , Spain
- Board member Hanse Wissenschaftskolleg, Delmenhorst , Germany
- Chair Scientific Board Hanse Wissenschaftskolleg, Delmenhorst , Germany

- Board member European Marine Sciences (MB/ESF)
- Board member Scientific Committee Alfred Wegener Institute (AWI), Bremerhaven , Germany
- Chair POGO (Partnership for the Observation of the Global Oceans), from 31 November 2004

Dr. J. J. Middelburg
- Professor of Biogeochemistry, University of Gent , Belgium
- Member international steering committee IMBER (Integrated Marine Biogeochemistry Ecosystem Research)
- Chairman selection committee Lindeman Award of American Society for Limnology and Oceanography
- Member NCEAS working group Integrating Terrestrial and Aquatic Carbon Cycle
- Associate member of SCOR working group 114
- Member Network-of-Excellence Euro-Oceans

Dr. P.A.G. Regnier
- Adjunct staff member, Free University of Brussels, Dept. Oceanography , Belgium
- Scientific expert, Danish Hydraulic Institute, Copenhagen , Denmark
- Member Steering Committee Blue City Project, University College , Cork , Ireland
- International scientific expert. Evaluation of the strategic development plan of the Centre for
- Environmental Research UFZ, Leipzig-Halle , Germany

Prof. dr. ir. J.S. Sinninghe Damsté
- Member of the Science Committee of the NIOO

Prof. dr. P.S.J. Van Cappellen
- International Symposia on Environmental Biogeochemistry (ISEB): Member International Committee and Member Executive Committee
- Member Selection Committee F.W. Clarke Award, The Geochemical Society
- Research Officer EU Research Training Network (Si-WEBS)
- Goldschmidt 2004: Member International Scientifc Advisory Committee
- European Association of Geochemistry: Member Executive Committee

Enclosure III: EXTERNAL CO-OPERATION
Part C: External functions of NSG staff – National

Tectonics VU

Prof. dr. S.A.P.L. Cloetingh
- Member of the Royal Netherlands Academy of Arts and Sciences (KNAW)
- Member of Council Earth and Life Sciences, ALW, NWO
- Member Scientific Advisory Board, NITG-TNO
- Member Board of Directors ISES
- Member Council Royal Netherlands Meteorological Institute (KNMI)

Prof. dr. H. Doust
- AAPG Netherlands Teamleader

Petrology VU

Member of Evaluation Commission for Geo-Biosphere for Research Council for Earth and Life Sciences (ALW)

Isotope Geochemistry VU

Prof. dr. P.A.M. Andriessen
- Member Council Earth and Life Sciences (GB-ALW/NWO)
- Member of Raad voor Aarde en Klimaat (RAK, KNAW)
- Chairman of scientific steering committee of ISES
- Member of the Board of Moolengraafs fonds
- Chairman Kamer overleg orgaan Aardwetenschappen VNSU
- Member Discipline Overleg orgaan Natuur en techniek (DNT, VSNU)
- Director Institute of Earth Sciences, VU Amsterdam

Sedimentology VU

Prof. dr. W. Schlager
- Member Advisory Board Earth and Life Siences, NWO
- Member Advisory Board of the Center of Technical Geosciences Delft

Dr. J.A.M. Kenter
- Chairman, Netherlands Ocean Drilling Committee

Prof. dr. J. Smit
- Member Koninkelijke Nederlandse Akademie van Wetenschappen

Paleoecology and Paleoclimatology VU

Prof. dr. D.Kroon
- Member of the national assessment committee installed by NWO/WOTRO
- Member of “beleidsadvies” committee NWO

Dr. G.M. Ganssen
- Member of Netherlands SCOR Committee

Dr. S.R. Troelstra
- Secretary Dutch IMAGES Committee
- Member of the national assessment committee installed by ALW/NWO
- Member CLIVARNET committee (NWO)
- Member CMF (Marine Research Facilities Committee, NWO)

Hydrogeology VU

Prof. dr. J.J. de Vries
- Advisory board of the Netherlands Committee for the International Hydrological Program, IHP-UNESCO
- Member of the Netherlands Committee of the International Association of Hydrological Sciences
- Member of the Netherlands Committee of the International Association of Hydrologists
- Member Steering Committee NEESDI
- Member Committee on History of Geology of KNAW

Dr. A.A. van de Griend
- Member Program Group II, National Research Program on Air Pollution and Climate Change (NOP)

Dr. C.J. Hemker
- Member Netherlands Committee for the advancement of analytical mathematical Solutions in Hydrology

Dr. H. Kooi
- Member Sub-committee Land and Sea Level Movement, National Geodetic Commission

Sedimentology UU

Prof. dr. P.L. de Boer
- Member Advisory Board “Integrated study of the effects of natural and artificial subsidence in the Wadden Sea”; Min. Economic Affairs / NAM 1998/1999
- Member Advisory Board “Studies of the effects of shell fishing on the Wadden Sea ecosystem”; Min. Agriculture and Fishery
- Associated partner EU MAST Programme: “Prediction of Aggregated-Scale Coastal Evolution” (PACE)

Dr. G. Postma
- Chairman of the Sedimentologische Kring KNGMG –till November 2002
- Hoofdbestuur KNGMG -- Oktober 2002 - present

Stratigraphy and Palaeontology UU

Prof. dr. J.E. Meulenkamp
- Member Board Netherlands Institute for Sea Research (NIOZ)
- Member Board LPP (Laboratory for Palaeobotany and Palynology) Foundation
- Member Board Molengraaff Foundation
- Member Scientific Steering Committee ISES Programme
- Chairman Board NITG-TNO – UU Biogeology Centre

Prof. dr. G.J. van der Zwaan
- Chairman Review Panel “Earth Surface”
- Member Review Panel “Puls”
- Member Board Royal Dutch Geological and Mining Association (KNGMG)
- Chief Scientist Dutch-Israeli-Italian “Adriatic-Levantine Programme”
- Advisor Programme “Introduction Science (ANW) on High Schools”

Dr. W.J. Zachariasse
- Coordinator (together with U. von Rad, BGR, Hannover) Ocean Drilling Project (ODP) proposal 549-Full
- Member ALW/NIOZ National Advisory Board

Palaeoecology UU

Prof. dr. A.F. Lotter
- Member of the NWO/ALW CLIVAR commission
- Member of the NWO/ALW Biodiversity commission
- Member of the NWO/ALW Coupled Geo-Biosphere commission
- Board member NITG-TNO –- UU Biogeology Center

Prof. dr. J.W. de Leeuw
- Member Verkenningscommissie Biogeologie (KNAW)
- Member Commissie (her)erkenning Onderzoekscholen (ECOS)
- Member of the Royal Netherlands Academy of Sciences (KNAW)
- Director Royal Netherlands Institute for Sea Reserach (NIOZ) till July 1st, 2004
- Senior Scientist at Royal Netherlands Institute for Sea Research (NIOZ) since July 1st, 2004
- Part-time professor Organic Geochemistry, Fac. Geosciences, University Utrecht, the Netherlands
- Member Councel for Earth and Climate (RAK)/ KNAW
- Member committee Biology, Oceanography and Earth Sciences (RAK)/ KNAW
- Member section Earth Sciences KNAW
- Member of committee Darwin Centre of Biogeology till June 2004
- Member of committee for Netherlands Energy Research/ KNAW
- Member committee Climate Variability, ALW
- Director Royal Netherlands Institute for Sea Research NIOZ

Prof. dr. J.H.A. van Konijnenburg-van Cittert
- Professor of Palaeobotany, University of Leiden

Prof. dr. H. Visscher
- Chairman LPP Foundation (development research and training in organic matter studies)
- Member WOTRO commission for Medical and Natural Sciences
- Advisor NITG-TNO

Dr. H. Brinkhuis
- Secretary LPP Foundation (development research and training in organic matter studies)
- Board member NITG-TNO –- UU Biogeology Center

Dr. J. van der Burgh
- Member Executive Board: Foundation Geology and Palaeontology

Dr. F. Wagner
- Member of the Open ALW programme commission BOC2
- Member of the KNAW advisory commision Biogeology

Geochemistry UU

Prof. dr. J.W. de Leeuw
- Member KNAW
- Director Royal Netherlands Institute for Sea Research NIOZ
- Member CLIVARNET commission
- Member Raad voor Aarde en Klimaat (RAK)
- Member Verkenningscommissie Biogeologie (KNAW)
- Member Commissie (her)erkenning Onderzoekscholen

Prof. dr. G.J. de Lange
- Member National Advisory Group AA
- Member National Advisory Group CTD
- Member National Advisory Group VI

- Member Program Committee Euromargins (ALW/NWO)

Dr. J. J. Middelburg
- Chairman of ALW-investment committee
- Member of Committee Marine Research Facilities
- Member of Dutch Scientific Committee on Ocean Research
- Member of East Kalimantan Programme

Prof. dr. ir. J.S. Sinninghe Damsté
- Head of Department Marine Biogeochemistry and Toxicology, Royal Netherlands Institute for Sea Research NIOZ
- Member of the ALW VICI Committee
- Member of the ALW Instrument grant Committee
- Member of the steering committee of the Darwin Centre for Biogeology

Dr. S.P. Vriend
- Member of the Board of the Netherlands Society of Soil Science

Prof. dr. P.S.J. Van Cappellen
- Member Advisory Board NWO-ALW
- Member Dutch Scientific Committee on Oceanic Research (SCOR)
- Member Program Committee TRIAS (NWO/ALW)
- Member Program Committee Coupled Biosphere-Geosphere (NWO/ALW)
- Member Verkenningscommissie Biogeologie (KNAW)
- Chairman Geochemical Circle (KNGMG/KNCV)

Member Dutch Scientific Committee 7 th INTECOL Conference

Enclosure III: EXTERNAL CO-OPERATION
Part D: Membership Editorial Boards

Tectonics VU

Prof. dr. S.A.P.L. Cloetingh
- Editor: Global and Planetary Change
- Member Editorial Board: Geology (Boulder)
- Member Editorial Board: Episodes
- Member Editorial Board: Tectonophysics

Prof. dr. H. Doust
- Member Editorial Board: Marine and Petroleum Geology

Dr. D. A. Nieuwland:
- Associate Editor: Tectonics
- Member Editorial Board: Journal of Geological Society of London

Dr. R.A. Stephenson
- Member Editorial Board: Geological Quaterly, Warsawa, Poland
- Member Editorial Board: Geophysical Journal, Kyiv, Ukraine
- Member Editorial Board: Journal of Geodynamics

Petrology VU

Prof. dr. G.R. Davies
- Editorial Board Journal of Petrology, Oxford University Press
- Editorial Board Geochemical Journal, The Geochemical Society of Japan.

Isotope Geochemistry VU

Prof. dr. P.A.M. Andriessen
- Series editor: European Geosciences Union Sephan Mueller Special Publication Series

Dr. J.R. Wijbrans
- Associate editor: Tectonophysics
- Associate editor: Journal of the Virtual Explorer

Sedimentology VU

Prof. dr. W. Schlager
- Associate Editor: Sedimentary Geology
- Associate Editor: Geological Society of America Bulletin
- Associate Editor: Austrian Journal of Earth Sciences

Dr. A.R. Fortuin
- Member Editorial Board: Journal of Asian Earth Sciences
- Member Editorial Board: Netherlands Journal of Geosciences

Dr. A. Immenhauser
- Member of the Editorial Board of GeoArabia
- Member of Editorial Board of Sedimentary Geology

Prof. dr. J. Smit
- Editor Netherlands Journal Geosciences (Geologie en Mijnbouw)
- Member Editorial Board: Historical Biology

Dr. J.M. Woodside

- Member Editorial Board: European Journal of Environmental and Engineering Geophysics
- Member Editorial Board: Marine Geology
- Editor: Gas in Marine Sediments. Special Issue of Geo-Marine Letters, 23(3/4).

Paleoecology and Paleoclimatology VU

Prof. dr. D. Kroon
- Editor Special Issue journal of the Geological Society of London (Arabian Sea tectonic evolution and climate change)

Dr. G. Ganssen
- Guest Editor: Global and Planetary change
- Editor in chief: Physics and Chemistry of the Earth

Hydrogeology VU

Dr. H. Kooi
- Member Editorial Board: Hydrogeology Journal

Dr. A.A. van de Griend
- Member Editorial Board: Forest and Agricultural Hydrology
- Member Editorial Board: Journal Geophysical Research

Sedimentology UU

Prof. dr. P.L. de Boer
- Member Editorial Board Sedimentary Geology

Dr. G. Postma
- Member Editorial Board Sedimentary Geology
- Member Editorial Board Sedimentology (I.A.S.)
- Member Editorial Board Basin Research (I.A.S.)

Stratigraphy and Palaeontology UU

Prof. dr. J.E. Meulenkamp
- Member Editorial Board Bulletin Societé Géologique de France
- Member Editorial Board Netherlands Journal of Geosciences / Geologie en Mijnbouw
- Member Editorial Board Turkish Journal of Earth Sciences
- Member Editorial Board Geodiversitas

Prof. dr. G.J. van der Zwaan
- Editor in chief Utrecht Micropaleontological Bulletins

Prof. dr. Th. Wong
- Member Editorial Board: Netherlands Journal of Geosciences

Dr. W.J. Zachariasse
- Member Editorial Board Marine Micropaleontology

Palaeoecology UU

Prof. dr. A.F. Lotter
- Associate Editor: Journal of Paleolimnology
- Associate Editor: Vegetation History and Archaeobotany
- Member Editorial Board: Review of Palaeobotany and Palynology

Prof. dr. J.W. de Leeuw

- Editor Organic Geochemistry

Prof dr. J.H.A. van Konijnenburg-van Cittert
- Member Editorial Board: Review of Palaeobotany and Palynology
- Member Editorial Board: Acta Palaeobotanica

Prof. dr. H. Visscher
- Editor-in-chief: Review of Palaeobotany and Palynology
- Member Editorial Board: Palaeogeography, Palaeoclimatology, Palaeoecology
- Member Editorial Board: Scripta Geologica
- Member Editorial Board: Palaeontographia Italiana

Dr. H. Brinkhuis
- Advisory Editor: Netherlands Journal Earth Sciences (Geologie en Mijnbouw)
- Member Editorial Board: Bolletino della Società Geologica Italiana

Dr. J. van der Burgh
- Member Editorial Board: Review of Palaeobotany and Palynology
- Member Editorial Board: Acta Palaeobotanica

Dr. W.M. Kürschner
- Editor of Albertiana (Newsletter International Subcommission on Triassic Stratigraphy)

Geochemistry UU

Prof. dr. G.J. de Lange
- Editor-in-Chief : Marine Geology
- Member Editorial Board: Netherlands Journal of Geosciences
- Member Editorial Board: International Journal of Oceanography

Dr. J. J. Middelburg
- Associate Editor: Geochimica Cosmochimica Acta
- Associate Editor: Limnology and Oceanography
- Editor: Biogeosciences
- Member Editorial Board: Marine Geology

Dr. P.A.G. Regnier
- Associate Editor Hydrology and Earth Systems Science (HESS)

Prof. dr. ir. J.S. Sinninghe Damsté
- Member Editorial Board and Associate Editor: Geology

Prof. dr. P.S.J. Van Cappellen
- Co-Editor in Chief: Journal of Hydrology
- Associate Editor: Geomicrobiology Journal

Enclosure IV: SCIENTIFIC PUBLICATIONS
Part A: Journal articles

Tectonics VU

- **Alexandre, P., Saintot, A., Wijbrans, J, Stephenson, R., Wilson, M., Kitchka, A. and Chalot-Prat, F.** (2004). 40Ar/39Ar Dating of magmatic activities in the Donbas Foldbelt and the Scythian Platform (Eastern Europe). *Tectonics*, v. 23, TC5002, doi:10.1029/2003TC001582
- **Barbieri, C., Bertotti, G., Di Giulio, A., Fantoni, R. and Zoetemeijer, R.** (2004). Flexural response of the Venetian foreland to the SouthAlpine tectonics along the TRANSALP profile, *Terra Nova*, v. 16, p. 273-280.
- **Bertotti, G., Buiter, S., Ruffo, P. and Schreurs, G.** (2004). From mountains to Sedimentary Basino: Modelling and testing geological processes. Bolletino di *Geofysica teoretica ed applicata*, v. 45, p. 366.
- **Bertotti, G.** (2004). Relating vertical movements and stress/strain fields in sedimentary basins and adjacent orogens following the main stages of contraction: modelling and reality of lithospheric buckling. *Bolletino di Geofysica teoretica ed applicata*, v. 45, p. 183-186.
- **Brun, J.P. and Sokoutis, D.** (2004). North Aegean extension: From the Rhodope Core Complex to Neogene basins. *Proceedings of the 5th International Symposium on Eastern Mediterranean Geology*, v. I, p. 49-52.
- **Carrapa, B., Wijbrans, J. and Bertotti, G.** (2004). Detecting provenance variations and cooling patterns within the Western Alpine orogen through $^{39}Ar/^{40}Ar$ geochronology on detrital sediments. The Tertiary Piedmont Basin, NW Italy. Detrital thermochronology-Provenance analysis, exhumation and landscape evolution of mountain belts, edited by M. Bernet and C. Spiegel, Chapter 5, *Geological Society of America Special Paper*, v. 378, p. 67-103.
- **Cloetingh, S., Ziegler, P.A., Beekman, F., Andriessen, P.A.M., Matenco, L., Bada, G., Garcia-Castellanos, D., Hardebol, N., Dèzes, P. and Sokoutis, D,** (2004). Lithospheric memory, state of stress and rheology: Neo-Tectonic controls on Europe's intraplate continental topography. *Bolletino di Geofysica teoretica ed applicata*, v. 45, p. 198-202.
- **Cloetingh, S., Burov, E., Matenco, L., Toussaint, G., Bertotti, G., Andriessen, P.A.M., Wortel, M.J.R. and Spakman, W.** (2004). Thermo-mechanical controls on the mode of continental collision in the SE Carpathians (Romania), *Earth Planet Science Lett.*, v. 218, p. 57-76.
- **Corti, G., Bonini, M., Sokoutis, D., Innocenti, F., Manetti, P., Cloetingh, S. and Mulugeta, G.** (2004). Continental rift architecture and patterns of magma migration: a dynamic analysis based on centrifuge models. *Tectonics*, v. 23, TC2012, doi: 10.1029/2003TC001561, p. 1-20.
- **Fjeldskaar, W., Voorde, M. ter, Johansen, H., Christiansson, P., Faleide, J.L. and Cloetingh, S.** (2004). Numerical simulation of rifting in the northern Viking Graben: the mutual effect of modelling parameters. *Tectonophysics*, v. 382, p. 189-212, doi: 10.1016/i.tecto.2004.01.002.
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ABBREVIATIONS

AAPG	- American Association of Petroleum Geologists
ALW	- NWO Earth and Life Sciences council
ANDRA	- Agence Nationale pour la gestion des Déchets Radioactifs, French national radioactive waste management agency
BIODEEP	- Biogeochemistry of the Deep Eastern Mediterranean
CoMCoM	- Continental – Marine Correlation in the Mediterranean
DFG	- Deutsche Forschungsgemeinschaft, German Research Foundation
ECOD	- European Consortium for Ocean Drilling
ECOS	- Research School Accreditation Committee
EEDEN	- ESF programme Environments and Ecosystems Dynamics of the Eurasian Neogene
EFTAN	- European Fission Track Analysis Network
EGS	- European Geophysical Society
ENDICI	- European Netwrok on Dissolved Inorganic Carbon Isotopes
ENTEC	- European Research program on *En*vironmental *Tec*tonics
ESAB	- External Scientific Advisory Board
ESCO	- European Science Consortium for Ocean Drilling
ESF	- European Science Foundation
EU	- European Union
EUG	- European Union of Geosciences
EUROBASIN	- European Research School on Sedimentary Basin Studies
EUROPROX	- European Graduate College - Proxies in Earth History
GeoB	- Department of Geosciences, University of Bremen
GEOMAR	- Research Center for Marine Geosciences at the Christian-Albrechts University Kiel
GFZ	- GeoForzungsZentrum
ICSU	- International Council of Scientific Unions
ICG	- Interuniversitary Center for Geo-ecologic Research
IFPS	- International Federation of Palynological Societies
IGBP	- International Geosphere-Biosphere Programme (ICSU)
IGCP	- International Geological Correlation Programme
ILP	- International Lithosphere Programme
INTAS	- International Association for the Promotion of Co-operation with Scientists of the former Soviet-Union
IODP	- Integrated Ocean Drilling Programme
ISES	- Netherlands Centre for Integrated Solid Earth Science
ITC	- International Institute for Geo-Information Science and Earth Observation
IWHA	- International Water History Associciation
JGOFS	- Joint Global Ocean Flux Studies
KNAW	- Royal Netherlands Academy of Arts and Sciences
KNGMG	- Royal Dutch Geological and Mining Society
KNMI	- Royal Dutch Meteorological Institute
LOICZ	- Land-Ocean Intractions in the Coastal Zone (IGBP)
LPP	- Laboratory for Palaeobotany and Palynology
MAST	- Marine Science and Technology Programme
METROL	- METhane fluxes in ocean sediments: microbiological and geochemical contrOL
MIOMAR	- EU Network, Miocene Marine Archives Reading
NAC	- Nederlands Aardwetenschappelijk Congres (biannual national convention)
NAM	- Nederlandse Aardolie Maatschappij B.V
NEBROC	- Netherlands – Bremen Oceanography
NEESDI	- Netherlands Environmental Earth System Dynamics Initiative
NIOZ	- Netherlands Institute for Sea Research
NITG-TNO	- Netherlands Institute for Applied Geosciences (former RGD)
NNM	- National Natural History Museum
NOP	- Netherlands Research Programme on Pollution and Global Change
NSG	- Netherlands Research School of Sedimentary Geology
NWO	- Netherlands Organisation for Scientific Research

ODP	- Ocean Drilling Program
PACE	- Prediction of Aggregated-Scale Coastal Evolution
PROPER	- Proxies in Paleoclimatology: Education and Research
RCMNS	- Regional Committee on Mediterranean Neogene Stratigraphy
RIVM	- Institute for Public Health Environment and Nature
RIZA	- Institute for Inland Water Management and Waste Water Treatment
SEPM	- Society for Sedimentary Geology
Si-WEBS	- Natural and anthropogenic modifications of the Si cycle along the land-ocean continuum: Worldwide Ecological, Biogeochemical and Socio-economical consequences
STOPFEN	- Sea-level, temperature and ocean circulation: past present and future non-linear feedbacks, a European Network
TUD	- Delft University of Technology
UU	- Universiteit Utrecht
VU or VUA	- Vrije Universiteit Amsterdam
WOTRO	- Foundation for the Advancement of Tropical Research