Report of
ILP – International Lithosphere Program

2006/2007*

* 1st July 2007

REPORT OF ILP – INTERNATIONAL LITHOSPHERE PROGRAM

1. TITLE OF CONSTITUENT BODY AND NAME OF REPORTERS

Prof. Dr. Sierd Cloetingh, President
Prof. (em.) Dr. Jörg F. W. Negendank, Secretary General
Dr. Jörn Lauterjung, Head of Office

ILP – an IUGS and IUGG initiative established by ICSU (International Council of Scientific Unions) in 1980

2. OVERALL OBJECTIVES

The International Lithosphere Program (ILP) seeks to elucidate the nature, dynamics, origin and evolution of the lithosphere through international, multidisciplinary geoscience research projects and coordinating committees.

The ILP is charged with promoting multidisciplinary research projects of interest to both the geological (IUGS) and geophysical (IUGG) communities.

The ILP seeks to achieve a fine balance between: *"addressing societal needs"*, e.g. understanding natural catastrophes and other solid earth processes that affect the biosphere, providing information for improved resource exploration and environmental protection; and *"satisfying scientific curiosity"*.

According to the new Terms of Reference ILP is a body of IUGG and IUGS.

Inter-Union Commission on the Lithosphere:
The International Lithosphere Program (ILP)

TERMS OF REFERENCE
approved with modification by IUGG Bureau 18 October 2006

I. ESTABLISHMENT AND PURPOSE OF THE PROGRAM

1. The International Lithosphere Program (ILP), guided by the Scientific Committee on the Lithosphere (SCL), was established in 1980 as the Inter-union Commission on the Lithosphere (ICL) by the International Council for Science (ICSU), at the request of the International Union of Geological Sciences (IUGS) and the International Union of Geodesy and Geophysics (IUGG). The name was formally changed to the Scientific Committee on the Lithosphere in 1999. According to Decision 8.4 from the 2005 ICSU General Assembly, ICSU decided "to withdraw ICSU sponsorship from SCL/ILP and to recommend that responsibility would then shift to IUGG and IUGS."

2. The International Lithosphere Program (ILP) seeks to elucidate the nature, dynamics, origin, and evolution of the lithosphere, with special attention to the continents and their margins. Believing these goals are best attained through international, interdisciplinary collaboration, the ILP establishes international, multidisciplinary projects and working groups to pursue specific research objectives. Projects and working groups address scientific topics in any of the four ILP themes: global change, contemporary dynamics and deep processes, continental lithosphere, and ocean lithosphere.

3. The target areas for ILP focus are aspects of the crust and deeper parts of the lithosphere and the interaction of crust/mantle (lithosphere) processes with surface processes and neotectonic

activities, especially on the continents and their margins (e.g. lithospheric folding) in which both geophysics and geology are involved. The ILP seeks to avoid overlap with current research fields in IUGS Commissions, Task Groups, and Initiatives; IGCP and GARS projects; IUGS Affiliated bodies; IUGG Associations; and other appropriate research groups. If plans for addressing such overlapping fields would develop, ILP should discuss these with both Unions beforehand. The Unions, in turn, are committed to involve ILP in their own programs and projects given an expression of interest to do so from ILP.

4. The ILP supports the active participation of scientists from developing countries. Although active participation of such scientists is not deemed a training activity, it is expected that their involvement will provide training opportunities for students and young scientists.

5. The ILP supports workshops and/or special symposia at regional, national, or international meetings through projects and coordinating committees or in conjunction with IUGS, IUGG, and other scientific bodies.

6. The ILP administers an award (a citation and travel grant), the Edward A. Flinn Award, given to an outstanding young scientist for contributions in the solid earth sciences addressed by the ILP.

7. The ILP maintains a website and issues an Annual Report. Currently, the Annual Report is available as a web-based publication; the last printed Annual Report was published for 2000. The ILP also delivers administrative reports to both IUGS and IUGG annually or as requested.

8. The ILP receives visibility from IUGG and IUGS in newsletters, websites, annual reports, and outreach materials and events. The ILP has access to the IUGS publishing house in the Geological Society of London, and is expected to join and participate in outreach and other events initiated by IUGS and/or IUGG, such as the International Year of Planet Earth. Logos of both Unions must be visible in all ILP publications, their website, and other outreach activities.

II. COMPOSITION OF THE PROGRAM

9. The ILP initiates projects and working groups selected through a competitive proposal process. Small grants may be awarded especially to support meeting and field travel for scientists from developing countries who are involved in the projects. ILP projects are expected to have an average life span of 5 years unless extraordinary success warrants continuation.

10. Working Groups may be created to accomplish specific objectives. The topic or problem around which a Working Group is organized must clearly require an interdisciplinary approach and significant participation by representatives of all branches of Earth science is highly desirable.

- A Working Group shall consist of a limited number of scientists appointed by the Bureau (defined in Part III). Consideration is to be given to the appropriate geographical distribution of the members. The Bureau will provide for an orderly rotation of the membership of the Working Groups.
- The Chair of a Working Group shall be appointed by the Bureau for a term of 5 years and will report the progress on the topic to the Bureau annually or as requested.

III. ADMINISTRATION

11. The ILP is positioned as a Joint Scientific Program of IUGG and IUGS. ILP may have its own National Members, on the condition that this would not negatively affect national membership to IUGS and IUGG.

12. The ILP is administered by a Bureau of seven members. These include the President and the Secretary General, who are named by agreement between IUGG and IUGS; two members appointed by IUGG; two appointed by IUGS; and one member appointed jointly by IUGG and IUGS. At least one Bureau member will normally represent a developing country. The Past President may attend meetings with voice but without vote. In addition, the National Members may elect a representative invited to attend ILP Bureau meetings with voice but without vote, although they may choose to elect a regular member of the Bureau to represent their interests.

13. The normal term of office for all Bureau members shall be 4 years, denoted as one period. The first period shall commence in calendar year 2006; officers appointed in 2006 must be reappointed or replaced in 2010. Vacancies during any term shall be filled by IUGG, IUGS, or jointly (as appropriate) in consultation with the ILP Bureau.

14. The President shall be appointed for one period and is eligible for re-appointment. The President shall chair the meetings of the Bureau and shall be their representative in external and internal affairs. The ILP President is welcome to attend regular Executive Committee meetings of IUGS and IUGG as an observer.

15. The Secretary General shall be appointed for one period, and may be re-appointed for consecutive periods up to a maximum of 3 periods in office. The Secretary General shall be responsible for all matters concerning the finances and administration of the Bureau; in particular, he/she shall conduct the correspondence, arrange for meetings of the Bureau, prepare agendas and meeting minutes, and issue reports.

` 16. Regular Bureau members may be reappointed once, but with the provision that no more than 4 of the 7 members may be in their second period of service. The representative of the national members should be elected at the beginning of each period.

17. The Bureau shall normally meet once each year in coordination with IUGG and IUGS. The meeting shall be announced no less than 4 months in advance. At such meetings, the Bureau shall approve the financial accounts submitted by the Secretary General, deliberate and adopt the budget for the forthcoming period of one year, initiate Working Groups and review their progress.

18. The decisions of the Bureau shall be taken during its meetings by a simple majority vote of the members then present. A quorum of 5 members must be present; the Chair has a casting vote.

19. Additional meetings of the Bureau may be convened as deemed necessary by the President or at the request of a majority of the Bureau members.

IV. FINANCES

20. The operational costs of the ILP Bureau shall be provided by the ILP budget. IUGG and IUGS will provide financial support to ILP, based on accepted work programs and their own budget capacity; ILP is committed to raising most of its budget by external fundraising.

V. AMENDMENTS TO THE TERMS OF REFERENCE

21. Amendments to the Terms of Reference may be proposed by the ILP Bureau and will be adopted when ratified by IUGS and IUGG.

3. FIT WITHIN IUGS AND IUGG POLICY

- IUGS and IUGG are represented in the ILP Bureau.
- ILP cooperates with IUGS and IUGG on the International Year of Planet Earth (IYPE). In this context ILP is leading the IYPE theme Deep Earth.

4. ORGANISATION

ILP has a team of 15 – 20 Bureau members from several countries that meet annually to monitor progress and to approve new programmes and activities together with the team of representatives of National Committees. The team is led by the President, the Secretary General and the leader of the national committees.

Bureau membership[+]

Executive Members:			
President:	S. Cloetingh	Netherlands	
Secretary General: (until end 2008)	J. F. W. Negendank	Germany	
with Executive Secretary:	A. Rudloff	Germany	
Chairperson – Committee of National Representatives:	S. Gregersen	Denmark	
Representatives of IUGG & IUGS:	E. R. Engdahl	IUGG	(USA)
	K. C. Sain	IUGG	(India)
	J.-P. Cadet	IUGS	(France)
	Y. Tatsumi	IUGS	(Japan)
	A. Green	IUGS & IUGG	(Switzerland)
Associate Members:	J.-P. Burg	Switzerland	
	D. G. Gee	Sweden	
	A. Morozov	Russia	
	F. Roure	France	
	M. Zoback	USA	
	R. Missotten	UNESCO	
Lifetime Members:	P. Hart	USA	
	M. von Knorring	Sweden	
	P. Ziegler	Switzerland	
	H. Gupta	India	

The Bureau members evaluate submitted projects (task forces, coordinating committees, workshops) and decide the approval according to the criteria of ILP.

5. EXTENT OF SUPPORT FROM SOURCES OTHER THAN IUGS AND IUGG

ILP is basically financed by IUGS and IUGG (each 17,000 US $ per year) but the Bureau has raised and is raising funds via the national committees and other bodies from the participating countries (e.g. National Science Foundations, Academies; see list of contributing countries 2006 and 2007 till end of June).

Country/Institution:	**Sum paid in 2006:**	**Sum paid in 2007 (till end of June):**
China	2,000.00 US $	2,000.00 US $
Cyprus		220.00 US $ (2006)
		220.00 US $ (2007)
Czech Republic	400.00 US $	400.00 US $
Denmark	2,000.00 US $	2,000.00 US $
Finland	1,000.00 US $	1,000.00 US $
Germany	5,000.00 US $ (2005)	5,000.00 US $ (2006)
India	2,000.00 US $	
Sweden		3,400.00 US $
Switzerland	2,000.00 US $	2,000.00 US $

[+] updated after the Bureau meeting in Perugia

Academy of Sciences in Taipei	783.00 US $	700.00 US $
USA	6,161.08 EUR	5,869.00 EUR

6. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

ILP stimulates and supports the Task Forces and Regional Coordinating Committees with 5000 US $ per year over a period of 5 years. This basic support is used by the project leaders to raise funds for their scientific activities, while there is a strong existing interface with other projects. A flagship of ILP is **ICDP**, demonstrating a real complex network of international projects.

7. CHIEF ACCOMPLISHMENTS IN 2006/2007

ADMINISTRATION

- **Bureau meeting of ILP, EGU, Vienna, April 2006**

Minutes of ILP Bureau Meeting

Vienna, Austria
4 April 2006, 7.00 p.m.

Opening:
The IUGS representative Prof. Cadet welcomes the revitalization of ILP during the last year.

Minutes of the last meeting:
- No redactional remarks
- Other remarks:

- Cloetingh: ICDP has held a successful meeting in 2005 at GFZ-Potsdam. There are many new opportunities related to ICDP. Information can be obtained from GFZ.
- Cloetingh: ILP is involved in the International Year of Planet Earth through the Deep Earth theme.
- The new ILP website was reported to be under construction during the last meeting; it is now ready and accessible.
- A new ILP flyer was produced; 200 copies were already distributed at the EGU conference; it is also available on the website.

Reports on new projects:
- The remark is made that there is a gap in the programme concerning oceanic lithosphere studies. Cloetingh: ILP does not intend to duplicate IODP research. However, deep seismics of ocean-continent transition zones are definitively of interest to ILP.
- Negendank: Finnish colleagues are preparing a project named “Upper Mantle Dynamics and Quaternary Climate in Cratonic Areas”. Present bureau members feel that such a project could be made more general and globally relevant. Cawood: “Call it Lithosphere-Climate interactions or something”. These remarks will be duly reported to the proponents.
- Current projects have been reported on during a separate splinter meeting at EGU. Further remarks:

- Thybo reports that EURO-ARRAY is now formally part of TOPO-EUROPE. The EURO-ARRAY community is happy with this arrangement and feels that they now have a better chance of getting the Array off the ground.
- Kröner reports that an Asian AGU has been constituted. There is a meeting coming up in Singapore, including a 3-day supersymposium encompassing 10 symposia on the Asian Lithosphere. There are plans for shooting a number of very long seismic lines, including one from N-India across Tibet into Siberia. There is a strong opportunity for transfer of knowledge here.
- There is a remark on an opportunity for starting a new project on ophiolites; it has been realized that there are many different types of ophiolites. The project should revolve around comparing recent ophiolites/oceanic crust with past ophiolites. Cloetingh: good idea; identify people who could take the lead in this.

Other remarks:
- ILP asked last year to nominate ILP co-convenors for sessions at EGU. This has happened this year. There is a number of ILP sessions in the programme. This adds to a large visibility of ILP at EGU/AGU and other international communities; keep this going!
- There should also be a strong contribution to the IGC programme in 2008 in Oslo; and in 2007 at IUGG.
- The bureau is re-installing the FLINN award for young researchers (<36). A call is currently going out. In parallel, there should be an effort to get young researchers involved in task forces. There is no nomination form available yet for the award. Proposals should demonstrate the track record, the connection to ILP and the potential of the nominee. The award should identify future leaders in lithosphere research.
- Gregersen would like to urge ILP to strengthen the connection with IUGG all the time. It was suggested that the bureau should meet during the IASPEI meeting, but few people turned up. Some info on ILP was given during the IASPEI meeting. Cloetingh remarks that the Bureau meetings are meant for exchange of information; the real work is done in the Task Forces. In order to reserve funds for the real work there should be one formal bureau meeting per year. At international conferences informal meetings of the Bureau and other members of the community can be held, like the current one.

Report of the President
(presentation)
- Cloetingh urges everyone to use the ILP logo wherever possible.
- An ILP conference will be organized in Potsdam in spring 2007 (after the EUG-meeting in Vienna). Task Forces are urged to submit papers for a special volume of Global and Planetary Change that will be published together with the meeting.

Report of the Secretary General
- Sato is organizing a meeting on continental margins, focusing on earthquakes and Seismics. He has requested to use the ILP logo; has not asked for money.
- The Geological Society London Memoir edited by Gee and Stephenson has highest priority now. The ILP contribution has allowed the volume to be printed in full colour. For slightly more than the requested 5000€ the ILP logo could be printed on the back cover and/or even on the spine.
- Cawood and Kröner are also ready to make a Geological Society London Special Publication on Task Force 1; similar for Task Force VII.
- Negendank indicates that the income of ILP is decreasing; more input from National Science Foundations is necessary. The Bureau will send out requests in the near future. To be successful, action from ILP members is required. Cawood asks whether there is a list available of which organizations from which countries gave money in the past? This makes it easier to get back to that source. Negendank: no documentation is available. Cloetingh asks Task Force leaders to take the lead in revitalizing contacts on the national level. This is the best way to get it done. Gregersen has a list of active ILP people; he'll get it to Negendank. Gregersen asks to be careful in informing IUGG and IUGS that requests are out.

Cloetingh states that there should be a special effort to enhance national contributions: Activate the activists to generate cash flow. Each Task Force should send a list of active people in the group to the Bureau; this should help to demonstrate to national science foundations that ILP is active

- Achauer reports on the Task Force Babyplumes. 80 people have been contacted; there will be a first thematic workshop 3-6 July; at least 30 people will attend. The group has come up with the Acronym PLUME: "Plume-Like Upper Mantle heterogeneities in Europe". Achauer has been invited to present the idea at a Japanese national meeting in May. The group is urged to add "and Analogues" to the name; ILP Task Forces should have a global perspective.

- **ILP Conference "New Frontiers in Integrated Solid Earth Sciences", 12/13 June 2007 at GFZ Potsdam**

On 12/13 June 2007 ILP organized the first comprehensive ILP-meeting that has been a great success. Additionally, we honoured Dr. Alan S. Collins (Australia) with the *Flinn Award 2007* (5,000 US $).
Attached please find the list of participants and a group photograph.

The echo about this meeting was overwhelmingly positive and in parts enthusiastic:
"I never before participated in such an extraordinary meeting of high quality and documenting the broad spectrum of science on the lithosphere."
"I came home with a great impression after the Conference that you have organized for us in Potsdam. It was a fruitful and dynamic conference which has outlined all possible aspects of our activity and movement ahead under ILP umbrella."

Programme

12 June 2007

Building H, Lecture Hall

Opening and review of major ILP research initiatives

9:00 – 9:15: Sierd Cloetingh (Netherlands): *"ILP – a new vision"*

Honouring of Dr. Alan S. Collins with Edward A. Flinn Award

9:15 – 9:45: Alan S. Collins (Australia): *"The accretion of Gondwana - an integrated model for the formation of our defining supercontinent"*

9:45 – 10:45: Rolf Emmermann (Germany): *"ICDP – Results and Challenges"*

10:45 – 11:15: Coffee break & posters

11:15 – 13:00: **Reports of ILP-activities* and discussion**

*Each contribution: 10 minutes

Alessandro Tibaldi (Italy): *"Construction and destruction of volcanoes: Predicting sites of eruption and erosion at unstable edifices"*

Alfredo M. F. Lagmay (Philippines), J. Caranto: *"Configuration of geothermal sites in the Tongonan Geothermal Field, Philippines, as viewed from a volcano-tectonic fra mework"*

Daniel Tormey (USA), Federico A. Pasquarè (Italy), Alessandro Tibaldi (Italy): *"Inter play Between Magmatic Activity and Sector Collapse at the Azufre-Planchon-Peteroa Volcanic Center, Andean Southern Volcanic Zone"*

Carlos Garrido (Spain): *"Mantle Peridotite Massifs and Xenoliths: Eyewitnesses of Present and past Subcontinenal Lithosphere-Astenosphere interactions beneath Europe"*

Larissa Dobrzhinetskaya (USA): *"Nanoscale mineralogy for understanding Earth's in terior"*

François Roure (France), Magdalena Scheck-Wenderoth (Germany): *"Integrated Se dimentary Basin Studies: Challenges and perspectives"*

Nadège Vilasi (France), Rudy Swennen (Belgium), François Roure (France), Olivier Lacombe (France): *"Carbonate reservoir characterization: examples from the Upper Cretaceous to Eocene strata of the Ionian Zone (Albania)"*

Katja Hirsch (Germany): *"3D Gravity Modelling and Subsidence Analysis in the Orange Basin, Southwest African Continental Margin"*

13:00 – 14:00: Lunch-break & posters

14:00 – 15:50: **Reports of ILP-activities* and discussion**

*Each contribution: 10 minutes

David G. Gee (Sweden): *"Arctic basement and basins"*

Kasper D. Fischer (Germany): *"Modelling deformation and stress changes after mo derate and large earthquakes in the Hellenic subduction zone"*

Georg Dresen (Germany), Mustafa Aktar (Turkey), Marco Bonhoff (Germany), Haluk Eydogan (Turkey): *"Drilling the North Anatolian Fault. A Proposal to the International Continental Scientific Drilling Program (ICDP)"*

Giampiero Iaffaldano (Germany): *"Feedback between mountain belt growth and dy namics of convergent plates: a climate-driven process?"*

Ulrich Achauer (France), Marjorie Wilson (UK) & the PLUME Project Participants: *"Plume-like instabilities in the mantle beneath Europe - hotspots, wetspots or displa ced material from the Transition Zone?"*

Sierd Cloetingh (Netherlands): *"Topo-Europe: the geoscience of coupled Deep-Earth and surface processes"*

Josep Gallart Muset (Spain): *"Topo-Iberia"*

Christophe Pascal (Norway): *"Topo-Scandes"*

15:50 – 16:15: Coffee break & posters

Key-notes

16:15 – 16:45: Markus Rothacher (Germany): *"Global Geodetic Observing System (GGOS): the Changing Earth from Space"*

16:45 – 17:15: Seth Stein (USA): *"Implications of time scale differences for plate motions and earth quake hazards"*

17:15 – 17:45: Alan G. Green (Switzerland): *"The anatomy of an impending rockslide"*

17:45 – 18:15: Lidunka Vocadlo (UK): *"Geomaterials Research - ab initio simulation of the Earth's core"*

18:15 – 18:45: Hans-Peter Bunge (Germany): *"Tectonic force balances: linking deep and shallow Earth models"*

13 June 2007

Building A 27 (Great Refractor)

9:00 – 12:00: Meeting of Task Force leaders with ILP-Secretariat, ILP-advisors and key-note spea kers: discussion and review of ILP-activities, publication plans and future actions

2 reports on possible future projects:

Markku Poutanen (Finland): *"DynaQlim – Upper Mantle Dynamics and Quaternary Climate in Cratonic Areas. A proposal for an ILP project"*

N.N.: *"TOPO-CENTRAL-ASIA: 4D Topography Evolution in Central Asia: Lithosphere Dynamics and Environmental Changes Since Cretaceous"*

Participants: ILP Conference at GFZ Potsdam, 12/13 June 2007

Title:	Name:	Surname:	Address:
Prof. Dr.	Achauer	Ulrich	EOST-IPG Strasbourg, 5, rue René Descartes, F-67084 Strasbourg, France
Prof. Dr.	Becker	Harry	FU Berlin, Institut für Geologische Wissenschaften, Malteserstr. 74-100, 12249 Berlin
Mr.	Bojanowski	Axel	Wissenschaftskorrespondent, Bahrenfelder Str. 132, 22765 Hamburg
Prof. Dr.	Bunge	Hans-Peter	Universität München, Dept. für Geo- und Umweltwissenschaften, Theresienstr. 41, 80333 München
Prof. Dr.	Cloetingh	Sierd	ILP-President, Tectonics Department, Faculty of Earth Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands
Dr.	Collins	Alan S.	School of Earth & Environmental Sciences, The University of Adelaide, Adelaide, 5005, South Australia
Dr.	Delgado-Argote	Luis Alberto	Depto. de Geología, División de Ciencias de la Tierra, CICESE, C.P. 22860, Ensenada, Baja California, México
Prof. Dr.	Dobrzhinetskaya	Larissa	University of California at Riverside, Dept. of Earth Sciences, California 925021, USA
Prof. Dr.	Dresen	Georg	GFZ
Prof. Dr.	Emmermann	Rolf	GFZ
Prof. Dr.	Erzinger	Jörg	GFZ
Mr.	Escalona	Felipe	Depto. de Geología, División de Ciencias de la Tierra, CICESE, C.P. 22860, Ensenada, Baja California, México
Dr.	Fischer	Kasper David	Ruhr-University Bochum, Institute of Geology, Mineralogy and Geophysics, Universitätsstr. 150, 44801 Bochum

Prof. Dr.	Friedrich	Anke	LMU München, Sektion Geologie, Luisenstr. 37, 80333 München
Mrs.	Gajewski	Claudia	GFZ
Prof. Dr.	Gallart Muset	Josep	Institut de Ciencies de la Terra "J. Almera", CSIC, c/ Lluis Sole Sabaris s/n, 08028 Barcelona, Spain
Dr.	Garrido	Carlos J.	Universidad de Granada, Fac. Ciencias, 18002 Granada, Spain
Prof. Dr.	Gee	David	Uppsala University, Villavagen 16, Uppsala, SE-752 36, Sweden
Prof. Dr.	Green	Alan	ETH Zürich, Institute of Geophysics, Schafmattstraße 30, CH-8093 Zurich
Dr.	Gregersen	Soren	Geological Survey of Denmark and Greenland (GEUS), Ostervolde 10, DK-1350 Copenhagen K, Denmark
Prof. Dr.	Gudmundsson	Agust	Universität Göttingen, Geowissenschaftliches Zentrum, Goldschmidstr. 3, 37077 Göttingen
Mrs.	Hirsch	Katja	GFZ
Mr.	Iaffaldano	Giampiero	Geophysics Section at Ludwig-Maximilians University Munich, Theresienstrasse 41, 80333, Munich
Dr.	Kanao	Masaki	National Institute of Polar Research, 1-9-10, Kaga, Itabashi-ku, Tokyo, Japan
Dr.	Klemann	Volker	GFZ
Prof. Dr.	Lacombe	Olivier	Université Pierre et Marie Curie – Paris 6, Laboratoire de Tectonique, Boîte 129; 4, Place Jussieu, 75252 PARIS Cedex 05, France
Dr.	Lagmay	Alfredo M. F.	National Institute of Geological Sciences, University of the Philippines, Quezon City, Philippines 1101
Prof. Dr.	Levander	Alan	GFZ
Dr.	Lorenzo-Martín	Francisco	Aon Jauch & Hübener GmbH, Heidenkampsweg 58, 20097 Hamburg
Dr.	Mancilla	Flor de Lis	GFZ
Prof. Dr.	Muszynski	Andrzej	Institute of Geology, Adam Mickiewicz University, ul. Makw Polnych 16, 61-686 Poznan, Poland
Prof. Dr.	Negendank	Jörg F. W.	ILP Secretary General, c/o GFZ
Prof. Dr.	O'Brien	Patrick	Institut für Geowissenschaften, Universität Potsdam, Karl-Liebknecht-Str 24/25, 14469 Potsdam
Prof. Dr.	Oberhänsli	Roland	Institut für Geowissenschaften, Universität Potsdam, Karl-Liebknecht-Str. 24, 14476 Potsdam
Dr.	Pascal	Christophe	NGU (Geological Survey of Norway), N-7491 Trondheim
Prof. Dr.	Poutanen	Markku	Finnish Geodetic Institute, Department of Geodesy and Geodynamics, Geodeetinrinne 2, FIN-02430 Masala, FINLAND
Dr.	Ritter	Oliver	GFZ
Prof. Dr.	Roth	Frank	GFZ
Prof. Dr.	Rothacher	Markus	GFZ
Prof. Dr.	Roure	François	Institut Français du Pétrole, 1-4 Avenue de Bois-Préau, 92852 Rueil-Malmaison Cedex France
Dr.	Rudloff	Alexander	GFZ
Dr.	Scheck-Wenderoth	Magdalena	GFZ
Dr.	Shyu	J. Bruce H.	Dept. of Geo- and Environmental Sciences, LMU Munich, Luisenstr. 37, 80333 Munich
Dr.	Stankiewicz	Jacek	GFZ
Prof. Dr.	Stein	Seth	Department of Earth & Planetary Sciences, Northwestern University, Evanston, IL 60208
Prof. Dr.	Stephanson	Ove	GFZ
Dr.	Stroink	Ludwig	GEOTECHNOLOGIEN Coordination Office, GFZ
	Tesauro	Magdala	GFZ

Prof. Dr.	Tibaldi	Alessandro	University of Milan-Bicocca, Dept. of Geological Sciences and Geotechnologies, Piazza della Scienza 4, 20126 Milan, Italy
Dr.	Tormey	Dan	ENTRIX Inc., 2140 Eastman Ave., Suite 200, Ventura, CA 93003, USA
	Vilasi	Nadège	IFP, 1-4 avenue de Bois Préau 92500 Rueil-Malmaison FRANCE
Dr.	Vocadlo	Lidunka	Department of Earth Sciences, UCL, Gower Street, London, WC1E 6BT
	Wang	Lifeng	GFZ
Prof. Dr.	Weber	Michael	GFZ
Dr.	Weckmann	Ute	GFZ
Dr.	Zahie	Anka	GFZ
Mrs.	Zubaidah	Teti	GFZ

During the meeting it was decided to publish the results in *EOS* and *Episodes* and the articles as a special volume of *Earth Science Reviews*.
Additionally, two new projects (see annex) "TOPO-CENTRAL-ASIA" (Regional Committee) and "DYNAQLIM" (Task Force) are in the procedure of evaluation and preparation. TOPO-CENTRAL-ASIA is welcomed and approved by the Bureau members. DYNAQLIM will be forwarded for evaluation in the next days.
It should be mentioned that the support through ILP will be 5,000 US $ each year (for a period of 5 years) to stimulate the scientists to develop research projects which should be financed by the national science foundations and other sources.
One financially very successful Regional Committee is TOPO-EUROPE [publication: *Global and Planetary Change* 58 (2007) – see annex] being supported by 23 European countries (European Science Foundation ESF) with a starting amount of ~ 14 million Euro funding.

SCIENCE AND RESEARCH

Within the flyer of ILP most of the active Task Forces and Coordinating Committees are documented (see: http://www.scl-ilp.org/fileadmin/SCLILP/user_upload/pdf/ILP-Flyer.pdf).
In September 2006 we received several reports about the activities and have asked the National Committee leaders to provide us in October 2006 with the different national reports after reactivation of ILP in 2005/2006 (all reports see homepage).
The list of active projects is given below.

LIST OF ACTIVE PROJECTS

I. Projects, Task Forces

Theme I: Geoscience of global change

I-4/Task Force II: New tectonic causes of volcano failure and possible premonitory signals

Theme II: Contemporary dynamics and deep processes

II-1/Task Force VII: Temporal and Spatial Change of Stress and Strain

II-5/Task Force V: Global and regional parameters of paleoseismology; implications for fault scaling and future earthquake hazard

II-6/Task Force VIII: Baby plumes in Central Europe

II-7 Ongoing project: Earthquakes and Megacities Initiative (EMI)

II-10/Task Force IV: Ultra-Deep Continental Crust Subduction (UDCCS)

Theme III: Continental lithosphere

III-2/Task Force VI: Sedimentary Basins

III-9/Task Force I: Earth Accretionary Systems (in space and time) (ERAS)

III-10/Task Force III: Lithosphere-Astenosphere Interactions

II. Coordinating Committees

CC-1/1: Himalaya-Karakorum-Tibet-Workshop 2005

CC-1/2: Andes

CC-1/3: TOPO-EUROPE

CC-4: Continental Drilling

CC-7: International Commission for the Earth Sciences in Africa (ICESA)

CC-8: Committee on Interdisciplinary Lithospheric Surveys (COILS)

CC-8A: Lithospheric Evolution of Gondwana East from iNterdisciplinary Deep Surveys (LEGENDS)

8. CHANGE OF ACCOUNT IN 2005

The ILP-account changed in 2005 and the negotiations to respect ILP as a non-profit organization are carried on. Till today it could not be resolved due to open state regulations (State of Brandenburg or EU regulations).

9. SUMMARY OF EXPENDITURES IN 2006/2007•

Expenditure in 2006:	
• Scientific activities/symposium support/publications:	39,595.85 EUR
	10,000.00 US $
• Travel costs of Officers/Expenses relating to Bureau meetings:	4,648.29 EUR
	2,343.37 US $
• Expenses related to ILP secretariat: (secretary/student assistant, postage, registration of new domain http://www.scl-ilp.org)	3,005.18 EUR
• Bank charges:	480.65 EUR
	148.20 US $
Total:	**47,729.97 EUR**
	12,491.57 US $
Income in 2006/Excess of former years:	
• Annual contributions of various countries, IUGG and IUGS subvention:	2,000.00 US $
	43,460.62 EUR
• Rest Dollar account from 2005:	22,529.15 US $
• Interest Bank account:	1,708.76 US $
• Rest Euro account from 2005:	5,456.74 EUR
• Deposit:	125,866.50 EUR
Total:	**174,783.86 EUR**
	26,237.91 US $
Balance Income/Expenditures:	**127,053.89 EUR**
	13,746.34 US $
+ Transfer Deposit to Euro Account:	+ 71,546.90 EUR
+ Transfer Deposit to Euro Account:	+ 14,719.49 EUR
- Dollar/Euro-transactions and transfer to deposit:	- 67,370.00 EUR
Euro account balance (including deposit):	**145,950.28 EUR**
Dollar account balance:	**13,746.34 US $**

• Balance on 1st July 2007

Expenditure in 2007:

• Scientific activities/symposium support:	38,455.60 EUR
	10,000.00 US $
• Travel costs of Officers:	1,307.69 EUR
• Expenses related to ILP secretariat: (secretary/student assistant, postage)	2,238.72 EUR
• Charges tax consultant:	250.56 EUR
• Bank charges:	110.60 US $
	210.70 EUR
Total:	**42,463.27 EUR**
	10,110.60 US $

Income in 2007/Excess of former years:

• Annual contributions of various countries, IUGG and IUGS subvention:	220.00 US $
	43,981.38 EUR
• Rest Dollar account from 2006:	13,746.34 US $
• Interest Bank account:	683.50 US $
• Rest Euro account from 2006:	20,083.78 EUR
• Interest Bank account:	479.23 EUR
• Deposit:	138,686.14 EUR
Total:	**203,230.53 EUR**
	14,649.84 US $

Balance Income/Expenditures:	**160,767.26 EUR**
	4,539.24 US $
+ Transfer Deposit to Euro Account:	+ 58,814.19 EUR
- Dollar/Euro-transactions and transfer to deposit:	- 71,633.15 EUR
Euro account balance (including deposit):	**147,948,30 EUR**
Dollar account balance:	**4,539.24 US $**

10. WORKPLAN FOR 2007/2008

The workplan published in the last report has been accomplished in detail:

- ILP Conference, contribution to "International Year of Planet Earth"
- Publications in *EOS*, *Episodes* and in *Earth Science Reviews* in preparation ILP-contribution to "International Year of Planet Earth"
- Bibliography
- Flinn Award to Dr. Alan S. Collins, Australia
- TOPO-EUROPE as an ESF-Eurocores science project
- 2 new projects: TOPO-CENTRAL-ASIA; DYNAQLIM

Workplan for second half of 2007 and 2008:

- Bureau-meeting IUGG Perugia, 8 July 2007
- ILP-editors for the above mentioned publications
- Advertising for new support by national science foundations and industry
- EGU-meeting Vienna, 13 – 18 April 2008

- May/June 2008: Meeting in Bishkek, Kyrghyzstan (Central Asian Institute for Applied Geosciences)
  Joint meeting TOPO-EUROPE & TOPO-CENTRAL-ASIA (Regional Committees)
- ILP-session at IGC, 6 –14 August 2008
- Joint meeting of 5 Task Forces in Ensenada, Mexico (CICESE), September 2008

11. ANTICIPATED WORK PLAN FOR THE NEXT 5 YEARS

The future plans are restricted due to the financial support of the coming years for the approved projects (5 years support).

Expenditures: List of projects, task forces etc. for 2006 and the following years (Themes I – IV, coordinating committees) [in US $]

Projects	**2006**	**2007**	**2008**	**2009**	**2010**
I-4 (TF II)	5000	5000	5000	5000	–
II-1 (TF VII)	5000	5000	5000	5000	–
II-5 (TF V)	5000	5000	5000	5000	–
II-6 (TF VIII)	5000	5000	5000	5000	–
II-10 (TF IV)	5000	5000	5000	5000	–
III-2 (TF VI)	5000	5000	5000	5000	–
III-9 (TF I)	5000	5000	5000	5000	–
III-10 (TF III)	5000	5000	5000	5000	–
DynaQlim			5000	5000	5000
CC-1/2	5000	–	–	–	–
CC-1/3	5000	5000	5000	5000	–
Topo-Central-Asia			5000	5000	5000
Σ					
Flinn Award	–	5000	–	5000	–
International Year of Planet Earth	5000	5000	5000	5000	–
Total:	**55,000**	**55,000**	**60,000**	**65,000**	**10,000**

ANNEX

- Publication:

  Global and Planetary Change, Volume 58, Issues 1-4, Pages 1-454 (2007)
  TOPO-EUROPE: the Geoscience of Coupled Deep Earth-Surface Processes
  Edited by S. Cloetingh

- Proposals for new ILP-projects:

  DynaQlim: Upper Mantle Dynamics and Quaternary Climate in Cratonic Areas

  TOPO-CENTRAL-ASIA: 4D Topographic Evolution in Central Asia: Lithosphere Dynamics and Environmental Changes since Mesozoic

Global and Planetary Change
Volume 58, Issues 1-4, Pages 1-454 (July 2007)
TOPO-EUROPE: the Geoscience of Coupled Deep Earth-Surface Processes
Edited by S. Cloetingh

Available online at www.sciencedirect.com
ScienceDirect
Global and Planetary Change 58 (2007) viii–xii
GLOBAL AND PLANETARY CHANGE
www.elsevier.com/locate/gloplacha

Editorial

4-D topography evolution in Europe: Uplift, subsidence and sea level change (TOPO-EUROPE)

1. Introduction

The topography of the continents and their margins is controlled by processes taking place at depth in the Earth, at the Earth's surface and in the atmosphere. The lithosphere responds to forces exerted by these processes, generating mountain belts (e.g. Alps, Apennines, Carpathians, Caucasus and Scandes), elongated rift zones (e.g. Rhine–Rhone rift system), vast areas of recent volcanism (e.g. Massif Central, Rhenish Massif), explosive volcanoes (e.g. Canaries, Azores, Santorini, Vesuvius, Campi Flegrei) and large sedimentary basins (e.g. North Sea, Pannonian Basin, Black and Baltic Seas, Mediterranean, East European Platform basins). Improved knowledge of the deep mantle and its coupling to the lithosphere and the surface is key to understanding the enormous forces that produce these features. The impact of solid-Earth processes on surface topography at plate boundaries has been known for several decades, but their significance for intraplate domains, and particularly the vulnerable coastal regions, has only recently been appreciated (Cloetingh and Ziegler, 2003; Cloetingh et al., 2005; Behrmann et al., 2005). Furthermore, critical feedback mechanisms between solid-Earth processes and topography are now recognized (Iaffaldano et al., 2006).

The present state and behaviour of the shallow Earth system is a consequence of processes operating on a wide range of time and spatial scales. Time-varying phenomena include long-term tectonic controls on subsidence, glaciation, uplift and river systems, residual isostatic effects of the ice ages on crustal movements, stress accumulation and release at intraplate boundaries, natural climatic and environmental changes from the distant past to the present and the powerful short-term anthropogenic impact of the last century. The key spatial dimensions vary from continental-scale mantle convection cells and plumes through regional-scale variations in lithospheric structure and glacial rebound to local-scale coastal erosion and changes to rivers, streams and groundwater flow.

2. The TOPO-EUROPE initiative

To trace, quantify and forecast topography evolution in response to solid-Earth processes and movements of water and air, it is essential that researchers proficient in a wide range of sub-disciplines interact and collaborate. In order to achieve this interaction on a European scale, geoscientists from almost every country in Europe and from directly around have come together in the TOPO-EUROPE initiative. TOPO-EUROPE intends to link the results of geomorphological, geological, petrologic, tectonic, geochemical, geochronological, geophysical, hydrological, geodetic, remote sensing and geotechnical investigations both in the field and laboratory. Researchers in various organisations (e.g. universities, government laboratories, geological surveys) in distinct scientific fields will join forces to implement innovative research strategies that lead to an improved understanding of Europe's dynamic topography and enhanced forecasting capabilities. Activities will be directed to such sensitive areas as onshore and offshore continental margins, densely populated lowlands, including flood-prone coastal areas and subsiding deltas, mountain ranges susceptible to landslides and rockfalls, active volcanoes, tectonic features prone to earthquakes and intra-plate basins that may contain hydrocarbon occurrences. TOPO-EUROPE will be linked via its members to a series of programs that focus on diverse aspects of topographic evolution. An important goal will be to simulate the recent past by "inverting" geodata and forecast the future by connecting the past, present and future evolution of the solid-Earth system.

0921-8181/$ - see front matter
doi:10.1016/j.gloplacha.2007.03.006

TOPO-EUROPE is designed as a 10-year initiative, seeking funding from national, European and international sources. A number of large-scale national initiatives have already commenced (including TOPO-Iberia and TOPO-Hungary), and recently TOPO-EUROPE was selected as a EUROCORES programme by the European Science Foundation.

3. Recent developments in continental topography research

The present volume aims to give an overview of the state of research in key areas to be investigated in TOPO-EUROPE. This volume directly results from a series of workshops and symposia, notably TOPO-EUROPE workshops in Budapest (2005) and Heidelberg (2006) and symposia at the European Geosciences Union (EGU) annual meetings of 2005 and 2006 in Vienna.

The introductory paper by Cloetingh et al. (2007-this issue) starts out with an overview of the state-of-the-art of continental topography research and the geological, geophysical, geodetical and geotechnological know-how necessary for integrated solid Earth science research. This part follows the integrated sequence of "observation, modelling, process quantification, optimization and prediction" envisioned for TOPO-EUROPE. In the second part of the paper, the Natural Laboratory approach is described, and a number of potential Natural Laboratories for future TOPO-EUROPE research are discussed. The final section describes the design of the TOPO-EUROPE science programme and its future targets.

The remainder of the volume follows the same general set-up as the introductory paper. The papers by Burov and Toussaint (2007-this issue) and Guillou-Frottier et al. (2007-this issue) describe modelling and observation methodologies that will be applicable in all of the Natural Laboratories.

Burov and Toussaint (2007-this issue) make use of a previously successfully used coupled thermo-mechanical numerical model for the early stages of India–Asia collision, to investigate the possible influence of surface processes on the evolution of continental subduction. Their study shows that the denudation rate influences not only the surface topography, but also, depending on the amount of erosion, the style of collision. The authors in this way indicate the strong control of surface processes on deep, mantle level tectonic evolution.

Guillou-Frottier et al. (2007-this issue) use spectral analysis of Europe's topography to distinguish between topographic undulations caused by Alpine compression and by plumeheads impinging on the base of the lithosphere, respectively. The study reveals that the distribution of the topographic undulations outside the volcanic provinces of the Massif Central and Eifel areas, for which the existence of mantle plumes has been postulated, contrasts with the coexistence of both large- and medium-scale high-energy coefficients obtained for the volcanic areas.

The subsequent papers focus on some of the Natural Laboratories (see Fig. 1) summarised in the introductory paper. Bada et al. (2007-this issue), Ruszkiczay-Rüdiger et al. (2007-this issue), Dombradi et al. (2007-this issue), Genser et al. (2007-this issue) and Kuhlemann (2007-this issue) all discuss various aspects of the Pannonian–Carpathian–Alpine System.

Bada et al. (2007-this issue) present a compilation of data on the present-day stress pattern in the Pannonian Basin and its tectonic environment, the Alpine-Dinaric orogens. The authors conclude that the state of recent stress and deformation in the Pannonian Basin is governed by the complex interaction of plate boundary and intra-plate forces, with a dominant role for the Adriatic microplate.

The next paper (Ruszkiczay-Rüdiger et al., 2007-this issue) investigates the roles of neotectonic activity and climate related erosional processes in the Quaternary landscape evolution of the Gödöllö Hills in the central Pannonian Basin. The authors have combined structural work, field studies and DEM analysis to separate landscape features developed under or in absence of neotectonic control.

Dombradi et al. (2007-this issue) use fractal analysis as a novel approach to study the influence of differential vertical motions on the drainage network of the intra Carpathian realm. The authors observe small but defined variations of fractal dimensions in sub-areas affected by differential vertical motions.

Subsidence analysis by Genser et al. (2007-this issue) provides new constraints on late-stage tectonic processes in the Alpine convergence. Major temporal and spatial changes in tectonic subsidence and late-stage uplift are shown to reflect a change from oblique dextral to sinistral convergence.

The final paper, by Kuhlemann (2007-this issue), gives an overview of the paleogeographic and topographic evolution of the Eastern and Swiss Alps since the Oligocene. This reconstruction is made on the basis of erosion rates, estimated by integrating data on sediment budget data and thermochronological data from earlier studies. The erosion rates are subsequently linked to processes like the tectonic activity, glaciations (climate) and isostatic compensation movement.

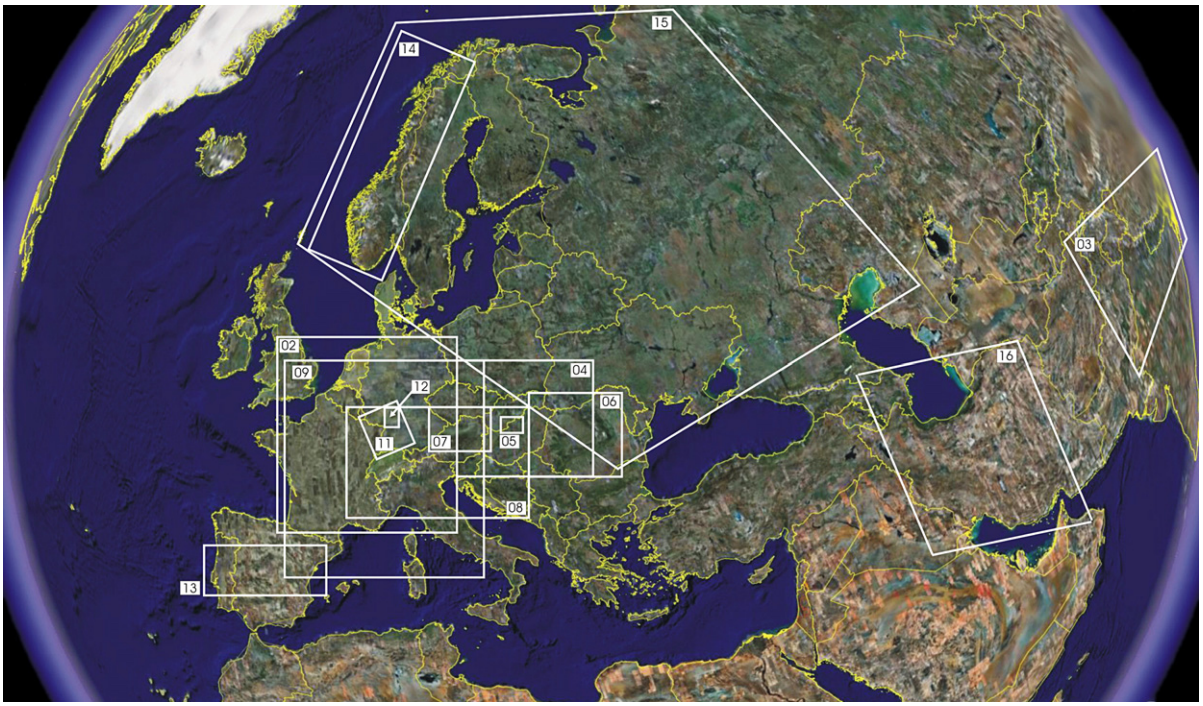

Fig. 1. Satellite Image (Google Earth) of Europe and surrounding areas, with the location of the Natural Laboratories covered by the papers in this issue. 02_Guillou-Frottier et al.; 03_Burov and Toussaint; 04_Bada et al.; 05_ Ruszkiczay-Rüdiger et al.; 06_Dombradi et al.; 07_Genser et al.; 08_Kuhlemann; 09_Ziegler and Dèzes; 10_Cornu et al.; 11_Buchmann and Connolly; 12_Peters and Van Balen; 13_De Vicente et al.; 14_Smelror et al.; 15_Artemieva; 16_Guest et al.

The next four papers (Ziegler and Dèzes, 2007-this issue; Cornu et al., 2007-this issue; Buchmann and Connolly, 2007-this issue; Peters and Van Balen, 2007-this issue) concentrate on the Alpine foreland in Western and Central Europe. Ziegler and Dèzes (2007-this issue) discuss timing and controlling mechanisms of the Cenozoic uplift of Variscan Massifs in the Alpine foreland, associated with the European Cenozoic Rift System. The other three papers focus on the Upper Rhine Graben (URG). For this Natural Laboratory, Cornu et al. (2007-this issue) present the use of local earthquake tomography to constrain a structural quantitative numerical model of present-day tectonics, Buchmann and Connolly (2007-this issue) use a finite element approach to shed light on the kinematics of the URG, and the paper by Peters and Van Balen (2007-this issue) discusses the use of geomorphologic data on the tectonics in the Northern section of the URG.

Cornu et al. (2007-this issue) present a novel numerical approach to construct quantitative tectonic models from crustal velocity distributions derived from local earthquake tomography, and give an application for the southern end of the Upper Rhine Graben. Their results demonstrate the dependence of fault interaction on kinematic conditions, and the influence of minor faults on major basin bounding faults.

Buchmann and Connolly (2007-this issue) present a simulation of the recent kinematic behaviour of the Upper Rhine Graben using a 3D finite element model. The modelling results suggest that the URG is currently being reactivated as a sinistral strike-slip system. Both sinistral shearing and mantle uplift appear to be active mechanisms driving the recent kinematics of the URG.

Peters and Van Balen (2007-this issue) concentrate on the northern part of the Upper Rhine Graben, investigating the effects of fault activity on the landscape evolution of the area. The study aims to detect active faults and to determine the last phase of tectonic activity. Their interpretations point to active border fault segments on both sides of the graben.

The final four papers focus on several other Natural Laboratories. De Vicente et al. (2007-this issue) describe the Cenozoic deformation and topography evolution of the Spanish Central System by integrating results from gravimetric, topographic, macro- and microtectonics, sedimentological, uplift history, paleoseismic and instrumental seismicity studies.

The paper by Smelror et al. (2007-this issue) gives an extensive overview of the topographic evolution of Norwegian Sea Margin trough time since the Caledonian Orogeny. Since the Silurian, the Norwegian Sea Margin has undergone a series of processes, including orogenic collapse, several extensional events culminating into continental break-up, rift episodes, thermal subsidence, glacial rebound and deep erosion, that have subsequently all had their influence on the resulting surface topography.

The paper by Artemieva (2007-this issue) examines the relative roles of the crust, the subcrustal lithosphere and the dynamic support of the sublithospheric mantle in maintaining surface topography in the East European Craton, using regional seismic data on the structure of the consolidated crust and sedimentary cover and thermal and large-scale seismic tomography data on the structure of the lithospheric mantle. The paper shows that positive dynamic topography at the cratonic margin, which exceeds 2 km in the Norwegian Caledonides and in the Urals, links on-going uplift with deep mantle processes. Negative residual topography beneath the Archean–Paleoproterozoic cratons may indicate the presence of strong downwelling in the mantle. Such mantle downflows can effectively divert heat from the mantle, leading to a long-term survival of Archean–Paleoproterozoic lithosphere.

Guest et al. (2007-this issue) present a flexural mechanism for the development and maintenance of a large non-isostatically compensated mountain belt and two adjacent basins in Northern Iran and the South Caspian domain, based on lateral and vertical lithospheric strength contrasts in compression. Their modelling predicts a south-dipping region of high creep strain along the lithospheric interface, which could be viewed as the precursor to subduction of the South Caspian lithosphere beneath Northern Iran. Their observations and model results demonstrate the potential for using this region as a Natural Laboratory for studying the early stages of continent–ocean collision and subduction processes.

The papers presented in this issue illustrate the need for an integrated multidisciplinary approach in the study of the complex interaction between lithospheric and surface processes. This issue demonstrates also the large efforts made in the last decade for obtaining high-quality data sets needed to constrain process-oriented studies. The Natural Laboratories will be key for the further development of a new generation of models for coupled deep Earth and surface processes and their impact on continental topography in future research to be carried out in the framework of TOPO-EUROPE.

Acknowledgements

We would like to thank the International Lithosphere Program (ILP), the European Science Foundation (ESF), the Netherlands Research Centre for Integrated Solid Earth Sciences (ISES), the Academia Europaea and the Klaus Tschira Foundation for partial funding. Paul Bogaard, Lieke de Jong and Judith van Hagen are thanked for editorial assistance. We thank all the reviewers for their critical and constructive comments.

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S. Cloetingh
Netherlands Research Centre for Integrated Solid Earth Sciences (ISES), Faculty of Earth and Life Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands
Fax: +31 20 5989943.
E-mail address: sierd.cloetingh@falw.vu.nl.

21 March 2007

DynaQlim

Upper Mantle Dynamics and Quaternary Climate in Cratonic Areas

A proposal for an ILP Task Force

Markku Poutanen (chairman), Søren Gregersen, Volker Klemann, Elena Kozlovskaya, Ilmo Kukkonen, Juha-Pekka Lunkka, Glenn Milne, Jürgen Müller, Bjørn R. Pettersen, Hans-Georg Scherneck, Bert Vermeersen, Detlef Wolf

1. Introduction

We propose an inter-disciplinary project for studying the relationship between Glacial Isostatic Adjustment (GIA), upper mantle structure, dynamics and Quaternary climate. We aim towards an ILP-driven task force which integrates existing data and models from a variety of disciplines that consider processes over a range of spatial and temporal scales. The task force will bring together researchers world-wide with complementary expertise and knowledge to identify key scientific problems relating to the Quaternary evolution of cratonic regions that can be addressed through innovative and multidisciplinary collaboration.

During the Pleistocene, quasi-periodic transitions between glacial and interglacial periods varied with dominant periods closely related to those present in the Earth-Sun orbit. These Milankovich-paced variations in the cryosphere have played a key role in shaping the landscape and driving the geodynamic evolution of cratonic regions such as northern Eurasia and North America during the Quaternary. An extensive and varied suite of observations can be applied to study and understand the key processes involved, including geodetic land uplift measurements, geological observations of sea-level changes and past shore-lines, end moraines and other glacial deposits and various paleoclimatological proxies. These observations have played a vital role in a number of recent advances that have improved our understanding of the structure and dynamics of cratonic regions and the dominant influence of ice sheet growth and ablation.

Recent advances in studies of the glacial history of the northern Europe and Eurasia have significantly improved our understanding of the glaciation and deglaciation histories during the Weichselian and Holocene epochs over the past 100 ka (Svendsen et al. 2004). In addition, developing numerical modelling of glaciations has opened a new view to the processes involved as well as their mutual couplings (Forsström, 2005; Näslund et al., 2006; Zweck and Huybrechts, 2005; SKB, 2006). As a result, the latest generation of ice sheet models are significantly better constrained and more realistic than before.

The phenomenon of glacial isostatic adjustment with its unique temporal signatures is one of the great opportunities in geosciences to get information about earth processes. It contains information about the recent climate forcing, being dependent on the geologically recent on- and off-loading of ice sheets. It gives a unique chance to study the dynamics and rheology of the lithosphere and asthenosphere with an increasing detailed modelling, and it is of fundamental importance in geodesy, since the global reference frames, Earth rotation and Polar motion are influenced by it.

Inversion of deep temperature data in boreholes provides a direct access to ground temperature histories during glaciation times (Kukkonen and Jõeleht, 2003). Kimberlite-hosted crustal and mantle xenoliths and seismic velocity models and controlled-source seismic experiments have yielded direct information on the composition and temperature of the lithosphere and asthenosphere (Bruneton et al., 2004, Hjelt et al., 2006, Kukkonen et al., 2003, Olsson et al., 2007, 2006, Pedersen et al., 2006, Stein et al., 1989). These results can be used to develop more realistic models of mantle temperature and viscosity that are key factors controlling ice sheet dynamics and the Earth's response to ice mass change.

These advances in better constraining ice sheet evolution and upper mantle properties have yet to be incorporated into dynamic models of ice-Earth interaction. A key aim of this project will be to facilitate the development of such models in order to generate more accurate predictions of Earth and ice sheet evolution during the Quaternary. Of course, there still exist many open questions in relation to upper mantle dynamics and composition, rebound mechanism and uplift models, elastic thickness contra lithosphere thickness, as well as ice thickness during the late Quaternary. The proposed task force will serve as a vehicle to identify the gaps in our knowledge that are critical in arriving at an accurate model of ice-earth evolution. Such a model will have a number of applications, including present-day global change as well as future changes in response to a warming climate.

2. Aim of the project

The broad aim of DynaQlim is to understand the relations between upper mantle dynamics, mantle and lithosphere composition, and their physical properties, such as temperature and rheology, in order to study GIA, Quaternary climate variations and Weichselian (Laurentide and other) glaciations during the late Quaternary. The project will initiate new research and synergy between the disciplines, climatology, glaciology, geology, geophysics, oceanography, geochemistry and geodesy. This will result in a comprehensive understanding of the coupling between the lithosphere, mantle and past climate changes on the time scale of glacial cycles.

We aim to use the ILP task force as a tool for bringing together people specialized in various experimental and theoretical fields relevant to GIA studies. These include Quaternary climate and glaciation history, post-glacial uplift and geodynamics, ice-sheet dynamics and glaciology, post-glacial faulting, rock rheology, mantle xenoliths, past and present thermal regime of the lithosphere, seismic structure of the lithosphere, and potential fields.

As a result of DynaQlim, we expect to start several topical projects whose funding will be applied for elsewhere, but which will be essential contributions produced under the umbrella of DynaQlim. At the end of DynaQlim we expect to have a more comprehensive understanding of the Earth's response to glaciations. This is achieved by arranging topical sessions, workshops and researcher networks in an inter-disciplinary framework. Results of DynaQlim will be published in individual articles, special issues of international journals as well as monographs.

One should also mention related tasks, such as the TOPO-Europe initiative which is dedicated to 4D surface deformations in Europe. DynaQlim is focussing on the coupling processes between climate, earth dynamics and earth response and therefore the initiatives are complementing each other with expected synergy in the future. DynaQlim has the global aspect, connecting regional studies. One could also address the IAG sub-commission 3.2 Crustal Deformations (Chairman M. Poutanen) as a connection to the existing structures.

3. Proposed research and problems to be solved

The broad topics contain following research items:

- Further development of 3-D Earth modelling
- Physical and thermal properties of the lithosphere and asthenosphere
- GIA-related geodynamics, observations and modelling
- Gravity change and uplift
- Glaciation history and paleoclimate
- Ocean dynamics

Paleoclimate and glaciation history of the Pleistocene is a global complex problem and therefore, it should be solved in a joint program. Due to the natural laboratories, data and research activities, the two main glaciated regions, Fennoscandia and Laurentide will be covered first. The task will be initiated for Fennoscandia and then extended to Laurentide and other relevant areas, including Greenland and Antarctica. The emphasis will be on the globally interesting modelling of the climate forcing, and the effects on lithosphere and asthenosphere processes (Bintanja et al., 2005; van den Berg et al., 2006).

Our present knowledge of the rheology of the lower crust is based mostly on petrophysical inference from seismology and heat flow (Blundell et al., 1992). Continuous GPS observations of plate-wide strain, accompanied by seismological investigations, and followed by continuum mechanical modelling of GIA, seismic source and wave propagation, and studies of the post-glacial faults offer a new entry and will add new insights into the role and properties of the lower crust. Observations and models of post-glacial or glacially induced faulting can help to illuminate crustal stress fields and therefore crustal rheology issues. On the lithosphere-mantle scale we expect, mostly on the basis of on-going improvements and densifications of GPS observations, that the fully 3-D observations, augmented by gravity (GRACE and GOCE) and sea level change. Drawing from advances in thermodynamical and climatological ice sheet modelling will retrieve laterally heterogeneous structure of mantle and lithosphere from the observed motions.

Current GIA models are mostly based on radially (1D-)stratified Earth models with linear rheology (e.g., Sabadini and Vermeersen, 2004), though during the last few years progress has been made in the development of global, 3D-stratified earth modelling (Martinec 2000; Wu & van der Wal 2003; Whitehouse et al. 2006). However, due to computational restrictions, the latter models are confined to relatively low resolutions.

A collaborative project has been initiated on coupling interactively a regional (flat) 3D high-resolution finite-element model to a 3D thermomechanical ice-sheet model that includes ice shelves, with a special interest to apply this to Northern Europe. Recently a PhD-study has been completed on mantle xenoliths in the Caledonian lithosphere domain along the west margin of North-west Europe. Present and near-future work is therefore concentrated on this western margin part. In the future, interest will concentrate more on the eastern parts of NW Europe (Schotman and Vermeersen, 2005).

An important aspect is to construct and improve coupled models of glaciation and land uplift history, using both forward and inverse modelling. Geodesy provides accurate measurements of contemporary deformation and gravity change. There are systematic postglacial uplift observations for more than 100 years based on repeated precise levelling, geodetic high-resolution observations of recent movements, gravity change and possibilities to monitor

postglacial faults. Geologically, the uplift is documented in ancient shorelines (e.g. Lambeck et al. 1998) but the precise timing of the shorelines may become a limiting factor.

Space geodetic techniques, such as GPS, allow the construction of 3-D motions from relatively short (less than 10 years) time series. This was demonstrated in the BIFROST project (Johansson et al., 2002, Milne et al., 2001, Scherneck et al, 2002) and other regional studies (e.g. Sella et al, 2007; Wolf et al. 2006). Differences between models and observations for some regions possibly indicate an additional component in the uplift process.

One task is to couple existing GIA uplift data, uplift models and the most recent geological and paleoclimatological data on glaciation history. Northern Europe and Russia provide a study area with several recent contributions. With the land uplift models, the sensitivity of uplift data on variations in ice thickness and duration should be quantified, at least for the period of the last deglaciation, i.e. from the Last Glacial Maximum at about 22 ka B.P. to the present time. Inverse modelling of glaciation history may be a potential new approach previously not applied.

Existing data on experimentally studied lower crustal and mantle composition and 3-D structure derived from xenolith data, lithospheric thermal models (Kukkonen et al., 2003) and seismic studies (Bruneton et al., 2004, Sandoval et al., 2004, Yliniemi et al, 2004, Hjelt et al., 2006, Plomerova et al., 2006, Pedersen et al., 2006, Janik et al., 2007) should be utilized for forward rheological modelling of the lithosphere and for testing of dynamic uplift models. The presence and volume of fluids in the upper mantle and the influence of fluids on the mantle rheology is an open question. As dissociated water may provide an effective mechanism for electrical conductivity in the upper mantle, important implications on mantle fluids and lithosphere-asthenosphere system in general can be potentially obtained from recent deep electromagnetic measurements (Hjelt et al., 2006; Korja et al., 2002; Korja 2007).

Crustal deformation and sea level variation studies are based on stable reference frames. If one wants to study effects on a 1 mm/yr level, stability of 0.1 mm/yr in reference frames are needed over several decades. Such stability is not yet achieved. Geodesy's response to the requirement is the Geodetic Observing System (GGOS), a project of the International Association of Geodesy, (IAG). There are several ongoing plans for regional implementation of GGOS, as an example the Nordic Geodetic Observing System, (NGOS, Poutanen et al., 2007). NGOS plan includes also regular repeated absolute gravity measurements at the permanent GPS sites, a central element of this proposal. Gravity satellites GRACE and GOCE are already providing or will provide additional global and regional constraints on the gravity field (Müller et al, 2006; Pagiatakis et al., 2003; Tamisiea et al., 2007).

To achieve the goal of coupling multidisciplinary research and data requires a suitable data and information management. A shared internet portal enables search, evaluation, access, and visualization of data and models. Furthermore, the information management strives is to improve the re-use of data by referencing the digital data to related articles in the scientific literature and by making the data citeable through the use of digital object identifiers. The development of advanced visualization tools should facilitate scientific integration in addition to data integration and exchange. The portal will be established according to community standards and thus may contribute to a wider network of data bases, in line with the European policy on digital data accessibility (Haubrock et al., 2006, Klump et al. 2006).

4. Research team and structure of the task force

Already more than 40 top-level scientists from 10 countries have expressed their interest in participating in the DynaQlim and taking care of their special fields. The provisional list of principal investigators for the relevant fields is in the appendix, as well as the CVs of the proposers.

The task force can be divided into following broad categories comprising the field. The final structure of the working groups will be based on these topics.

1) Geodesy, geodynamics, ocean dynamics;
2) Post-glacial uplift, contemporary movements and gravity;
3) Dynamic ice sheets, glaciology;
4) Quaternary paleoenvironments and climate;
5) Geology and tectonics;
6) Dynamics, structure, properties and composition of the lithosphere;
7) IT, data management and outreach

The groups and their tasks will be defined, and group leaders agreed before the end of the year 2007. If accepted as a task force, the kick-off meeting where the structure will be finalised, will be arranged at the end of 2007 or early 2008.

5. Expected results and deliverables

As expressed in Chapters 2 and 3 we expect the following results from the task force:

- Comprehensive and improved understanding of the GIA through innovative research
- Publications and special issues from DynaQlim meetings
- Improved and updated 3-D uplift data sets
- Updated data on glaciation history
- Multidisciplinary data base and information portal
- Software and models
- Instrumentation development

6. Schedule

Duration of the task force will be 5 years: Oct. 2007- Sept. 2012 with following milestones

2008 January-February: Opening workshop and kick-off meeting (venue Copenhagen);
Proceedings issue to be edited in 2008
2008 April: DynaQlim sessions at EGU Vienna
2009 April: DynaQlim sessions at EGU
2009 November: DynaQlim workshop (Finland)
2010 April: DynaQlim sessions at EGU
2010 November: DynaQlim workshop
2011 April: DynaQlim sessions at EGU
2012 September: Final summarizing meeting and proceedings of DynaQlim

7. Funding plan

Most of the funding of the research groups will be arranged on national bases, or for seeking EU or similar funding. Majority of the activities are already initiated and facilities exist. Based on the ILP support, following activities can be covered: invited speakers, travel costs; workshop arrangements; support for travel costs of workshop participants (students); costs of the portal. To cover the rest of the workshop costs, small fees will be collected from participants.

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Appendix: Provisional list of participants and sub-projects

Geodesy, geodynamics, ocean dynamics:

Fred Beekman (Netherlands Research Center for Integrated Solid Earth Sciences, NL)
James L. Davis (Harvard, USA)
Mikhail Kaban (GeoForschungsZentrum Potsdam, D)
Zdenek Martinec (Charles-U, Prague, CZ)
Ove Omang (Norwegian Mapping Authority, Honefoss, N)
Markku Poutanen (Finnish Geodetic Institute, FI)
Hans-Georg Scherneck (Chalmers, S)
Seth Stein (Northwestern University, Evanston, IL, USA)
Maik Thomas (GeoForschungsZentrum Potsdam, D)
Martin Vermeer (Helsinki Technical Universty, FI)

Post-glacial uplift, contemporary movements and gravity:

Paul Andriessen (Vrije Universiteit, Amsterdam, NL)
Glenn Milne (U.Durham, UK)
Volker Klemann (GeoForschungsZentrum Potsdam, D)
Vasily Kolka (Kola Science Centre, Russian Academy of Sciences, Apatity, RU)
Jaakko Mäkinen (Finnish Geodetic Institute, FI)
Jürgen Müller (U.Hannover, D)
Bjørn R. Pettersen (Norwegian University of Life Sciences, Aas, N)
Hugo Schotman (TU Delft, NL)
Holger Steffen (U.Hannover, D)
Bert Vermeersen (TU Delft, NL)
Detlef Wolf (GeoForschungsZentrum Potsdam, D)

Dynamic ice sheets, glaciology:

Jan Åström (Center for Scientific Computing, Espoo, FI)
Jojanneke van den Berg (U.Utrecht, NL)
Pirjo-Leena Forsström (Center for Scientific Computing, Espoo, FI)
Erik Ivins (JPL, USA)
Olga Korsakova (Kola Science Centre, Russian Academy of Sciences, Apatity, RU)
Cecilie Rolstad (Norwegian University of Life Sciences, Aas, N)
Roderik van de Wal (U.Utrecht, NL)

Quaternary paleoenvironments and climate:

Juha-Pekka Lunkka (U.Oulu, FI)
Gerald Haug (ETH, Zurich, CH)

Geology and tectonics:

Hans de Bresser (U.Utrecht, NL)
Martin Drury (U.Utrecht, NL)
Annakaisa Korja (U.Helsinki, FI)
Björn Lund (U.Uppsala, S)
Christophe Pascal (NGU, N)
Dimitrios Sokoutis (Vrije Universiteit, Amsterdam, NL)
Jan-Diederik van Wees (Vrije Universiteit, Amsterdam, NL)

Dynamics, structure, properties and composition of the lithosphere:

Søren Gregersen (GEUS Copenhagen, DK)
Ilmo Kukkonen (Geological Survey of Finland, FI)
Toivo Korja (U.Oulu, FI)
Elena Kozlovskaya (U.Oulu, FI)
Petri Peltonen (Geological Survey of Finland,, FI)
Dmitry Zozulya (Kola Science Centre, Russian Academy of Sciences, Apatity, RU)

IT, Data management and outreach:

Doris Dransch, (GeoForschungsZentrum Potsdam, D)
Jens Klump (GeoForschungsZentrum Potsdam, D)

ILP Project Proposal:

TOPO-CENTRAL-ASIA: 4D Topographic Evolution in Central Asia: Lithosphere Dynamics and Environmental Changes since Mesozoic

SCIENTIFIC RATIONALE:

The birth of *Earth System Science* theory is another revolution in Earth sciences after the Plate Tectonic theory. From the viewpoint of Earth System Science, planet Earth is a complex interacting system that requires us not only to understand the processes, cycles and dynamics within the component parts (the core, mantle, lithosphere, hydrosphere, biosphere and atmosphere) but also to understand the interactions between them. Earth System Science provides us with a theoretical framework to examine the way in which Earth System processes controlling the nature of the planet have changed since the birth of the solar system 4.57 billion years ago.

The topography of the Earth has changed dramatically since Mesozoic, as a result of the dismembering of Gondwana, the opening of the Atlantic Ocean, closing of the Tethys Ocean, collision between the Indian and Eurasian Plates, and so on. These changes have shaped Central Asia into a unique region in the world: the North China Craton lost its thick Archean lithospheric root; the Tethys Ocean closed and many oil-gas fields formed along its previous seaway; the Tibetan Plateau rose and changed atmospheric circulation as well as the global climate; and intensive intraplate deformation developed in areas far from the India-Eurasia collision zone. These important events and their natural records have attracted international Earth scientists, who rushed into Central Asia to meet their scientific curiosity or to hunt for mineral and energy resources. Obviously, Central Asia has become an international natural laboratory of Earth System Science. Now is the right time to launch an ILP project to study the Earth's mantle-lithosphere and its coupling to the shallow Earth System, and the feedback mechanisms between Solid-Earth processes and topography. Therefore, we propose a new project TOPO-CENTRAL-ASIA, following the ILP project that is studying the 4D topographic evolution in Europe (TOPO-EUROPE). Such a study will not only improve our understanding of Earth System processes through the Central Asian window, but will also provide us with further knowledge of how Earth System Sciences can serve the society, such as mineral and energy resources exploration, sustainability of local ecosystems and human habitats, and so on.

SCIENTIFIC THEMES:

The proposed project TOPO-CENTRAL-ASIA will take Central Asia as a natural laboratory and study the following themes:

1. Deep structure of Central Asia

The Global Geoscience Transects (GGT) Program of ILP has been completed for several years. However, the deep structure of Central Asia is still poorly known, as illustrated by the limited number of published transect studies. Technology to reveal the Earth's deep structure has greatly improved in the past two decades. Seismic tomography and gravity data can construct the deep structure of the Earth's interior. The portable seismic station array has become a powerful tool to reveal lithosphere

structure. This lithospheric probe method enables recognition of the composition in the Earth's interior. The proposed project TOPO-CENTRAL-ASIA will aim to obtain high-resolution images of lithospheric structure, the mantle convection pattern, as well as inhomogeneous components in the lithospheric mantle. More integrated geological-geophysical-geochemical surveys are necessary.

2. Tectonic evolution of Central Asia

Tectonic evolution of Central Asia lasted for more than 800 million years from about 1 Ga to the Triassic and ended with the closure of the Mongol-Okhotsk ocean. During this long history the Central Asian Orogenic Belt (CAOB), extending from the Ural Mts. to the Pacific Ocean, evolved into one of the largest accretionary orogens on Earth, and led to unparalleled juvenile crustal growth in the Phanerozoic. This process depleted the underling mantle to an enormous extent. The recent discovery of some of the world´s largest base metal deposits in southern Mongolia highlights the CAOB as one of the prime exploration targets for the future. Central Asia contains several major sutures, such as the Mongol-Okhotsk suture (late Palaeozoic to Cretaceous), the Permo-Triassic Solonker suture zone in Inner Mongolia, the Dabie Shan suture, and the Song Ma suture in Vietnam. Closure of the Mongol-Okhotsk ocean may have left a remnant slab in the mantle. Are there other remains of subducted slabs still in the mantle? Furthermore, is there any measurable effect of ultra-deep subduction of the ultra-high pressure (UHP) metamorphic rocks in the Dabie-Sulu region? The CAOB contains many important mineral occurrences of high economic significance. What is the relationship between metallogenetic processes to tectonics and geodynamics? The proposed project will focus on the above important issues and encourage investigations of detailed field geology, in particular structural studies, geophysical surveys, geochronology, petrology and geochemistry, and metallogeny.

3. Tibetan Plateau Uplift: deep processes and environmental effects

The Tibetan Plateau has the highest topography in the world. It rose after the India-Eurasia collision and changed the Cenozoic climate at least in Central Asia. Therefore, the Tibetan Plateau has long been a prime target to study the link between mountain building and climate change. Among many important questions, the proposed project will study the following: (1) The deep processes that caused the Tibetan Plateau uplift. What was the contribution of lower crust rheology and lithosphere deformation to Tibetan Plateau uplift, as well as to the extrusion and extension of the Tibetan Plateau? (2) The dynamic link between Tibetan Plateau uplift and climate change. How did the Tibetan Plateau alter the atmosphere circulation and then affected the Asian monsoon evolution? (3) The distal effects of the Tibetan Plateau uplift and intraplate deformation. How did the deep processes that uplifted the Tibetan Plateau cause the intraplate deformation, such as the rise of the Tianshan Mountains and formation of the "Chinese-type" basins? and (4) Interaction between climatic change and solid earth processes: erosion history vs. crust-mantle processes.

4. Dynamic topography and processes of removal of the subcontinental lithosphere below the North China Craton

Most Precambrian cratons have thick subcontinental lithospheric roots. However, the Archaean lithosphere beneath the North China Craton was not only thinned from 200 km to about 80 km, probably in the Cretaceous, but was also replaced by juvenile lithospheric mantle in the Cenozoic. Facing this unique geological phenomenon, the proposed project will focus on the following topics: (1) The mechanism of the sub-craton lithospheric thinning. What, among various deep processes, was responsible for the loss of the cold, thick Archaean lithospheric root?: plume,

delamination or thinning? (2) The environmental consequence of the sub-continental lithospheric destruction. Was there any obvious change in palaeo-topography and/or in palaeo-climate during removal of the Archaean lithosphere under the North China Craton? (3) What was the relationship between lithospheric removal and the formation of important contemporaneous mineral deposits such as gold on the margins of the North China Craton? (4) The implications of subcrustal lithosphere removal for continental evolution and global geodynamics. Was the thinning of the North China Craton just an accident or an inevitable consequence of most, if not all, cratons in the world?

5. Response of the lithosphere to surface processes: modeling

Plate tectonics has influenced the Earth's surface topography and climate in different ways, such as the opening and closure of seaways and oceanic basins, the formation and rifting of supercontinents, the uplift of plateaus and mountains, the rise and fall of sea level, etc. In addition to investigations of the geological record naturally preserved in the crust-lithosphere system, analogue and numerical modelling are important tools to understand the dynamic links between lithosphere processes and changes of environment and climate. The proposed project will encourage both analogue and numerical modeling. We aim to understand the feedback mechanisms between Solid-Earth processes and topography, especially the interactions between orogeny, climatic change, and erosion.

ACTIVITIES IN THE NEXT 5 YEARS:

The proposed project will construct a forum to exchange ideas and study the results by working group members and others who are interested in the themes of the proposed project. We shall organize a workshop every year in the period 2008-2012. The first workshop will be held during the 33rd International Geological Congress, Oslo, 2008. Subsequent workshops will be held as independent or joint sessions of either AGU, AOGS or EGU. We have only one Earth, and we hope to strengthen research cooperation with scientists from Australia, Europe and North America.

ORGANIZATION

The proposed project will establish its office at the Institute of Geology and Geophysics, Chinese Academy of Sciences, China. The suggested working group members will include Earth scientists from 12 countries. They are:

Chairman: Qingchen Wang (China)

Co-Chairman: Shigenori Maruyama (Japan)

Co-Chairman: Boris Natal'in (Turkey)

Co-Chairman: Yan Chen (France)

Secretary: Wenjiao Xiao (China)

Members:

Australia:	S. A. Wilde, S.Wilde@curtin.edu.au;
	W. L. Griffin, bill.griffin@mq.edu.au
	Zhengxiang Li, zli@tsrc.uwa.edu.au
China:	Chengshan Wang, cswang@cdut.edu.cn

	Erchie Wang, erchie-wang@mail.igcas.ac.cn;
	Fuyuan Wu, wufuyuan@mail.igcas.ac.cn;
	Guochun Zhao, gzhao@hkucc.hku.hk;
	Peizhen Zhang, peizhen@gps.gov.cn;
	Qingchen Wang, qcwang@igcas.ac.cn;
	Rui Gao, gaorui@cags.net.cn;
	Shan Gao, sgao@263.net.cn;
	Shuwen Dong, swdong@cags.net.cn;
	Sun-Lin Chung, sunlin@ntu.edu.tw;
	Wei Lin, linwei@mail.igcas.ac.cn
	Weiming Fan, wmfan@gig.ac.cn
	Wenjiao Xiao, wj-xiao@mail.igcas.ac.cn;
	Xiaomin Fang, fangxm@itpcas.ac.cn;
	Zhongjie Zhang, zhangzj@igcas.ac.cn;
France:	Charles Gumiaux, Charles.Gumiaux@univ-orleans.fr;
	Elisabeth Verges, ElisabethVerges@univ-orleans.fr;
	Michel Faure, michel.faure@univ-orleans.fr;
	Stephane Dominguez, dominguez@gm.univ-montp2.fr;
	Yan Chen, yan.chen@univ-orleans.fr;
Germany:	Alfred Kröner, kroener@mail.uni-mainz.de;
	Manfred Strecker, strecker@geo.uni-potsdam.de;
	Lothar Ratschbacher, lothar@geo.tu-freiberg.de;
Japan:	Dapeng Zhao, zhao@sci.ehime-u.ac.jp;
	Shigenori Maruyama, maruyam@geo.titech.ac.jp;
	Simon Wallis, swallis@eps.nagoya-u.ac.jp;
	Y. Otofuji, otofuji@kobe-u.ac.jp;
Korea:	Seung Ryeol Lee, leesr@rock25t.kigam.re.kr;
Mongolia:	D. Tomurhuu, dt@igmr.mas.ac.mn;
Russia:	Dmitriy Alexeiev, dvalexeiev@mtu-net.ru;
	Mikhail Buslov, misha@uiggm.nac.ru;
Turkey:	Boris Natal'in, natalin@itu.edu.tr;
UK:	Brian Windley, brian.windley@btinternet.com;
	D. Cunningham, wdc2@leicester.ac.uk;
	D. McKenzie: mckenzie@madingley.org,
	M. Menzies: m.menzies@gl.rhul.ac.uk;

Yaoling Niu: yaoling.niu@durham.ac.uk
USA: An Yin, yin@ess.ucla.edu;
Clark Burchfiel, bcburch@mit.edu;
Peter Molnar, Peter.Molnar@Colorado.edu;
R. L. Rudnick: rudnick@geology.umd.edu;
R. Van der Voo, voo@umich.edu;
Tim Kusky, kusky@eas.slu.edu;
Walter Mooney, mooney@usgs.gov;
Uzbekistan: Bakhtier Nurtaev, nurtaev@ingeo.uz;
Turabek Dalimov, holboy64@mail.ru