

2005-2009 report of the ILP Task Force 6 on Sedimentary Basins and Renewal application for 2010-2014

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1- Introduction

The basic objectives of the ILP Task Force on Sedimentary Basins are:

- 1) to unravel the architecture and evolution (i.e. formation and deformation) of sedimentary basins in various geodynamic settings, from rift and passive margins to intracontinental sags, foreland and thrust-top basins.
- 2) to assist the international community of Earth Scientists involved in the study of asthenospheric and deep lithospheric/crustal processes to exchange views with colleagues involved in the study of sedimentary basins, and to promote collaborative projects integrating surface and deep processes for regional case studies;
- 3) to promote regular meetings involving colleagues from universities, research institutes as well as the industry;
- 4) to provide support for young scientists (PhD and post-docs) to participate in the activities of this international network.

These objectives have been addressed during the last five years by means of yearly international workshops dedicated to specific topics, rotating from one continent to the other, and to the organization of special sessions at EGU in Vienna and other international conferences in Europe, in order to keep the network attractive for any participant, even if they could not attend other more specific Task Force meetings across the Atlantic and in other continents (**see Appendix 1 for list and details of these meetings**).

2- Scientific outcomes of ILP Task Force 6 and further challenges for 2010-2014

The amount of data available for the study of sedimentary basins is extremely large and diverse, one of the main concern for Earth scientists involved in the study of sedimentary basins being to **access to the data**, part of those being the property of national or international companies, with restricted access, whereas the acquisition of others, like deep seismic profiles or mantle tomography, are quite expensive and require an extremely strong and efficient network international collaboration. In this respect, our Task Force has proved to be an excellent platform to link the industry with academics, and to facilitate scientific collaborations, access to and integration of existing data, as well as evidencing the need for new data acquisitions.

For many years, and because outcrops are mostly, if not only, accessible in mountain ranges where uplift and erosion are active, the science addressed by field geologists (namely Alpine geologists) was a bit disconnected from other earth scientists involved in the study of passive margins and sedimentary basins, where subsidence and active sedimentation prevent a direct access to the rocks, and for the study of which seismic imagery and access to other subsurface data (wells, gravi, mag) are required. Here again, ILP and its Task Force on sedimentary basins have been very efficient in providing bridges to these various communities, which are now integrating their diverse expertise for the **study of active processes, and to unravel the past evolution of both subsiding and uplifting areas**.

The best way to integrate the huge data bases available in sedimentary basins, to test and validate hypotheses on the physical/chemical processes active in sedimentary basins, and to provide reliable prediction/quantification of various parameters (i.e. reservoir characteristics, pore fluid pressure, CO₂ storage capacities or hydrocarbon charge), is to **address various types of analogue and numerical modelling**, aiming at coupling geometric/kinematic evolution with either or both thermal and fluid flow modelling.

Another concern the Task Force 6 is currently addressing is the need for **coupling deep and shallow processes**, as the main engine responsible for both **uplift in source areas and subsidence in sink areas** relates to mantle dynamics and the **long term thermo-mechanic evolution of the lithosphere/asthenosphere**.

Climate and surface water circulations are important factors to be taken into account, in addition to uplift and subsidence, when addressing simulations of the coupling between **tectonics and sedimentation**. Seemingly, **mechanical compaction**, but also subsurface fluid transfers, **paleothermicity and fluid-rock interactions** must be studied jointly when predicting porosity evolution of reservoirs.

However, the study of natural processes cannot be done only by means of modelling, but requires **the use of natural laboratories and case studies**. Seemingly, models need to be calibrated against wells, paleothermometers, biostratigraphy as well as radiometric dating. Here again, one of the input of the Task Force has been to help people interested by the same basin to exchange their views and combine their expertise, or to guide modelers toward the best geographic areas where their hypotheses could be tested/validated. Within the last five years, we tried to cover quite distinct geodynamic environments, each of them likely to be illustrated by a wide set of case studies from various parts of the world. A dedicated meeting was thus organized for foreland and thrust belts in Paris, complemented by another meeting on vertical motion in Marrakech, whereas passive margin processes were addressed during the meetings held in Québec and Ensenada, as well as during the numerous ILP sessions held at EU in Vienna.

Scientific results of the Task Force on sedimentary basins are thus extremely diverse as far as the work flows, techniques involved and regional applications are concerned. They have been made available to the entire Earth Science community thanks to our policy to compile high quality (peer reviewed) proceedings volumes as well as special issues in international scientific journals. **A list of the main publications of ILP Task Force 6 is provided in Appendix 2.**

3- Implication of students and young scientists

We try to keep registration prices for our yearly international workshops as low as possible for students and participants from the universities. Further support to the students is provided in the form of travel grants, up to the maximum limit allowed to keep our budget balanced (see Appendix 3).

4- Links between Industry and Academia

The format of our meetings is excellent to stimulate the interactions between Industry and Academia, and initiate new collaborative work between new comers. Although ILP seed money would not be sufficient to support alone the cost of the venues and expenses related to the invitation of key note speakers, we have up to now benefited from enough, although not

regular, sponsorship from the industry, thus helping to maintain the registration prices at a reasonable level (see Appendix 3).

5- Road map proposed for 2010-2014 yearly international meetings and EGU sessions and tentative list of topics and meetings to be scheduled in the next 5 years

Because of the success of these first five years of action, we would like to extend the activities of Task Force 6 on Sedimentary Basins for another period of 5 years, i.e., for 2010 to 2014. We have listed below the main scientific focus and meeting plans for this second phase of the ongoing network:

The most efficient way to secure interactions between the participating teams and industry would be indeed to meet again once a year during a dedicated seminar of the Task Force, tentatively including 3 days of indoor presentations (single session with 80-120 participants, i.e. Hedberg-type format), linked with a 2-days field-trip.

Because of IUGS/IUGG commitments, the ILP task Force on Sedimentary Basin has global significance, we propose to keep the same policies as what we did during the last five years for our 2010-2014 yearly international workshops, i.e., to move alternatively from the western to the eastern hemisphere, and from the northern to the southern hemisphere. It is expected that participating members from different continents will still help to organize future meetings in various parts of the World. It is intended that the meetings will address general topics especially relevant for the area where the meeting takes place, and accompanying field trips can provide specific insights.

Seemingly, we want to continue our involvement in the EGU annual convention in Vienna (or elsewhere in Europe if a site change is to occur during the time period considered).

2010

The sixth workshop of the Task Force is tentatively scheduled in September 2010 in **Albania**, and should be organized jointly with the Polytechnic university of Tirana, the seismological institute and the National Energy Agency. The aims of this meeting and companion field trip would be to learn more from this natural laboratory with very active tectonics, in the scope of Topo-Europe, with presentation of the results of recent GPS campaigns and other geophysical studies supported by NATO, and further studies dealing with fluid-rock interactions and coupled fluid flow and thermal modelling.

Seemingly, following the success of their first international meeting in 2007, Moroccan colleagues have asked us to participate to a 2nd joint MAPG-ILP-AAPG in Marrakech, on May 2-5, 2010, with ILP sessions to be chaired by François Guillocheau (Topo-Africa), Laurent Jolivet (the fate of the Mediterranean slab), Gianreto Manatschal (deep margins of the Atlantic) and Giovanni Bertotti (active tectonics and unroofing history).

2011-2014

The four other meetings will be planned outside of Europe (order not yet decided), with the following objectives:

- Go back to **Latine America**, this time in the Southern Hemisphere, hopefully in **Argentina**, in order to benefit from the huge scientific effort dedicated recently by the international Earth Sciences community on the **South Atlantic margins** in the one hand, and in the **Andes and sub-Andean basins** in the other hand. Probably ready to go as soon as 2011.
- Take the opportunity of ongoing IFP collaborations with local research institutes and companies on Papua-New Guinea (PNG) and the South Australian Margin, as well as ongoing

ICDP projects in New Zealand, to organize a joint workshop either in **Australia or New Zealand**.

- Have a workshop dedicated to the **Chinese basins and Southeastern Asia**, hopefully in China, the best being to coordinate with a local university or research centre, and other international programmes such as ICDP or Topo-Asia. Because of the requisite contacts, such meeting would probably take place only in 2013 or 2014, unless ILP network can help to open the doors more quickly.

- **Revisit the Arctic**, which is becoming a top priority for the industry, but is also a major concern for its societal/environmental impact on climate and resources. This could be done by organizing a workshop again in North America (Canada or Alaska), or in Russia. Again, such meeting should be rather scheduled in 2013 or 2014, in order not to duplicate all the recent and forthcoming events associated with the ongoing International Polar Year.

Appendix 1

Summary of international meetings and special sessions organized by ILP Task Force 6 from 2005 to 2009

1- Yearly international meetings

2005 workshop in France (Foreland fold and thrust belts)

O. Lacombe (UPMC, France), J. Lavé (Univ. Grenoble, France), F. Roure (IFP) and J. Vergés (Barcelona) were the convenors of the first workshop of the new ILP Task Force on sedimentary basins, focusing on Foreland Fold-and-Thrust Belts (FFTB). This first meeting was held in December, 2005, hosted at IFP, being jointly sponsored by the Société Géologique de France and the Sociedad Geologica de España, with additional support from the industry, i.e. Shell, Total and Conoco-Phillips.

180 colleagues from 22 countries participated in this kick-off meeting of the ILP Task Force on Sedimentary Basins, with about 25% PhD students and post-docs, 25% participants from the industry, 25% members from the French and Spanish geological societies, and another 25% senior scientists from universities of other countries. France, Spain, Germany, UK, Italy, Switzerland, the Netherlands, Belgium, Poland, Romania were all well represented, but geologists and geophysicists from North America (Canada and US), Latin America (Argentina and Mexico), Asia (Iran, Emirates) and Africa (Algeria, Tunisia, Morocco) were also present.

Thrust belts and foreland basins record both the main phases of orogenic evolution and the coupled influence of deep (flexure, plate rheology and kinematics) and surficial (erosion, sedimentation) geological processes, at different time scales. They constitute important targets for scientists interested in both fundamental and applied (fluids, hydrocarbons) aspects.

This conference provided the opportunity for geologists from various domains of our community to discuss and understand new data sets on high resolution seismicity, high-frequency sequential stratigraphy, geochemistry and provenance studies, geodesy and vertical motions. These modern aspects will be combined with (more) classical field studies and analogue/numerical modelling in order to provide a timely comprehensive overview of processes governing the evolution of orogenic belts and adjacent forelands.

Proceedings of this Thrust belt conference have been published in a Springer volume, issued in 2007 (see Appendix 1).

2006 workshop in Canada (Circum-Polar basins)

Donna Kirkwood (Laval University), Denis Lavoie, Michel Malo (INRS) and Kirk Osadetz (Geological Survey of Canada) organized the second workshop of the Task Force on September 18-22, 2006, at Laval University in Québec. This meeting benefited also from the sponsorship of Fugro, Gastem, INRS, Junex, Natural Resources Canada, Total and Shell, and focused on the History of convergent and passive margins in the Polar Realm: Sedimentary and tectonic processes, transitions and resources.

A total of 80 people attended the conference, coming from 11 countries (Canada, USA, France, Norway, Germany, Sweden, UK, the Netherlands, Russia, Spain and Australia), about 35 % from the industry (most major companies, but also junior companies from Québec and Alberta), 30 % from Academy and 35% from National Research Institutes, including about 10 students (see Appendix 1). About 60% of the participants were coming from North America (36 from Canada and 12 from the USA), and 40% from Europe.

Dona Kirkwood led a one-day field trip along the northern front of the Appalachians in downtown Québec City and its surroundings.

Summation of Panel discussions demonstrated that the Task Force could be a valuable tool for all estates of the geoscience community. An Arctic Atlas would be most welcome in Industry, who can be interested to support the Task Force. Some effort needs to be made to bridge the difference from the university focus on processes to the industrial interest in regions or areas. There are good indications that much existing data could be obtained if collaborative research themes were developed, as well as there being opportunities for new data collection on a major collaborative scale. Properly presented, with reasonable goals and time frames, Industry would probably also support such initiatives. The petroleum resources of the Polar regions are perceived to be great, and the Task Force provides an innovative and potentially effective mechanism to efficiently and effectively understand, not just the Arctic margins, but the sedimentary basins on continental margins in general, including their petroleum resources.

Proceedings of this 2nd Task Force 6 workshop have been published in the December 2008 issue of the Bulletin of Canadian Petroleum Geology, edited by Donna Kirkwood, Michel Malo, Kirk Osadetz and Denis Lavoie.

2007 workshop in Morocco (Subsidence and uplift in African basins and margins)

Giovanni Bertotti (VU-Amsterdam), Dominique Frizon de Lamotte (University of Cergy-Pontoise), Antonio Teixell (University Autònoma of Barcelona) and Mohamed Charroud (University of Fes) organized ILP sessions dedicated to discuss the history of vertical movements in African basins and margins, which were hosted by the MAPG (Moroccan Association of Petroleum Geologists) on October 28-31, 2007, during their first international conference and exhibition held in Marrakech. Numerous companies sponsored also directly this first international conference of MAPG.

Among the 100 participants to ILP sessions, 75 presented either an oral or poster contribution. Altogether, the MAPG conference was a tremendous success, with 700 participants, 50% from Morocco, and 50% coming from 30 countries around the World. Foreign industry and academia participants were coming from Europe (226, including 65 Spanish and 50 French), North America (60, with one third Canadians and 2/3 US citizen), as well as Africa (42, in addition to the 350 from Morocco), and 22 for Asia, South America and Australia. Numerous PhD students were present and contributed to the technical programme.

Dominique Frizon de Lamotte led a one-day field trip to the front of the Atlas Mountains. Discussions focused on the geodynamics and the subsidence and inversion in the basins of the Atlas, which can hardly be explained by classical concepts. These basins are located between a passive non-volcanic continental margin to the west and a transform and/or convergent plate boundary to the north. In addition, the high topography of the Atlas is not supported by a lithospheric root but appears to be underlain by an unusually thin lithosphere. Furthermore a number of studies from other basins have been presented. Both long-term subsidence histories as well as young processes have been evaluated in the context of forward thermo-mechanical models ranging in scale from the sediment-fill to lithospheric and finally to whole mantle convection models and their surface expression. This integrated discussion gave new insights on processes controlling present and past vertical movements and related stress/temperature conditions.

Proceedings of this 3rd Task Force workshop constitute a special issue of Tectonophysics, 2009, edited by G. Bertotti, D. Frizon de Lamotte, A. Teixell and M. Charroud.

2008 workshop in Mexico (Geodynamics of Mexican basins, with focus on the Gulf of California and its surroundings)

CICESE (Center of Scientific Research and Graduate Studies in Ensenada) and the Mexican Geophysical Union (Unión Geofísica Mexicana, UGM) hosted the 2008 workshop in Ensenada, Baja California, Mexico, from September 21 to 26. This workshop, organized by Luis Delgado (CICESE) and Felipe Ortuño (Instituto Mexicano del Petróleo), involved also the other ILP Task Forces dealing with mantle processes, volcanism and paleostress.

60 geologists and geophysicists participated to the meeting, 50% coming from Mexico and 50% from abroad.

Arturo Martin-Barajas and Ramón Mendoza-Borunda (CICESE) lead a field trip on September 22-23 across the northern part of the Gulf of California, from Mexicali to the sea shore, thus allowing to document both low and high-angle normal faults, volcanic records of the rifting processes, as well as modern interactions between continental (fluvio-deltaic) and brackish-evaporitic sedimentation. Seismic profiles and wells data were also helpful in stimulating in depth discussion on the timing of deformation and overall crustal architecture of the basin.

Following the discussions on Mexican basins held during the oral/poster sessions and the field trip, the last day was mostly devoted to a panel discussion (Luis Delgado and Arturo Martin for CICESE, Leni Scheck-Wenderoth and Sierd Cloetingh (Panel Chair) for ILP, Kirk Osadetz and Hans Thybo for Research Institutes and Universities), Noëlle Schoellkopf and Patrick Unternehr for the Industry), aiming at identifying points of common interest for the Mexican and international Earth Sciences communities, and defining a road map for further collaborations.

Abstracts have been published in GEOS, volume 28, N°1, 70 pp (September 2008 issue of the Journal of the Unión Geofísica Mexicana). A pdf of this volume, which includes also the Field Trip Log, can still be downloaded from UGM website (www.ugm.org.mx).

2009 workshop in the United Arab Emirates

The last workshop of the ongoing phase of the Task Force will be hosted by the Ministry of Energy of the United Arab Emirates in Abu Dhabi, on December 6-11, 2009, aiming at discussing "Lithosphere dynamics and sedimentary basins: The Arabian plate and analogues. The organizing committee comprises two colleagues from the UAE, i.e., Khalid Al Hosani (Ministry) and Stephen Lokier (Petroleum Institute), as well as Richard Ellison (BGS) and F. Roure (ILP/IFP).

One-day pre-conference field trip will focus on the Oman Range thrust front in the vicinity of Al Ain, whereas a two-days post-conference field trip will visit the ophiolites and underlying Hawasina complex in the Northern Emirates (Dibba Zone).

Proceedings of this Middle East conference will be published in a special issue of the new Arabian Journal of Geosciences edited by Springer.

2- Other meetings and special ILP sessions in larger conventions

EGU Vienna 2007: One session (oral/posters) chaired by Magdalena Scheck-Wenderoth and F.Roure. Proceedings are summarized in a special volume of *Tectonophysics*: "Progress in understanding sedimentary basins", with guest editors: Magdalena Scheck-Wenderoth, François Roure, Ulf Bayer, printed 2009.

ILP-Potsdam -June 2007: Oral presentation of the status report of the Task Force.

EGU Vienna 2008: One session (oral/posters) chaired by Magdalena Scheck-Wenderoth, U. Bayer, H. Thybo and F. Roure.

33th International Geological Congress in Oslo: One session on Sedimentary Basins Processes chaired by M. Scheck-Wenderoth, S. Cloetingh and F. Roure.

Contributions to these EGU and IGC sessions are currently in the revision process of a thematic volume of *Marine and Petroleum Geology* entitled "The link of shallow and deep processes in Sedimentary Basins" with guest editors: Magdalena Scheck-Wenderoth, Ulf Bayer and François Roure.

EGU Vienna 2009: One session (oral/poster) chaired by Magdalena Scheck-Wenderoth and F. Roure. Currently preparations are under way to collect some of the contributions in a further thematic volume of *Marine and Petroleum Geology*: "New results on basin dynamics", with guest editors: Magdalena Scheck-Wenderoth et al..

It is worth to note that the number of contributions to the scientific sessions co-organised by the Task Force at EGU has been continuously rising and reached 53 in 2009.

Appendix 2

List of publications

- Proceedings of the first workshop of the Task Force: Thrust belts and Foreland Basins, Lacombe O., Lavé J., Roure F. and Vergès J., eds., **Springer, 2007**, (25 papers)
- Proceedings of the 2nd Task Force 6 workshop (Québec meeting): **Bulletin of Canadian Petroleum Geology, 2008**, edited by Donna Kirkwood, Michel Malo, Kirk Osadetz and Denis Lavoie.
- Proceedings of the 3rd Task Force workshop (Marrakech meeting): Special issue of **Tectonophysics, 2009**, edited by G. Bertotti, D. Frizon de Lamotte, A. Teixell and M. Charroud.
- Outcomes from 2007 EGU Vienna meeting: Special issue of **Tectonophysics, 2009**, edited by Magdalena Scheck-Wenderoth, U. Bayer and F. Roure.
- Outcomes from 2008 EGU Vienna and Oslo meetings: Special issue of **Marine and Petroleum Geology, 2009**, edited by M. Scheck-Wenderoth et al. (still under review)
- Outcomes from 2009 EGU Vienna meeting: Special issue of **Marine and Petroleum Geology, 2010**, edited by M. Scheck-Wenderoth et al. (collect of papers has just started)
- Proceedings of the 5th Task Force workshop (Abu Dhabi meeting): our objective here is to edit a Special issue of **Arabian Journal of Earth Sciences, 2010**.
- Worth to mention also a review paper, contribution of the Task Force to the Deep Earth topic of the International Year of Planet earth: Roure F., S. Cloetingh, M. Scheck-Wenderoth and Ziegler P., 2009. Achievements and challenges in sedimentary basins dynamics. **Springer**, International Year of Planet Earth, **Special Volume on Deep Earth**, in press.

Appendix 3

Budget summary

2005 Budget (SGF-SGE-ILP meeting)

in:

2005 ILP contribution:	5000	US\$
Shell and Total sponsorship:	12500	Euros
Conoco sponsorship:	2500	US\$
Registration fees (SGF account):	17500	Euros

out:

Conference cost (lunch buffets, coffee breaks, local support):	25000	Euros
15 travel grants:	4400	Euros

2006 Budget

in:

2006 ILP contribution:	4500	Euros
Shell and Total-Canada sponsorship:	7500	Euros

out:

11 travel grants and registration:	5800	Euros	
	and	3750	Canadian\$
Proceedings Springer volume (lay-out and colour pages)	10000	Euros	
(this extra cost was partly covered by the surplus of 2005 registration fees from 2005 SGF-ILP meeting in Paris)			

2007 Budget

in:

2007 ILP contribution:	4000	Euros
Extraordinary ILP contribution for securing 2008 Ensenada venue:	4000	Euros
MAPG direct contribution to 5 key note speakers (6000 Euros) and 3 organizers (5000 Euros), amounting to:	11.000	Euros

out:

6 travel grants for Marrakech meeting:	2400	Euros
Support of 5 key notes and 3 organizers (Marrakech):	11.000	Euros
First deposit for Coral Hotel Ensenada:	4.172,99	US\$

2008 Budget

in:

2007 balance:	1600	Euros
2008 ILP contribution:	3500	Euros
Schlumberger sponsorship (Ensenada)	4000	US\$

out:

2nd deposit Coral Hotel (Ensenada)	4.172	US\$
3 travel grants Ensenada:	2.100	Euros
40 copies of Springer volume on the Geology of Morocco:	1.000	Euros

2009 Budget (still preliminary)

(the Abu Dhabi conference venue is directly sponsored by Ministry of Energy of UAE and local companies, i.e. ADCO, ZADCO, ADMA, and Exxon-Mobil + Schlumberger)

in:		
2009 ILP contribution		Euros
Registration fees (SGF account):		Euros
out:		
10 travel grants for Abu Dhabi	7600	Euros
Proceedings		Euros
(to be covered by registration fees and ILP 2009 contribution)		