
Workshop Conveners
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WORKSHOP RATIONALE
Studying rifted margin systems: Where do we stand and where do we go next?
Theoretical modeling provides an essential complement to observational and experimental approaches and a fundamental tool to test conceptual models. Increasing computing capacities and power combined with methodological and algorithmic developments have not only increased our ability to investigate complex geological processes operative in lithospheric extension, but also enabled modelers to use more realistic boundary conditions for their models. These "technical" improvements, however, occurred in parallel with an explosion of high-quality data from passive continental margins and rift basins and the recognition of the need to model dynamically (because of feedback effects) many of the fundamental processes involved in rifting such as mechanical, thermal, and magmatic processes, and the way these processes interact during extension. To model these processes and test predictions, a multidisciplinary approach is required. Although, in the past, single disciplines within the earth sciences have played a major role in addressing a range of important questions related to rift systems, a general understanding of the entire extensional system and all of its manifestations can only be achieved if modelers (numerical and analog), observationalists, and experimentalists strongly coordinate activities and collaborate in multidisciplinary research efforts. Although small collaborative groups already exist, we believe that they can and must be strengthened and enlarged in order to address the major outstanding questions in studying rift systems and the tensile failure of the lithosphere. A simple step forward can be achieved by the sharing of basin modeling software across the Internet. Therefore, we propose a workshop, sponsored by InterMARGINS, that aims to:

1. Facilitate information exchange and foster collaboration within the modeling community and across discipline boundaries,
2. Summarize the latest developments in extensional basin and lithospheric deformation concepts, key results (both observational and modeling), and modeling codes developed over the last few years,
3. Benchmark basin and lithospheric codes in terms of temperature structure, strain rates, subsidence/uplift patterns in space and time,
4. Identify and generate a set of fundamental lithospheric extension observations (geological, onshore and marine geophysical, petrophysical, and petrological data) for constraining and testing theoretical and conceptual models,
5. Initiate an active web site for preservation and dissemination of data and modeling code upgrades (for teaching purposes). The site will be created and maintained by the U.S. MARGINS Office, consistent with other MARGINS-supported workshops, with help from the workshop organizers.
A main focus area for the modelers is a benchmark comparison of a number of “standard” cases. These will be defined by prescribing geometry, boundary and initial conditions, and the physical parameters governing thermodynamics and rheology. The workshop proponents, with input and advice from a workshop steering committee (to be assembled with the help of the InterMARGINS Steering Committee), will provide a number of benchmark tests, starting with simple extension case studies and gradually adding complexity (time-dependence, variable rheology, more realistic fault geometries, both two-dimensional and three-dimensional). The description of these cases will be distributed well in advance of the meeting and the participating modelers are expected to bring their best solutions, together with a documentation of the method, computational efficiency, and resolution tests.

“Non-modelers”, i.e., experimentalists and observationalists, will be expected to prepare an objective overview of the fundamental constraints that their mapping or analyses can provide on the mechanical, rheological, thermal, and structural development of extensional systems, and to participate in the discussion of the feasibility of the various proposed models. We include under this heading the important experience and insights offered by researchers working with analog and analytical extensional systems. The workshop deliberations and overviews will be crucial in identifying and defining a set of fundamental observations (geological mapping, onshore and marine geophysical multi-channel seismic reflection data and seismic refraction data, drilling data and petrophysical and petrological data) for constraining and testing theoretical and conceptual models of lithospheric extension.

We believe that the above objectives are best accomplished in a workshop with a limited number of participants (about 40 maximum). However, in order to ensure that the workshop results are accessible for the whole scientific community, we envisage that all invited presentations and the ensuing discussions will form the basis of an InterMARGINS-sponsored publication. The workshop organizers will serve as editors of the book. For accuracy, each presenter (invited presentations, short presentations, and discussions) will have ample opportunity to review their material prior to publication. We will compile the “best estimates” of the benchmark solutions, the presentations of the experimentalists’ and observationalists’ overviews, the various short presentations, general discussions, and the main conclusions and recommendations of the workshop for publication. Columbia University Press will be approached to publish the book as part of the general U.S. MARGINS agreement to publish a "MARGINS Theoretical and Experimental Earth Science Series". A workshop summary will be included in the InterMARGINS and U.S. MARGINS newsletters (and in other European and Australasian MARGINS newsletter if requested).

We hope that this first InterMARGINS workshop will produce new ideas on how modelers, observationalists, and experimentalists can strengthen their collaborative efforts (sharing of basin modeling codes, compatibility of data sets) to address common problems and identify what type of observations and experiments are necessary to better understand and model rift systems.
WORKSHOP FORMAT
The workshop will comprise three different but intimately related components, which are:

• A series of invited presentations, which will: 1) summarize the latest research and results dealing with lithosphere extension modeling and mapping, 2) summarize new algorithms and engineering applications that could be employed to model the deformation of the lithosphere, and 3) summarize the pertinent observations and experiments crucial for constraining and testing models of lithospheric deformation and basin evolution.

• A set of smaller presentations (or “mini-talks”) will be scheduled, based on abstract submission at the time of application, to allow workshop attendees to present their own work and views (alternative ideas, results and concerns) relative to the themes outlined above. There will be two types of mini presentations, those that follow the keynote presentations (thematic mini presentations) and general mini presentations presented on Thursday, in which attendees are encouraged to present topics not previously discussed at the workshop or topics that should be amplified – General mini presentations: 10 minutes, 2-3 overheads and/or Quicktime movies maximum; Mini thematic presentations: One overhead/one idea/one comment/max 2 minutes.

• Presentations from groups in terms of how their codes have performed on the assigned experiment and presentations from observationalists and experimentalists highlighting recent work and results as per the “application prerequisites (see below)”.

• Three field trips, which are an integral part of the workshop theme and which are intended to reinforce the theme of the invited and short presentations and to underscore the importance of including pertinent and critical observations not presently encapsulated in the modeling efforts. Most importantly, summary of the field trip discussions will be used to help identify and generate a set of fundamental lithospheric extension observations (geological, onshore and marine geophysical, petrophysical, and petrological data) for constraining and testing theoretical and conceptual basin models. The field excursions are therefore not just a “convenient break” during the workshop, but are an attempt to integrate at a fundamental level the field geology of extensional systems with basin and lithosphere deformation modeling.

PROPOSED WORKSHOP LOCATION
As a field workshop location, we propose the town of Pontresina, located in the highest-altitude valley that branches off from the Upper Engadine and about 10 km from St. Moritz, Switzerland (http://www.pontresina.ch/011stm_010000_de.htm). Our choice is based on the following arguments:

• In the Engadine region of Eastern Switzerland, remnants of the ancient Adria rifted margin are spectacularly exposed and preserved on a seismic scale. These structures allow us to observe deformation structures and the stratigraphic record of the rifting process from onset in the proximal margin to the final stages of rifting in the distal margin and the formation of the ocean-continent transition zone.
• We get people out of their working environments and into a locale where there is complete immersion in the workshop objectives and interaction with attendees.
• The region is easy to access (within about 3 hours by train from Zurich). Transport will be organized by the conveners for Zurich-Pontresina (return).
• In the area, there are several places where accommodation and state-of-the-art equipment for conferences, including Internet access, exist at reasonable prices.

**WORKSHOP DATES & DURATION**
We have estimated a total of 5.5 days in the second week of July, 2004 (11-16 July) for the workshop. The assignment of time for each theme will be approximately: 1) 1.5 days for presenting modeling results and benchmarking the basin modeling codes, 2) 1 day to introduce and explain the observational aspects of extensional systems and to highlight what basin modeling codes need to include, predict, or simulate, and to define a list of critical predictions, and to outline future directions for modeling applications, 3) 1 day for the short presentations and resulting discussions, and 4) 2 days for the field trips to see the nature and importance of such observations.

Participants will arrive at the workshop venue during Saturday afternoon and evening of July 10, 2004, and the meeting will commence with a reception that evening. Five and one-half days will be devoted to keynote presentations, participant show-and-tell, field trips, and work sessions designed to benchmark code and generate a set of fundamental lithospheric extension observations (geological, onshore and marine geophysical, petrophysical, and petrological data) for constraining and testing theoretical and conceptual basin models. The workshop will finish late afternoon on Friday, July 16, 2004.

**POTENTIAL PARTICIPANTS AND NUMBERS**
• Numerical, theoretical, analytical, and analog basin modelers, field geologists and marine geologist and geophysicists researching extensional tectonic problems.

• In order to keep the workshop informal, maximize discussions and interactions, and to make the field trip logistics viable, the total number of participants should not exceed 40 persons (approximately 15 European, 15 US/Canadian, and 10 from Australasia). Even though this is a relatively small number of attendees compared with US MARGINS Theoretical Institutes or large international conferences, we see that the results of the InterMARGINS workshop could have a large, significant and wider impact via the proposed web site, the availability of code for teaching applications, and the inclusion of the workshop presentations and deliberations in a formal publication.

• Participant selection will be based on researchers responding to a workshop advertisement (in EOS) and providing an abstract of their work consistent with the goals of the workshop. We envisage two main groups of participants: 1) Basin modelers, who should state their interests in outlining their basin modeling or deformation code, and agree to benchmark their codes, and 2) field geologists and geophysicists, who should offer accounts of their recent observational and
experimental results and/or reviews of observational and experimental results crucial for constraining, imaging, or understanding extensional systems. The application should outline how and why their code, observations and/or experimental results are important to the workshop goals. The workshop organizers and the InterMARGINS Steering Committee will make the final selection of participants.

PROPOUNENTS/ORGANIZERS

Luis Pinheiro (Aveiro, Portugal), Gianreto Manatschal (Strasbourg, France), who will be responsible for the European proposal and field trip logistics, respectively, and Garry Karner (LDEO, Palisades, USA) who will prepare the US proposal.
IMEDL 2004 Excursions  
(led by Gianreto Manatschal)

Dates and Times TBD.

Three field trips are planned, which are an integral part of the workshop theme and which are intended to reinforce the theme of the invited and short presentations and to underscore the importance of including pertinent and critical observations not presently encapsulated in the modeling efforts. Summaries of the field trip discussions will be used to help identify and generate a set of fundamental lithospheric extension observations (geological, onshore and marine geophysical, petrophysical, and petrological data) for constraining and testing theoretical and conceptual basin models. The field excursions are an attempt to integrate at a fundamental level the field geology of extensional systems with basin and lithosphere deformation modeling.

Excursion 1: Basin geometry and stratigraphic record in the proximal margin (Il Motto, Ortler-nappe) (half-day excursion)

- preserved rift-basin architecture
- study of pre-, syn- and post-rift sequences
Excursion 2: Rift-structures in the distal margin (Err-nappe) (half day)
• preserved low-angle detachment structures
• study of pre-, syn- and post-rift sequences and their relationship with detachment faults
Excursion 3: A preserved Ocean-Continent Transition (Tasna nappe) (one day)

- preserved structure of an Ocean-Continent Transition
- importance of detachment structures and their relationships to lower crustal rocks, mantle rocks, magmatic rocks, and post-rift sediments