

An Indian-Australian research partnership

Project Title: Modelling geophysical signatures for rift tectonics and basin formation in the northern Red Sea conjugate margins through structure and rheology

Project Number IMURA0485

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Earth Sciences

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. **Advanced computational engineering, simulation and manufacture**
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

The research problem

The geometry of rift basins, ocean-continent transition and the associated thermo-mechanical processes are important for understanding geodynamic history of continental margins. The Red Sea rifted margin provides an ideal platform to understand these processes in detail because of the incipient ocean basin and the proximal conjugate rift segments. While, geophysical signatures such as the gravity and magnetic anomalies are normally used to delineate the structural heterogeneities, the multi-channel seismic reflection and refraction data provide valuable insights rift geometry, crustal transition and magmatic processes at the margin. Many earlier workers highlighted the importance of rheological control on the rift initiation and basin formation, which needs to be modelled. Integrated analysis of both seismic and potential field datasets therefore would provide ample scope for modelling tectonic and rheological history of the margin from rifting through breakup and subsequent events. The present project deals with the northern part of Red Sea ocean basin with the conjugate rifted margin segments and the coastal areas of the Arabian and Nubian shields.

Project aims

The project aims are:

1. To model crustal architecture, rift tectonics and rheological characteristics through subsidence analysis using

- gravity and seismic data
2. Kinematic reconstruction of northern Red Sea spreading ridge and the adjoining ocean basins through integrated analysis of geophysical and geological data
 3. Onshore-offshore tectonic linkage, structural heterogeneities and margin segmentation

Expected outcomes

Improved understanding of the northern part of Red Sea margin in terms of rift tectonics and rheology
Development of a geodynamic model for the evolution of northern Red Sea rift margin

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The project involves large amount of data integration, analysis and is computationally intensive. Several hypotheses on the rift basin evolution needs to be tested through modelling and simulation. Therefore, this project eminently falls within the theme 1 on **Advanced computational engineering, simulation and manufacture.**

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

Must be a post-graduate (M.Sc/M.Sc(Tech)/M.Tech) student in Applied Geophysics/Geophysics/Marine Geophysics. Candidate with adequate knowledge in computer programming are highly desirable.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Please provide a few key words relating to this project to make it easier for the students to apply.

Continental margins
Geophysical studies
Gravity, magnetic and seismic
Tectonic reconstruction
Crustal structure and Rheology