

Postgraduate Scholarship: Geophysics

Applications are invited for a PhD scholarship in Plate Tectonics/Geodynamics working with Professor Dietmar Müller's EarthByte Group at the School of Geosciences, The University of Sydney, for the project "**Towards a unified East Gondwanaland reconstruction and its implications for Himalayan Orogeny**".

The plate kinematic history leading to the separation and migration/collision of Gondwanaland fragments and the adjoining continental shelves and orogenic belts remain poorly constrained. Working as part of a team of scientists based in Sydney and Canberra, Australia and Goa, India, the objective of this PhD project is to develop more robust plate reconstructions for the rifting and breakup of Gondwana and the seafloor spreading history of the Indian Ocean, linked to geodynamic models. **This project is at the interface between geophysics, e-research and space science.** It will involve state-of-the-art numerical modeling tools, the assimilation of geophysical data into models of crustal deformation, and satellite potential field data. Specific challenges include:

(1) Using quantitative constraints from areas of continental extension to derive more robust full-fit reconstructions of East Gondwana. The earliest phases of relative motion between each of the major plates relies on analysis of continental extension and breakup. Traditionally plate reconstructions have modeled the continents as rigid blocks, but software and workflows recently developed at the University of Sydney allow us to incorporate areas of continental deformation. Deriving more robust reconstructions for the original configuration of Gondwana will involve developing deformable plate reconstructions the conjugate passive margins of India, Africa, Madagascar, Antarctica, and Australia, as well as various continental fragments within the Indian Ocean. This analysis will build on geological and geophysical data describing the crustal structure of these extended regions (crustal thickness, sediment thickness, and correlation of ancient geological terranes between continents) leading to the generation of a deforming plate model and new Gondwana fit reconstructions. These reconstructions will help to resolve ongoing controversies surrounding the fit of the continents in Eastern Gondwana and the size of Greater India prior to collision with Eurasia;

(2) Resolving inconsistencies between different published regional plate tectonic models of the Indian Ocean to generate a single, self consistent history. Key areas include the Central Indian Ocean, Wharton and Crozet basins where marine magnetic anomaly data and fracture zones from satellite gravity data will be used. The resulting reconstructions will in turn provide a more detailed history of the convergence history between India and Eurasia during the Himalayan Orogeny;

(3) Understanding the links between the evolution of the Indian Ocean and regional and global-scale plate-mantle system reorganizations. Deformable plate reconstructions for the Indian Ocean and East Gondwana passive margins will be integrated into a global plate model which will then be linked to geodynamic modeling codes. This will enable investigation of the links between mantle dynamics, especially subduction processes, lithospheric deformation and surface topography.

Successful candidates must have:

- An undergraduate degree and an Honours degree in physics, geophysics or geology
- An interest to carry out research at the interface between geophysics and e-research
- An ability to work as part of a research team
- Good communication skills, and an ability to present results both orally and in written form, in English.

Additional information about the group's research can be found at www.earthbyte.org and about related software development at www.gplates.org. Applications and enquiries should be directed to Dietmar Müller, dietmar.muller@sydney.edu.au.