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Contribution of magnetotellurics to the study of the Continental Lithospheric Break-up in East Africa

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The breakup of continents and creation of new oceans is a fundamental yet poorly understood plate tectonic process. It is essential not only in terms of fundamental Earth Sciences because it results in the formation of new plate boundaries and ocean basins, but it also has a major social impact, as it will create places of high natural hazards. Its study is yet challenging because most of the ancient margins where breakup occurred are obscured with thick piles of sediments and/or located under deep water. Among still debated topics the rift initiation and the driving forces are burning questions: What controls the strain location? How does the breakup interact with mantle heterogeneities such as plumes and inherited lithospheric fabrics? How do the forces exerted by far-field and mantle processes change during rift evolution? Particularly, the interactions between deep (mantle) and superficial (crustal) processes are controversial and topical subjects. The French project ColiBrea proposes to acquire new field, geophysical, geochemical and petrophysical data in a rifting inception place, the Tanzania rift, to constrain and test 2D and 3D models of continental lithospheric extension associated with repeated episodes of magma intrusion. This combination of data acquisition, novel inversions and models will allow to: (1) map the spatial distribution of strain in space and time using geophysical and geodetic methods; (2) constrain crust and upper mantle structure; (3) characterize the chemistry and spatial distribution of crustal fluids and magma; (4) quantify the volume of magma intruded into the crust through seismic data interpretation combined with InSAR, and (5) distinguish the role of the different processes involved in continental rifting through numerical modelling. The first stage of the project was carried out early this year with a field experiment combining seismological stations installed for 1 years and a series of co-located magnetotelluric (MT) soundings. Further work includes gravity and GPS surveys of the studied area. In this presentation we present the ColiBrea project and report on the preliminary results from the MT experiment.

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