Joint inversion and collaborative interpretations in complex geodynamical context

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Active regions concentrate different geodynamical processes sometimes with complex interactions and retroactions. In order to understand the associated lithospheric deformation and evolution, scientists deduce crustal and mantle structures from sparse, inaccurate and indirect observations. In particular, geophysics aims at retrieving physical properties of crustal or lithospheric media from gravity, electric or seismic measurements. Those indirect tools have been used for decades now to image the Earth Interior at many different scales, from the surface down to the Core.

Besides, density, resistivity or seismic velocity retrieved from geophysical inversions are sensitive to many different factors (temperature, pressure, melt, composition...), each of them impacting the parameters variously. Finally, each of these methods presents its own depth investigation and accuracy, which depends on time lap, network configuration, data wavelength, etc.

In order to distinguish the role of each factor in the lithospheric structure heterogeneity, and to counteract the different method limits, geophysicists have combined their observations in combined schemes for decades now. We will present here how jointly inverting seismic tomography and gravity may help to better understand complex zones implying melt, faults, crustal modification and plate interaction. When mathematical link between the parameters doesn't exist, we will present a combination of petrophysics and geophysics, that brings new information on past and present dynamical evolution in a magmatic area (East African Rift, Tanzania). Finally, we will address the question of the real benefit of a joint inversion, and whether we can combine all kind of data.