The consequences of hotspots on continental lithosphere: towards a new reference frame for the last 260Ma.

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Résumé

Hotspots are mantle thermal instabilities, which arise in high temperature and low viscosity zones (Olson, 1988), composed by a head and a tail. Its activity is revealed by surface and sub-surface phenomena, like volcanic trapps or volcanic ridges on the seafloor (Morgan, 1972 - Morgan, 1981). The first one is due to an eruption of the hotspot's head, and the second to the tail fed by volcanic material.Consequences of a hotspot tail travelling the oceanic lithosphere are known, but we still don't know what happens in the continental lithosphere when it travels over a hotspot tail. The aim of this study is to understand the relationship between the lithosphere deformation and the hotspot.
First, we mapped hotspot tracks on the continental lithosphere for the last 260Ma. Plate motion models are usually derived from major hotspot tracks, like the Ninetyeast Ridge, untill they are visible, i.e. 130Ma. We built a new reference frame based on oceanic and continental hotspots activities for the last 260Ma. Therefore we assumed that hotspots are fixed through time (Glisovic et al., 2012) and that their volcanic activity is irregular (Davaille et al., 2005). The data of the paleomagnetical study of Torsvik et al. (2012) and the hybrid frame of Seton et al. (2012) were used. The method consists in matching the intra-plate volcanism, submarine volcanoes or oceanic plateau with the hotspot, at a given age. This allows us to build a new hybrid frame with new constraints. Then we evaluate the hotspot impact on the continental lithosphere. A first case study has been performed for the Arabian Plate : petroleum data are analyzed in order to estimate the heat flow. The thermal diffusion time in that region is estimated, thanks to well-log data. Evidence of the hotspot thermal impact is expected.

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