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New insights on the oceanic lithosphere at La Reunion hotspot volcano

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It is now clear that the structure and the mechanical properties of the lithosphere have to be taken into account to understand how mantle plumes are expressed by surface volcanism. La Reunion, a large volcanic system in the Indian Ocean, is widely considered as the most recent expression of a mantle plume. Previous studies have suggested that it could have developed on pre-existing structures of the oceanic lithosphere such as a fossil spreading centre or a fracture zone.

Cruise FOREVER (FORmation and Evolution of the Volcanic Edifice of Reunion) of french R/V L Atalante has surveyed the oceanic plate around La Reunion Island in 2006 in order to investigate possible relationships between the structures of the plate and the emplacement of surface volcanism. The cruise collected swath bathymetry and back-scatter data, as well as magnetic, gravity, 3.5 kHz echosounder and 24-channel seismic reflection profiles. The coverage extends up to 250 km around the island.

The new data confirm that the formation and evolution of the oceanic plate in La Reunion area is more complex than in the adjacent compartments. Oceanic magnetic lineations display various directions (discussed in Bissessur et al., this meeting) and do not support a fossil axis located close to the volcano. In addition to La Reunion large volcanic edifice, the high resolution bathymetry coverage reveals numerous volcanic structures on the surrounding oceanic plate: a series of elongated ridges regularly-spaced, several elongated volcanic structures and large isolated seamounts. The seismic data, complemented by older multi-channel seismic data (cruise REUSIS, 1993), allow investigations of the oceanic plate topography beneath the sedimentary cover. Results indicate that a fossil spreading axis is unlikely to underlie La Reunion, in agreement with magnetic data interpretation, but reveal, beneath the volcano, an EW alignment of topographic highs and a N35° E topographic structure, possibly a short fracture zone. Therefore, La Reunion volcano may have developed on pre-existing lithospheric structures. The seismic and gravity data also document the flexure of the lithosphere related to Mauritius and La Reunion loading (discussed in de Voogd et al., this meeting).