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Surface wave Tomography on the Indian Plate under La Réunion Island from RHUM-RUM experiment data

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The island of La Reunion has been created by one of the most active volcanoes in the world, but the origin at depth of the mantle upwelling beneath the hotspot is still controversial. More particularly the interaction between the plume and the ridge is not known. In the framework of the RHUM-RUM project, an array of 57 french and german ocean bottom seismometers (OBS) has been deployed during one year (2012-2013) over an area of 2000 km x 2000 km centered on La Reunion Island. 15 land stations have also been installed in Madagascar, the Comoros and Mozambique. This dataset has been used to obtain a high resolution tomographic model of the South West indian area. For each earthquake-station path, Rayleigh wave fundamental mode phase velocity has been measured using the *roller-coaster* method in the period range 30-250 seconds. The total dataset consists of 3500 paths. This dataset has then been regionalized and inverted versus depth using a simulated annealing method in which the number and shape of the splines that describe the S-wave velocity model are variable. The model lateral resolution is about 500 km. We observe a good correlation between the tomographic model and surface tectonics down to about 100 km depth. At 50 km depth, a slow velocity anomaly is found beneath the hot-spot of Réunion-Mauritius islands. This slow anomaly is extended along the Rodrigues ridge up to the Indian central ridge which confirms a connection between the plume and the ridge. At greater depth (150 km) a large slow velocity anomaly is observed beneath the Réunion hot-spot elongated in the direction of the African plate motion, that may be related to the spreading of hot plume material. We also observe slow velocities beneath the hot-spots of Marion, Crozet and Kerguelen. Finally, under Comoros archipelago, the slow velocity anomaly may be the signature of the termination of the East African rift.