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Upper Mantle Seismic Anisotropy Patterns around the La Réunion Hotspot deduced from SKS-splitting measurements: Plate, Plume and Ridges signatures

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We present results of upper mantle seismic anisotropy in the Southwest Indian Ocean around the hotspot of La Réunion, deduced from SKS splitting measurements using the 'SplitLab' toolbox. Data analysed in this study were recorded by 20 terrestrial and 57 ocean-bottom three-component seismometers installed in the framework of the RHUM-RUM project (www.rhum-rum.net). Broad-band and wide-band ocean-bottom instruments were deployed around the La Réunion Island and along the Central and Southwest Indian Ridges (deployment: R/V Marion Dufresne, 2012, MD192 − recovery: R/V Meteor, 2013, M101), and recorded for 8 to 13 months.
We discuss the anisotropy signatures that are potentially induced by the absolute motion of the African Plate, by the spreading of the Central and Southwest Indian Mid-Ocean Ridges (CIR & SWIR), and by the interaction of the ascending plume with the overlying lithosphere and the neighbouring CIR and SWIR. The observed pattern displays a ridge-parallel anisotropy beneath the SWIR that suggests an along-axis upper mantle flow controlled by the thick and cold lithosphere on both sides of the ridge. We furthermore observe a coherent regional anisotropy pattern between La Réunion and the CIR. Both body and surface wave analysis suggest that this dominant flow is located at asthenospheric depths and could be consistent with a preserved feeding of the ridge by the mantle upwelling associated with the Réunion hotspot, as first proposed by Morgan (1978). Finally, we quantitatively compare the azimuthal anisotropy derived from SKS splitting with those from surface wave data.