Title:Regional Tomography targetting mantle plumes by waveform inversion: the case of La Réunion Island

January 11, 2022

Mid-plate volcanoes are well known as hotspots. They represent the surface signature of mantle plumes, nevertheless their origin and their role in geodynamics are still a challenge in the Earth sciences. Even though plate tectonics and mantle plumes were discovered at the same time, the latter cannot be explained by the former. Plumes' birth, life and death play a fundamental role on the evolution of life on Earth and on plate-tectonic reorganization. La Réunion hotspot is known as one of the largest on the Earth, that created the Deccan volcanic traps in India (almost 2 million km^2) and the death of more than 90 % of life on the Earth including dinosaurs $\sim$ 65Ma ago. So far the origin of the mantle plumes and their role in geodynamics are still unclear in Earth sciences. In that respect, we use the dataset from the French-German RHUM-RUM experiment around La Réunion hotspot (2012-2013), from IRIS data center and FDSN to extensively investigate the deep structure of the plume along its complete track from its birth to its present stage, as well as from the upper mantle to the lowermost mantle. Several shear-wave anomalies are resolved underneath Indian Ocean and the upper mantle beneath this region is fed by mantle plume rising from the core-mantle boundary. The lower mantle thermochemical dome associated to the South-African Large Low-Shear Velocity Province (LLSVP) is found to be composed of several conduits. Plume branches are highlighted at $\sim$ 900 km depth. Thermal instability and thermochemical heterogeneities in the D" layer are likely the principal reasons of the plumes birth at the core-mantle boundary, and therefore an indicator of long-life of the Réunion hotspot.