Lateral variability of slabs interactions into the transition zone: insights from 3D numerical models.

Arthur Briaud

(artur.briaud@gmail.com)

Università degli Studi Roma Tre

- Roberto Agrusta
  ENS de Lyon
- Francesca Funiciello
  Università degli Studi Roma Tre
- Claudio Faccenna
  Università degli Studi Roma Tre
- Jeroen van Hunen
  Durham University

How slabs interact with the mantle transition zone remains enigmatic. Indeed, tomographic images are becoming sharper, allowing us to apprehend the internal structure of the Earth. In some places, for instance, beneath the South American plate, there are lateral variations of slab morphology. From the North to the South, the subducting slab sinks into the lower mantle to stagnate at 660 km depth discontinuity. Previous studies show that changes in the subducting plate buoyancy, plates kinematics, surrounding mantle flow or even the width of the trench might control lateral variations of slabs. However, it remains unclear how slabs may sink across the mantle transition zone and lead to the creation of denser and colder patches of slabs' materials into the lower mantle. Unravelling how slab interacts with the mantle transition zone in 3D may help us to better constrain the solid Earth and even explain some specific surface fingerprints of subduction zones. We are working on 3D modelling of subduction using the Citcom code. The presence of the two major phases transitions of the olivine combined to a viscosity contrast between the upper and lower mantle leads the slabs to get ponding at 660 km depth. By changing the buoyancy of the subducting plate, slabs are more prone to sink deeper into the lower mantle. Such variations in slab proprieties might induce lateral changes of the deep dynamics. We found that slabs may sink spontaneously into the lower mantle and thus, lead to the formation of patches of denser material into the lower mantle. At the surface, we observe characteristic
signatures such as concavity of the trench combined to a local uplift of the upper plate. These models might allow us to explain the lateral variations of slabs at depths and the resulting surface response.