Geophysical Research Abstracts
Vol. 17, EGU2015-8107-1, 2015
EGU General Assembly 2015

Effect of slab width on the mantle flow: insights from laboratory models of free subduction

Vincent Strak and Wouter P. Schellart
School of Earth, Atmosphere and Environment, Monash University, Australia (vincent.strak@monash.edu)

Slab width is known to be an important factor controlling the dynamics of subduction zones. However, its effect on the mantle flow remains to be quantified. Crucial points to investigate are (1) how the lateral extent of the slab controls the position and magnitude of mantle upwellings located laterally away from the sub-slab domain, and (2) what is the relationship between slab width and the extent of the toroidal-component cells. This is important as the subduction-induced mantle flow controls in return deformation of both the slab and the overriding plate, and the mantle upwellings can potentially trigger decompression melting, thereby producing intraplate volcanism. We used three-dimensional self-evolving subduction experiments to test the control of slab width on the flow in a Newtonian mantle. We tested slab widths ranging from narrow (e.g., Calabria) to wider (e.g., Tonga-Kermadec-Hikurangi) subduction zones. The three components of mantle flow have been mapped at depth using a stereoscopic Image Velocimetry Technique (sPIV). The models show that both the magnitude of the upwelling occurring laterally away from the sub-slab domain and the extent of the toroidal-component of mantle flow increase non-linearly with increasing slab width.