Geophysical Research Abstracts
Vol. 20, EGU2018-8115, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Geodynamic model of subduction-induced upwelling to explain non-hotspot Samoan volcanism

Vincent Strak (1,2) and Wouter P. Schellart (1,2)

(1) Department of Earth Sciences, Vrije Universiteit Amsterdam, Amsterdam, Netherlands, (2) School of Earth, Atmosphere & Environment, Monash University, Melbourne, Australia

The origin of Samoan volcanism in the southwest Pacific remains enigmatic. Whether mantle melting is solely caused by a mantle plume is questionable because some volcanism younger than 5 Ma defies the plume model and its linear age-progression trend. We will present results of buoyancy-driven analogue subduction modelling, in which we quantified the slab rollback-induced upper mantle flow occurring around the northern slab edge of the Tonga-Kermadec-Hikurangi subduction zone. Our model results show that a broad subduction-induced upwelling is produced north of the Tonga lateral slab edge. A comparison with a new tectonic reconstruction demonstrates that the subduction-induced upwelling coincides very well with non-hotspot volcanism younger than 5 Ma. In contrast, older volcanism may be consistent with the plume model as it is located close to the predicted Samoan hotspot and far away from the Tonga slab and its slab rollback-induced mantle upwelling. Using estimates for mantle temperature we make predictions for the depth of mantle melting initiation caused by subduction-induced upwelling, Samoan mantle plume, and interaction between subduction-induced upwelling and Samoan mantle plume. We propose that volcanism older than 5 Ma can be explained by the Samoan mantle plume, whereas younger volcanism occurring far from the Samoan hotspot results from the subduction-induced upwelling that triggers melting in westward-swept Samoan mantle plume material.