Geophysical Research Abstracts
Vol. 19, EGU2017-4007, 2017
EGU General Assembly 2017

Initiation of the Andean orogeny by lower mantle subduction

Claudio Faccenna (1), Onno Oncken (2), Adam Holt (3), and Thorsten Becker (4)

(1) Università Roma TRE, Dipartimento di Scienze, Roma, Italy, (2) Helmholtz Centre Potsdam, GFZ German Research Centre Geosciences,Potsdam, Germany, (3) Dept. Earth Sciences, University Southern California, USA, (4) Jackson School of Geosciences, The University of Texas at Austin, USA

The Cordillera of the Andes is a double-vergent orogenic belt built up by thickening of South American plate crust. Several models provide plausible explanations for the evolution of the Andes, but the reason why shortening started at ∼50 Ma is still unclear. We explore the evolution of the subduction zone through time by restoring the position of the Nazca trench in an absolute reference frame, comparing its position with seismic tomography models and balancing the evolution of the subducting slab. Reconstructions show that the slab enters into the lower mantle at ∼50+10 Ma, and then progressed, moving horizontally at shallow lower mantle depth while thickening and folding in the transition zone. We test this evolutionary scenario by numerical models, which illustrate that compression in the upper plate emerges once the slab is anchored in the lower mantle. We conclude that onset of significant shortening and crustal thickening in the Andes and its sustained action over tens of million years is related to the penetration of the slab into the lower mantle, producing a slowdown of lateral slab migration, and dragging the upper plate against the subduction zone by large-scale return flow.