T52B-08: The Terminal Stage of Subduction: the Hindu Kush Slab Break-off

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The terminal stage of subduction arrives when the ocean basin is closed and the continental margin arrives at the trench. The opposite forces of the sinking slab and buoyant continent ultimately leads to break-off of the subducted slab. This process, although common in geological history, is rarely observed, because it is short-lived. Here we report new precise earthquake hypocenters, detailed tomographic images and earthquake source mechanisms from the Hindu Kush region in Central Asia, which hint at continental subduction and plate necking. Our images provide a rare glimpse at the ephemeral process of slab break-off: the Hindu Kush slablet in its uppermost section is thinned or already severed and that intermediate depth earthquakes cluster at the neck connecting it to the deeper slab. From a strain rate analysis, we deduce that the deep portion of the slab is in the process of detaching from the shallower fragment at much higher rates than the current convergence rate at the surface. The increased strain rate might arise as the buoyant continental crust, which is dragged into the subduction system in its terminal stage, resists subduction, whereas the earlier subducted mantle lithosphere pulls from underneath.

Authors

Sofia-Katerina Kufner
Helmholtz Centre Potsdam
GFZ German Research Centre for Geosciences

Arib slof Mohammad Akbar
Tajik Technical University

Anatoly Ischuk
Tajik Academy of Sciences

Bernd Schurr
GeoForschungsZentrum Potsdam

Shohrukh Murodkulov
Tajik Academy of Sciences

Christian Sipli
Australian National University

Felix Schneider
Universität Wien

Xiaohui Yuan
Deutsches GeoForschungsZentrum GFZ

James Mechlie
Deutsches GeoForschungsZentrum GFZ

Lothar Ratschbacher
Freiberg University of Mining and Technology

Frederik J Tilmann
Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences

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