Geophysical Research Abstracts
Vol. 21, EGU2019-4179, 2019
EGU General Assembly 2019

Pacific subduction control on continental deformation in East Asia and east-west extension in Tibet

Wouter P. Schellart (1), Zhihao Chen (2), Vincent Strak (1), João Duarte (3,4), Filipe Rosas (3,4)

(1) Department of Earth Sciences, Vrije Universiteit Amsterdam, Amsterdam, Netherlands, (2) Japan Agency for Marine-Earth Science and Technology, Yokohama, Japan, (3) Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal, (4) Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal

The collision between India and Asia has pushed up the Himalayas and has been the main driver for formation of the Tibetan plateau. In the current paradigm, the collision is responsible for all intraplate continental deformation in East Asia covering ∼32 million square km, stretching from Indonesia in the south to eastern Siberia in the north, including strike-slip faulting, normal faulting and backarc basin formation. The role of the Pacific and Sunda subduction zones in such deformation has been considered passive. More recently it has been suggested that the subduction zones have played an active role, but this has never been tested with geodynamic models. Here we present scaled experiments of continental deformation that for the first time model Indian indentation and active rollback of the Pacific and Sunda subduction zones. We show that only the synchronous activity and interaction of the collision and subduction zones can explain normal and strike-slip faulting in East Asia, and demonstrate that enigmatic east-west extension in Tibet, eastward continental extrusion and backarc basin formation along the East Asian margin are controlled by east-directed Pacific slab rollback. The models necessitate ∼1700 ±300 km of Indian indentation to ensure that backarc basins form in East Asia (e.g. Okinawa Trough, Sea of Japan, Kuril Basin, Sea of Okhotsk), that extension in central East Asia is limited to ∼100 km, and that eastward extrusion is limited to ∼300 km. Such Indian indentation and Indian slab advance, in conjunction with Pacific and Sunda slab rollback, implies large-scale clockwise upper mantle circulation from the Tibetan region towards East Asia, and from the Philippine Sea region along a path south of the Sunda-Banda slab wall into the Indian Ocean domain. This circulation can be reconciled with mantle seismic anisotropy and anomalous Dupal geochemistry in East Asia.