Geophysical Research Abstracts
Vol. 16, EGU2014-6624, 2014
EGU General Assembly 2014

Dynamic ups and downs of mountain belts: the Himalayas

Laurent Husson, Matthias Bernet, Stéphane Guillot, Pascale Huyghe, Anne Replumaz, Xavier Robert, and Peter Van der Beek

ISTerre, CNRS, Université Joseph Fourier, Grenoble (laurent.husson@ujf-grenoble.fr)

In many mountain belts, the record of uplift and subsidence in mountain belts is often at odds with crustal tectonics and shortening history. Fast surface uplift and exhumation of the Himalayas and Tibet and fast subsidence in the foreland basin portrays at first glance the Neogene tectono-morphic evolution of the Indian-Eurasian collision zone. Canonical explanations require a complex combination of lithospheric flexure and removal of the mantle lithosphere. Transient dynamic topography is an alternative mechanism that jointly explains all observations. At present-day, our mantle-flow model derived from seismic tomography shows that dynamic topography over the southward folded Indian slab could be responsible for the modern location of the foreland depocenter. Backwards in time, our kinematic reconstructions suggest that the stretched Indian slab detached from the Indian plate during indentation of the Eurasian plate, and gradually drifted southward underneath the Indian continent. We model the impact of the southward drift of the Indian slab on dynamic topography and show that this drift is accompanied by a southward migration of the dynamic deflection of the topography. Transient effects essentially show a prominent surface uplift of the Himalayas of $\sim$1000 m during Early to Mid Miocene, and a 6000 m subsidence of the foreland basin during the last 15 m.y. Transient dynamic topography thus explains both the uplift history of the Himalayas and subsidence in the Siwaliks basin, without any need for removal of the lithospheric mantle nor for the elastic flexure of the Indian plate.