Geophysical Research Abstracts
Vol. 20, EGU2018-1541, 2018
EGU General Assembly 2018

Impact of Cocos Ridge (Central America) subduction on the forearc drainage system

Stefanie Zeumann and Andrea Hampel
Leibniz Universität Hannover, Institut für Geologie, Hannover, Germany (hampel@geowi.uni-hannover.de)

Subduction of aseismic oceanic ridges causes uplift and deformation of the upper plate, but the impact of subducting topographic highs on drainage systems in the forearc of subduction zones has never been analyzed by numerical modeling. Here we couple a 3D finite-element model of ridge subduction to a landscape evolution model to investigate the impact of the subducting Cocos Ridge on the evolution of drainage patterns in Central America (Zeumann and Hampel, Geology, 2017). Our model results show that rivers above both ridge flanks are deflected away from the ridge crest, which explains the diverting flow paths of rivers in the upper plate above the Cocos Ridge in nature. In contrast, model rivers show only minor deflection inboard of the broad crest of the Cocos Ridge, which agrees with the observation that rivers draining the central Talamanca Range in Costa Rica flow in a southwestern direction until being deflected near the coast by the tectonically active Fila Costeña thrust belt. The temporal evolution of river network and drainage divide in our model demonstrates that the modern drainage system in Costa Rica and Panama represents an advanced stage of ridge subduction, implying that the Cocos Ridge has been subducting for at least $\sim$1.8 Myr beneath Central America. Our findings imply that subducting bathymetric highs lead to distinct patterns in forearc drainage systems, which can help constraining both the onset and history of ridge subduction.