Geophysical Research Abstracts
Vol. 18, EGU2016-13049, 2016
EGU General Assembly 2016

Improved analysis of the marine terraces and rivers of E-Corinth based on high-resolution Pleiades DEMs

Giovanni de Gelder (1), David Fernández-Blanco (1), Julius Jara-Muñoz (2), Daniel Melnick (2), Robin Lacassin (1), and Rolando Armijo (1)

(1) Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, CNRS, F-75005 Paris, France, (2) University of Potsdam, Institut für Erd-und Umweltwissenschaften, Earth Sciences, Potsdam, Germany

The Corinth rift, one of the fastest extending regions in the world, is a key area to understand the large-scale mechanics of an evolving rift system. It comprises a complicated en-echelon pattern of normal faults that shape a large, mostly asymmetric E-W-trending graben driven by large north-dipping faults located along the southern shore of the rift. The footwall of one of these faults in eastern Gulf of Corinth, the Xylokastro Fault, has been uplifted by ∼2000m during Pleistocene times, which is evidenced by presently-onshore marine sediments, a drainage reversal of several major river systems and an extensive and remarkably well-preserved flight of marine terraces. The greatly improved resolution and accuracy of present-day satellite imagery facilitates extraction of detailed topographic information. This in turn provides an encouraging possibility to refine tectono-geomorphic constraints extracted from the flight of marine terraces and the drainage networks. We used tri-stereo satellite images from the Pleiades platform of the CNES to develop a 2m-resolution digital elevation model (DEM) for an area of ∼200 km2 around the best-preserved terrace sequence between the towns of Xylokastro and Corinth. We produced a terrace map of unprecedented detail, with more terrace sub-levels than previously mapped, and improved the method of shoreline angle determination using the graphical interface TerraceM. With swath profiles perpendicular to the paleo-seacliffs we determined ∼750 estimates of the paleoshoreline. The resulting 16 terrace levels display both a long wavelength trend related to flexural uplift within the footwall of Xylokastro fault, and smaller-scale height variations in relation to secondary faults and/or natural variations in coastal morphology. To strengthen the age correlation of the terraces, we applied 2D numerical models of terrace formation to reproduce our observed geometry. This also allows us to test uplift rate variations in both space and time, which vary between 0.3 and 1.5 mm/yr depending on distance to fault, and the sensitivity to several other parameters such as our choice of sea-level variation curve. To put constraints on the effects of footwall flexure along the southern shoulder of the Corinth rift, we analysed the river drainage systems using a wider DEM combining 2-m-resolution Pleiades and 20m-resolution SPOT data. Whereas the smaller rivers incising the flight of marine terraces display knickpoints that directly correspond to the major terrace levels, the larger rivers reveal patterns related to the large scale flexure produced by slip on the graben-bounding faults. Combining these findings with a detailed mapping of the faults in map view, and the geometry of the marine terraces, allows us to sharpen our knowledge on the rates of surface uplift and put forward an in-depth discussion on the mechanisms of uplift, and the mechanical behaviour of the lithosphere in the area.