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Neogene uplift of the eastern Betic Cordillera (Spain) : new constraints from low-temperature thermochronology and stream profile analysis

Marianne Janowski (1,2), Nicolas Loget (1,2), Cécile Gautheron (3), Bertrand Meyer (1,2), Jean Van Den Driessche (4), and Julien Babault (5)

(1) Sorbonne Universités, UPMC Univ Paris 06, UMR 7193, Institut des Sciences de la Terre Paris (iSTeP), 4 place Jussieu, F-75005 Paris, France (marianne.janowski@upmc.fr), (2) CNRS, UMR 7193, Institut des Sciences de la Terre Paris (iSTeP), 4 place Jussieu, F-75005 Paris, France, (3) Univ Paris Sud, UMR IDES-CNRS 8148, Bâtiment 504, rue du Belvédère, 91405 Orsay, France, (4) Géosciences Rennes, Université de Rennes 1, Campus de Beaulieu, Rennes, France, (5) Departament de Geologia, Universitat Autonoma de Barcelona, Barcelona, Spain

The Betic Cordillera (south Spain), forms the western european ending of the peri-Mediterranean alpine belts. In the eastern Betics, uplift of the cordillera and the peripheral neogene marine basins results from recent tectonic processes (shortening linked to Africa-Eurasia convergence, dynamic topography associated with Alboran slab evolution). These processes are connected to the Alboran domain tectonic inversion subsequent to the Miocene thinning stage and exhumation of metamorphic domes. These metamorphic domes now correspond to the highest topographies in the area (e.g. Sierra Nevada, Sierra de Gador) surrounded by the neogene basins. Based on a geomorphological study of the eastern Betics, and a LT thermochronology analysis focused on the Sierra de Gador, our aim is to bring new constraints on the late-neogene topography evolution. Apatite (U-Th)/He analysis was performed on samples from the Alpujarride Complex of the Sierra de Gador and reveals an AHe cooling age of $\sim$ 9 Ma. Thermal modeling of the Alpujarride Complex, based on the new AHe and published data (AFT, ZFT and Ar/Ar on muscovite), was performed using QTQt software. The thermal model shows a very fast cooling of $\sim$ 120°C/Ma between 20 and 16 Ma associated with Miocene thinning, then a brutal stop in the cooling path between 16 and 10 Ma when the temperature remains approximately at 65°C and may be linked to a peneplanation event. Low-relief surfaces (detected by relief spatial analysis and field mapping) preserved at the summit of the Sierra de Gador could be related to this event. Surfacing is constrained by uncomfortably late-tortonian inner platform deposits on the top of the Sierra de Gador. Post-Tortonian non-resetting indicates (i) the thickness of these platform deposits has not been significant, and (ii) tortonian tectonic inversion of the domain is not expressed in the exhumation signal. On the other hand, we performed a stream profile analysis to investigate large scale neogene uplift thanks to the extraction of rivers steepness indexes. This morphometric parameter is an indirect proxy of continental domains uplift. We show that two uplift wavelengths can be determined : (i) a localized uplift centered in the sierras area and likely associated with the post-tortonian tectonic inversion of the Alboran domain, and (ii) a large scale uplift (included the internal Betics and part of the external Betics) rather associated with a dynamic topography effect.