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Recent (0-8 Ma) tectonics and exhumation processes in Cordilleras Blanca and Negra, Central Peru: Constraints from (U-Th)/He dating

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The Central Andes are a classical example of topography building in front of an oceanic subduction. However, many first order questions are still debated: How do subduction processes and observed tectonic uplift interact along the Andean margin? What is the impact of tectonic, magmatism and climate on exhumation?
The Cordilleras Blanca (6768 m) and Negra (5181 m), in north Central Peru, belong to the highest Andean reliefs. Both ranges trend parallel to the subduction zone and are separated by the NW-SE Rio Santa valley. The Cordillera Blanca pluton formed in an active subduction context at 8-5 Ma and renders an abnormal magmatic activity over a planar subduction. In contrast with the Cordillera Blanca, the Cordillera Negra is an older relief, which evolution and exhumation history has never been studied. A remarkable $\sim$200 km-long normal fault system showing $\sim$4500 m of vertical displacement since 5 Ma edges the western flank of the Cordillera Blanca. This region is a perfect target to study the impact of magmatism and subduction processes on exhumation. We perform a morphotectonic study on both cordilleras coupled with low-temperature thermochronology apatite (U-Th)/He dating to quantify these processes.
Geomorphic parameters and altitude contrasts between these two ranges indicate a differential uplift. The Cordillera Negra displays a smooth and asymmetric relief from the West to the East whereas the Cordillera Blanca shows higher and sharper relief with North/South and East/West contrasts. We obtain apatite (U-Th)/He ages for twenty samples located along vertical and horizontal profiles at different latitudes of the Cordilleras Blanca and Negra. The (U-Th)/He ages range from 13.4 $\pm$ 1.3 to 5.6 $\pm$ 0.6 Ma in the Cordillera Negra and range from 11.8 $\pm$ 1.2 to 2.0 $\pm$ 0.2 Ma in the Cordillera Blanca. We use them as inputs in QTQt tools for time-temperature reconstructions and thus to constrain the exhumation history.
Whole ages evidence a more regional exhumation than previously proposed, in both Cordilleras Blanca and Negra. Exhumation history inferred from low-temperature thermochronology ages coupled with geomorphologic characteristics suggests a regional uplift above the Peruvian flat-slab. However, ages from the Cordillera Blanca indicate higher exhumation rates than in the Cordillera Negra. We propose that the Cordillera Blanca exhumation is in addition facilitated by structural inheritance and controlled by plutonism. These processes occur as a response to the flattening of the Peruvian slab and confirm the role of the subducting plate geometry in topography building in Central Andes.