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Slab flattening driving regional uplift in the Cordilleras Blanca and Negra, Western Andes

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The Andean range topographic evolution is known to have had a strong impact on regional climate by building an orographic barrier that preserved its western flank from the south Atlantic moisture. Even if largely invoked, the impact of subduction processes on the uplift and relief building is not yet well understood in the Andes. The northern Peru is characterized by a present day flat subduction zone (3-15°S), where both the geometry and temporal evolution of the flat-slab are well constrained. The subduction of two buoyant anomalies, the Nazca ridge and the lost Inca plateau controlled the slab flattening. The highest Peruvian peaks in the Cordillera Blanca (6768 m), and the Cordillera Negra (5187 m) are located just above the flat-slab segment. Both ranges trend parallel to the subduction zone and are separated by the NW-SE Rio Santa valley. The Cordillera Blanca batholith emplaced at 8-5 Ma and renders of an abnormal magmatic activity over a planar subduction. This area is a perfect target to explore the impact of slab flattening on the topography and uplift in the Occidental Cordillera of the Andes. We present new AHe and AFT data from three vertical profiles located in both the Cordilleras Blanca and Negra. We compare time-temperature paths obtained from inverse modeling of the thermochronological data with the timing of the slab flattening, the arrival of the Nazca ridge and magmatism. Our thermochronological data evidences a regional exhumation in the Occidental Cordillera from $\sim$10 Ma. We propose that the Nazca ridge subduction below the Occidental Cordillera (11 Ma) and slab flattening (8 Ma) drive the Occidental Cordillera uplift and thus exhumation. We evidence the important contribution of the magmatism in the Cordillera Blanca exhumation and high relief building in the Occidental Cordillera. Our new thermochronological data highlight the control of both the subduction processes and magmatism on the paleogeography and uplift in the Andes. Finally, the high topography of the Occidental Cordillera in northern Peruvian Andes was not built during compressive phases but is mainly controlled by subduction processes (ridge subduction, slab flattening and magmatism).