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The Cordillera Blanca normal fault and its contribution to the Andean topographic evolution (northern Peru)

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Nature and localization of Quaternary tectonics remains largely unconstrained in Peruvian Andes as well as the mechanism driving rock uplift. The Cordillera Blanca normal fault accommodates extension in a convergent context. The fault system trends parallel to the subduction zone, just above the Peruvian flat-slab, and separate the Cordilleras Blanca and Negra. The Cordillera Blanca batholith (8-5 Ma) is an elongated pluton, emplaced at $\sim$6 km depth in the Jurassic sedimentary country rocks. The Cordillera Blanca range (6768 m) that comprises the highest Peruvian peak built the footwall of the fault. The $\sim$200 km-long fault has showed $\sim$4500 m of vertical displacement since 5 Ma. This normal fault is described as active despite the lack of historical seismicity and constitutes a striking singularity within the prevailing compressional setting of the Andean orogeny. This region is a perfect target to explore the contribution of large normal fault in relief building. Our goals are to determine if the fault was pre-existing before the Cordillera Blanca batholith emplacement, when it has been reactivated and how does it interact with the batholith exhumation. For that purpose, we focus on brittle deformation analysis from a regional scale (faults trends) to outcrop scale (fault planes, striaes and kinematics). We present here new structural data and focal mechanisms indicating a senestral transtensive component on the Cordillera Blanca normal fault and a regional extensional regime in the Cordillera Negra area. We compare the paleotensors obtained from the inversion of the microstructural data and focal mechanisms with the exhumation history deduced from the thermochronological data to constrain the role of the normal fault in relation with relief building. We propose that the Cordillera Blanca normal fault is an inherited tectonic feature reactivated in transtension after the slab flattening at $\sim$8 Ma. The differential exhumation of the Cordillera Blanca with respect to the Cordillera Negra can be explained by contemporaneous strike-slip deformation and magmatic emplacement before the plutonism cessation at $\sim$5 Ma. Finally, the regional exhumation inferred from our tectonic and thermochronological data comes in contradiction with models previously proposed for the Cordillera Blanca normal fault, which involved mainly extensional collapse.