



Erosion and isostasy driving the Cordillera Blanca uplift (northern Peru)

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In mountain ranges, surface uplift is usually assumed to be the result of shortening and crustal thickening. In northern Peru, the Cordillera Blanca hosts the highest Peruvian summits (>6000 m) and both surface and rock uplift seem closely linked to the Cordillera Blanca normal fault (CBNF) which delimits the western flank of the Cordillera Blanca. Several models have been proposed to explain the presence of this major normal fault in such a compressional setting but both the presence of the CBNF and the Cordillera Blanca recent rapid uplift remain enigmatic. This raises numerous questions about the role of normal faulting in the formation of such high topography at Myrs to kyr time-scales. Therefore, to understand the nature of the processes driving normal faulting and relief creation in the Cordillera Blanca is a fundamental question. The Cordillera Blanca morphology shows that it has been strongly affected by glacial erosion and, therefore, that a significant mass of rocks has been removed. The impact of erosion and isostasy on the Cordillera Blanca uplift has, however, never been explored. Here, we attempt to evaluate the contribution of erosion and associated flexural rebound to the uplift and exhumation of the Cordillera Blanca using numerical modelling of landscape evolution (FastScape). We performed joint inversions of the present day topography and thermochronological data to provide new independent constraints on model parameters controlling the uplift, erosion and thermal history of the massif: i.e. the erosion efficiency factor, the uplift rate and the temperature gradient. Our results show the strong contribution of erosion and isostasy to the Cordillera Blanca uplift. It indicates that climatic and erosion forcing is at least as important as tectonic forcing in this area. This leads us to propose a new model for the CBNF in which regional surface uplift, fault reactivation and glacial erosion control the landscape evolution and mountain building in the Cordillera Blanca.