



Resolving the uplift versus climate change dilemma for the Central Andes by means of low-temperature thermochronology and exposure age dating

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This study addresses the influence of climate and tectonics on denudation rates in the region between Pacific and the western flank of the Andes in Chile, between 20° and 40° S. Tectonic forces in this zone are set by the near orthogonal subduction of the Nazca plate beneath the South American Plate. The same zone covers a large variety of climatic conditions. To investigate possible feedback, and to quantify regional denudation rates and their temporal evolution, thermochronological and exposure age dating were used.

(U-Th)/He ages from a 1900 m vertical profile show that significant uplift and erosion of the Coastal Cordillera in northern Chile started at ~45 Ma. This indicates that uplift took place concurrent with the start of uplift of the Eastern Cordillera. According to our data, this was the last major period of denudation in the Coastal Cordillera, indicating that arid conditions must have been established during the Early Oligocene, and hence before the main period of Andean uplift in Miocene times. Exposure age dating of sediments in the Coastal Cordillera reveals concordant sedimentation and exposure ages, indicating hyperaridity for most of the past ~25 m.y. (Dunai et al 2005). Denudation rates along the Coastal Cordillera show a regional trend with the highest denudation rates found in the semiarid areas. The recurrent changes in vegetation cover in these transitional zones -related to global climate change- could explain greater rates of erosion. In contrast in humid areas, despite higher rates of precipitation, continuous vegetation cover seems to slow down erosion at geological time scales.

It has recently been proposed that the most relevant mechanism controlling the uplift of the Andes is the degree of coupling between the Nazca and South American Plates,

due to the presence/absence of trench sediments (Lamb & Davis 2003). Our data, indicating an Early Oligocene aridification, are compatible with this hypothesis that the onset of aridity could be the reason, rather than the consequence, of uplift of the high Andes. Moreover, in wetter latitudes higher onshore denudation rates could explain the occurrence of flat slab subduction in the region where we obtain the highest denudation rates, and by inference the highest sedimentation rates in the trench.

Dunai T. et al (2005) *Geology* 33; Lamb S. & Davis P. (2003) *Nature* 425