Latitudinal climate gradient co-determine the location of the Southern Andes volcanic arc

Veleda Astarte Paiva Muller [*1], Pietro Sternai [1], Christian Sue [2]

[1] Department of Earth and Environmental Sciences, University of Milano-Bicocca, Milan – Italy
[2] Laboratoire Chrono-Environnement, Université de Franche-Comté, Besançon – France

The Southern Andes volcanic zone (SVZ) is an ~1500 km long chain of volcanoes, extending between 33°-46° S on the South American Plate, above the subducting Nazca Plate. In the northern segment (33°-42° S) the location of the SVZ matches that of the water divide between rivers flowing to the Pacific and Atlantic Oceans. In the south (42°-46°S), volcanoes are systematically to the west of the water divide, and closer to the trench. Changes in the geometry of the subducting slab, crustal thickness, and basement structures are amongst the main mechanisms that control this shifting. However, the role of precipitation and erosion gradients remains elusive. Westerly winds increase the precipitation rate on the western side of the orogen south of 35°S, and generate an erosion hotspot (0.75-1.75 mm/year) exactly where the volcanic arc migrates trench-ward and westward with respect to water divide (42°-46°S). We use thermomechanical visco-elasto-plastic numerical models to elucidate the relationship between the trans-lithospheric migration and intrusion of melts into the crust, associated extensional deformation, and volcanism, accounting for the landscape evolution in response to erosion gradients. The modeling results show that leeward migration of the topographic barrier due to enhanced erosion upwind enhances asymmetric slip along normal faults, forcing the magma migration path toward the upwind side of the orogen. Latitudinal climate trends may thus affect the magma migration path, thereby setting the location of volcanic activity. Therefore, the SVZ testifies a novel example of climatic– tectonic interactions on Earth.

Mots-Clés : Andes, volcanism, active margins, deformation, geodynamic modeling

Merci de ne rien inscrire dans cette zone et ne pas modifier les marges des pieds de page et entêtes.