Patagonian Foreland burial and exhumation during Mesozoic revealed by low temperature thermochronology: a response to mantle processes?

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During the last decade, the study of the south Patagonian Andes and Antarctic area have demonstrated the occurrence of a complex mantle setup during the pre-Atlantic opening (200-140 Ma) with the formation and disappearance of an anomalous flat slab (~1000 km long), combined with the Karoo Plume development and western migration. In the Patagonian foreland, this period is characterized by plutons emplacement distant from the arc, flowed by a major volcanic income, the Chon Aike Large Igneous Province (~180 Ma to ~160 Ma). These markers are mostly seen in the Deseado Massif (~47 ° to ~48 ° S. Lat), a 350 x 200 km topographically high (between 500 and 1000 m elevation) area surrounded by Cretaceous and Cenozoic basins. The evolution of the Deseado Massif remains poorly constrained, although it is believed to be at this high topographic level since the end of the Chon Aike event.

In order to understand the pre-Atlantic opening evolution of the Deseado Massif and its potential long-term stability, we used a low temperature thermochronological approach. For this purpose, we sampled the Chon Aike deposits (rhyolite and ignimbrite) and basement rocks (~450 Ma to ~200 Ma plutons) across the Deseado Massif. The thermal history was reconstructed using new apatite (U-Th)/He data and published apatite fission tracks data. These thermochronometers are sensitive to temperature ranges from 120 ° and 40 °C, allowing to reconstitute rocks cooling and reheating history in the last kilometers of the crust. The thermal models reveal a significant Jurassic reheating event (post Chon Aike event) followed by a last cooling phase before ~100 Ma. The origin of this heating-cooling event will be discussed in relation with potential deposit accumulation/erosion, a change in the regional geothermal gradient, and finally, the eventual controls produced by the regional mantle setup.