



The Patagonian Orocline: Paleomagnetic evidence of a large counter-clockwise rotation during the closure of the Rocas Verdes basin.

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The southernmost Andes of Patagonia and Tierra del Fuego present a prominent arc-shaped structure, the Patagonian Orocline. Despite the fact that this major structure was already described by Alfred Wegener in his famous textbook in 1929, few paleomagnetic studies have been attempted to describe the rotations associated with the formation of the Patagonian Orocline. In this study we present a paleomagnetic and anisotropy of magnetic susceptibility (AMS) study from more than 130 sites obtained from the Ultima Esperanza region (NS structures at $\sim 51^\circ\text{S}$) to Península Hardy, south of the Beagle Channel at $\sim 55^\circ\text{S}$. 45 sites were sampled in early-cretaceous gabbros (gabbro complex), mid-cretaceous tonalites and granodiorites (Canal Beagle group) and Paleocene intrusive rocks (Seno Año Nuevo group) from the South Patagonian batholith, 4 sites from the late Jurassic Hardy formation, a volcanic succession outcropping in Hardy Peninsula and Stewart Island, 9 sites were drilled in the lower cretaceous sedimentary infill of the Rocas Verdes Basin, 3 sites from the Tortuga ophiolite, a quasi-oceanic crust related to the opening of the Rocas Verdes basin. 80 sites were sampled in Cretaceous to Miocene sedimentary rocks from the Magallanes fold and thrust belt and Magallanes Basin. Characteristic Remanent Magnetizations (ChRMs) obtained from the Rocas Verdes Basin tectonic province correspond to secondary magnetizations postdating the early phase of folding. Pyrrhotite is the main magnetic carrier in some of these sites. ChRMs from the South Patagonian Batholith correspond to a primary magnetization. These rocks record about 90° counterclockwise rotations south of the Beagle channel.

Few sites from sediments of the Magallanes fold and thrust belt have stable ChRM. The available paleomagnetic results show that no rotation has occurred in the Provincia of Ultima Esperanza (51.5°S), at least, for the last 60 Ma. In the southern part of Provincia de Magallanes and Tierra del Fuego (53° - 54.5°S), paleomagnetic results indicate a counterclockwise rotation of $\sim 15^\circ$ after 60 Ma.

AMS results show a good correlation between magnetic lineations and the strikes of structures of the fold and thrust belt except near the Magallanes Fagnano fault zone. On the other hand, the magnetic lineations in both intrusive and sedimentary rocks along the Beagle Channel are mainly vertical suggesting compressive deformation during pluton emplacement at ~ 90 Ma along the Beagle channel fault.

In summary, the formation of the Patagonian Orocline occurred in two stages during a period of convergence and collision of the Antarctic Peninsula with Patagonia. The first stage is associated with large counterclockwise rotations and closure of the Rocas Verdes basin during the late Cretaceous. The second stage corresponds to the formation of the curved, mainly non-rotational Magallanes fold and thrust belt during the Tertiary.

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