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Paleomagnetism of the Patagonian orocline (Tierra del Fuego, Argentina): Evidence for a pre-early Eocene (ca. 50 Ma) oroclinal bending.

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The southernmost segment of the Andes of southern Patagonia and Tierra del Fuego forms a $\sim$700 km long orogenic re-entrant with an interlimb angle of $\sim$90° known as Patagonian orocline. No reliable paleomagnetic evidence has been gathered so far to assess whether this great orogenic bend is a primary arc formed over an articulated paleomargin, or is due to bending of a previously less curved (or rectilinear) chain. Here we report on an extensive paleomagnetic and anisotropy of magnetic susceptibility (AMS) study carried out on 22 sites (298 oriented cores), predominantly sampled in Eocene marine clays from the external Magallanes belt of Tierra del Fuego. Five sites (out of six giving reliable paleomagnetic results) containing magnetite and subordinate iron sulphides yield a positive fold test at the 99% significance level, and document no significant rotation since $\sim$50 Ma. Thus, the Patagonian orocline is either a primary bend, or an orocline formed after Cretaceous-earliest Tertiary rotations. Our data imply that the opening of the Drake Passage between South America and Antarctica (probably causing the onset of Antarctica glaciation and global climate cooling), was definitely not related to the formation of the Patagonian orocline, but was likely the sole consequence of the 32$\pm$2 Ma Scotia plate spreading. Well-defined magnetic lineations gathered at 18 sites from the Magallanes belt are sub-parallel to (mostly E-W) local fold axes, while they trend randomly at two sites from the Magallanes foreland. Our and previous AMS data consistently show that the Fuegian Andes were characterized by a N-S compression and northward displacing fold-thrust sheets during Eocene-early Miocene times (50-20 Ma), an unexpected kinematics considering coeval South America-Antarctica relative motion. Both paleomagnetic and AMS data suggest no significant influence from the E-W left-lateral Magallanes-Fagnano strike-slip fault system (MFFS), running few kilometres south of our sampling sites. We thus speculate that strike-slip fault offset in the Fuegian Andes may range in the lower bound values ($\sim$20 km) among those proposed so far. In any case our data exclude any influence of strike-slip tectonics on the genesis of the great orogenic bend called Patagonian orocline.