Comunicaciones Nº 42 - 1991: 85 - 86
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NEW PALEOMAGNETIC DATA FROM THURSTON ISLAND: IMPLICATIONS FOR THE TECTONIC OF WEST ANTARCTICA AND WEDDELL SEA OPENING

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Paleomagnetic data from three West Antarctic crustal blocks (Antarctic Peninsula (AP), Thurston Island-Eights Coast (TI), and the Ellsworth-Whitmore Mountains (EWM) indicate that there has been motion between the individual blocks and motion relative to East Antarctica during the Mesozoic. A Triassic paleomagnetic pole from the TI block (116°E, 61°S, A_{95}=19.4°, N=3 VGPs) appears to indicate that the block has rotated ~90° relative to East Antarctica between 230 Ma and 110 Ma. Our previously reported Middle Jurassic paleomagnetic pole from the EWM block indicates that a 90° rotation relative to East Antarctica occurred sometime between the Cambrian and 175 Ma. We believe that the 90° counterclockwise EWM rotation occurred between ~ 220 Ma and 175 Ma related to the development of post-Gondwanide Orogeny shear zones. The motion of the AP, TI, and EWM blocks appears to be linked during the mid- to - late Mesozoic to three major events in the evolution of the southern ocean basins. Opening in the Mozambique-Somali-Weddell Sea basins may have produced major counterclockwise rotation of the TI block with respect to East Antarctica between the Jurassic and Early Cretaceous based on new Late Jurassic (145°E, 64.5°S, A_{95}=7°, N=5 VGPs) poles. We believe that the TI rotation, as well as deformation in the southern AP block, was caused by collision and shearing of the EWM block against the other two as the EWM block moved southward with East Antarctica. An Early Cretaceous paleomagnetic pole (232°E, 49°S, A_{95}=7.9°, N=5 VGPs) from the TI block requires that between the Early and mid-Cretaceous there was clockwise rotation, with

respect to East Antarctica, of the AP-TI-EWM blocks (an entity we call Weddellia). A change in the opening history of the Weddell Sea basin caused by initiation of speading in the South Atlantic ocean basin at ~130 Ma probably started Weddellia's clockwise rotation. Two new ~110 and ~90 Ma poles from the TI block (210°E, 73°S, A_{95}=7.6°, N=7 VGPs and 161°E, 81°S, A_{95}=3.9°, N=18 VGPs, respectively) are similar to equivalent age poles from the AP block and East Antarctica and indicate that Weddellia was at or near its present-day position with respect to East Antarctica by ~110 Ma. This corresponds to a time of major plate reorganization in the South Atlantic and southeast Indian Oceans. Based on both the new TI paleomagnetic data and previously reported data from Marie Byrd Land (MBL), dextral shearing would be expected to have occurred between MBL and Weddellia since the mid-Cretaceous. Pine Island Bay, the area between the TI and MBL blocks, marks a fundamental and complex tectonic boundary in West Antarctica that we propose has largely been a zone of transcurrent shearing.

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