Structural Controls on the Origin of Regolith-Hosted Rare Earth Elements Deposits at the Coastal Cordillera, Central-Southern Andes (35°–37°S)

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In the coastal range in the southern-central Chilean Andes (35°–37°S), regolith-hosted rare earth element (RH-REE) deposits have been discovered in recent years. These deposits develop on pediplanes where in situ weathering of REE-bearing host rocks and minerals has occurred. However, the structural controls on the genesis of these deposits remain unknown and may be dual. First, regional brittle fault zones localize fracture networks in damage zones adjacent to fault cores, increasing host-rock potential for weathering. Second, neotectonic faults may shape the landscape by generating morphologies favorable for weathering. Our preliminary results indicate the existence of two groups of faults and shear zones: the Pichilemu-Arauco faults (PiAF) and the Andean transverse faults (ATF). The PiAF are N- to NE-striking transpressional synmagmatic shear zones, which govern the emplacement of Carboniferous batholiths. The ATF are NW- to WNW-striking faults with sinistral and sinistral-normal kinematics and control the occurrence of NW-SE–oriented Triassic continental sedimentary basins and hypabyssal stocks. Both the PiAF and ATF show a late episode of transtensional brittle reactivation resembling neotectonics of specific ATF segments at the northern termination of the study area. Comparison of the structural data to published geomorphological models reveals several areas where regional faults limit regional pediplanes (e.g., 14 × 8 to 5 × 2 km^2), suggesting a neotectonic control in the formation of the landscape. Overall, results suggest that faults and shear zones increase the prospective potential for RH-REE deposits, especially when they limit pediplanes and affect host rocks with adequate REE-bearing mineralogy.