RENE-5: Fallas y circulación de geofluídos en la corteza: Sistemas activos y fósiles

The Piuquencillo Fault System: a long-lived, lithospheric-scale, arc-oblique fault system and its relationship with magmatism and hydrothermal activity

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Lithospheric-scale fault systems control the large-scale permeability of the crust and lithospheric mantle, and their proper recognition is fundamental to understand the distribution and geometry of mineral deposits, volcanic complexes, and geothermal systems. However, their manifestations in the present-day surface can be very subtle, as in many cases they are oriented oblique to the axis of younger magmatic arcs and can be obliterated by younger, arc-parallel faults and by volcanic and sedimentary deposits through which the fault has to propagate vertically. The Piuquencillo Fault System (PFS) was defined during regional studies around the El Teniente porphyry Cu-Mo deposit. Later studies suggest that the PFS is part of a major NW-striking continental-scale discontinuity, which includes faults identified in the coastal cordillera, and that it acted as a major boundary between two segments of the intra-arc Abanico Basin. Here we present the first detailed field study of the PFS, based on data from 82 structural stations distributed across all the Western Main Cordillera of central Chile. The first published U-Pb zircon ages for the La Obra batholith, which is bounded to the south by the PFS but it is also affected by younger reactivations of it, were obtained. They yielded 20.79 ± 0.13 Ma (granodiorite) and 20.69 ± 0.07 (monzogranite). Statistical analysis of fault plane data shows that the presence of the PFS is reflected on a strong preferred NW to WNW strike, with variable dip directions, evident from the analysis of the total fault plane population and also from individual segments of the PFS. In some segments, the presence of major NE to ENE-striking faults which intersect the PFS is also reflected in the preferred orientation of fault planes. Kinematic and dynamic analysis of fault-plane data reveals that most of the fault system was reactivated with sinistral ± reverse kinematics during the Neogene, under a transpressive regime with ENE-directed compression. Detailed kinematic and dynamic analyses were completed for various segments of the PFS and also for the different rock units affected by it. Syn-tectonic actinolite is currently being dated (40Ar/39Ar method) to establish the absolute age of sinistral-reverse reactivation. Our study supports the concept that the PFS correspond to a lithospheric-scale fault system which strongly controlled deformation and the flow of magmas and hydrothermal fluids during the Neogene.