Structural Control on Fluid Flow Pathways and Vein/Ore-Shoot Emplacement at the Au-Ag LSE Pampa Paciencia Deposit, Antofagasta, Chile

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The Pampa Paciencia deposit (56-64 Ma) is part of the Paleocene mineral belt, 57 km SW from the city of Calama. It is divided into three zones: north, central and south, central being the most important one and the focus of this study as it hosts the Paciencia vein system (PPVS). The PPVS is made up of three sub-vertical, NW-oriented veins: Paciencia Oeste, Paciencia, and Paciencia Este.

A total of 68 structural measurements were taken at surface (faults and veins) and summarized in six stations as rose plots. Riedel diagrams were generated using a hypothetical σ_1 at the syn- and post-mineralization stage. An RTP magnetometry map was interpreted with the predicted kinematics from the riedel diagrams. Au, Ag, Bi, Zn, Cu, and Pb values were numerically modelled on the PPVS vein solids to define the ore shoots and fluid flow pathways.

Syn-mineralization NNW σ_1 would have nucleated the PDZ, R, and T fractures along the pre-existing NW anisotropies observed in RTP magnetometry, controlling the vein emplacement (banded vein and siliceous breccia). A post-mineral event with an E-W σ_1 would have deformed the vein along strike, generating the limonitic breccia, and also NE dextral strike-slip faults (R' faults) (mapped in station 2) that would displace the PPVS and rotate the system 10°. Two ore shoots were identified, one in the Paciencia vein (biggest) and the other in the Paciencia Oeste vein. The first one is interpreted to be generated by a fault bend mode II and the second one by a lithological contact. Geochemical modelling supported this, showing high concentrations of Zn, Cu, and Pb in the deep zones and Ag and Bi in the shallow zones of the shoots.

This study shows the structural evolution of the PPVS as well as the mechanics and distribution of the ore shoots.