

Tectonic Controls on Long-Lived Sn Mineralization in the Martinamor Extensional Dome (Salamanca, Spain)

Daniel Bermejo López¹, Lorena Ortega¹, Pedro Castiñeiras¹, Lorenzo Tavazzani³, Santos Barrios², Elena Crespo¹, Cyril Chelle-Michou³, Juan Gómez Barreiro²

¹Universidad Complutense De Madrid, Spain, ²Universidad de Salamanca, Spain, ³ETH Zürich, Switzerland

Regional tectonothermal evolution plays a crucial role in the formation of mineral deposits. One of the key processes in this context is the gravitational collapse of orogens, widely documented in belts such as the Variscan. The Martinamor gneissic dome, located in the Central Iberian Zone of the Iberian Massif, is a well-constrained structure related to the late-Variscan extensional collapse. Its formation is associated with crustal delamination and exhumation along a major subhorizontal extensional detachment located at the top of the dome. The dome hosts a significant tin-tungsten (Sn-W) mineralization, including cassiterite-bearing quartz veins and pegmatites, as well as stratabound scheelite skarns.

This study focuses on cassiterite-bearing mineralization. Cassiterite U-Pb dating from different deposits reveal a prolonged mineralizing event lasting ~25 million years (324.1 ± 5.9 to 300.7 ± 5.4 Ma). The mineralization began with early pegmatitic Sn deposits and evolved into cassiterite-bearing quartz veins that formed during syn- to late-extensional deformation. These deposits occur across various levels of the Martinamor shear zone and show structural patterns consistent with progressive deformation within the extensional regime.

Our results suggest that the E2 extensional phase, traditionally constrained to 315–300 Ma, began earlier, around 325 Ma, marking the onset of local syn-collisional extension. This evolved into dominant extensional tectonics from 315 to 300 Ma. The downward propagation of cassiterite mineralization over time suggests a structural control linked to progressive deepening of the brittle-ductile transition zone and evolving detachment architecture.

Comparable mineralization ages across the Iberian Massif and in other European regions point to a regionally significant metallogenic episode. The Martinamor dome thus offers a key record of prolonged tectono-magmatic-hydrothermal activity, highlighting the importance of sustained heat flow, crustal melting, and major extensional structures in the genesis of post-orogenic Sn-W deposits.