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Timing of Variscan metamorphism and the Central Iberian paradox

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The hinterland of an orogen constitutes the area where maximum crustal thickening, due to collision, is accomplished. The Central Iberian Zone (CIZ) is the largest single section of the Variscan hinterland in the Iberian Massif. Extensive metamorphic complexes and widespread plutonism attest to this. These metamorphic complexes form a high-grade infrastructure separated from an overlying greenschist facies suprastructure by D2 ductile extensional shear zones.

U-Pb dating of monazite across the metamorphic complexes of Central Spain indicate that peak Barrovian metamorphism (M1) in the high-grade infrastructure was reached at 337-328 Ma (Somosierra, Honrrubia, Hiendelaencina), after the D1 compression. The orogen-parallel, D2 extensional event was responsible for the isothermal decompression leading to migmatization and anatexis at 325-320 Ma, and growth of low-pressure / high temperature paragenesis (M2) at 323-320 Ma, in the high-grade infrastructure (Somosierra, Tormes Dome). Upwards heat transfer across the D2 shear zones

produced local anatexis and a low-pressure metamorphic overprint of the suprastructure (Tormes Dome). This was followed by a D3 compression and upright folding of both the infrastructure and suprastructure, and local greenschist facies overprint of the infrastructure (ca. 315-311 Ma; Ar-Ar data Somosierra). Monazite dating in the Lumbrales Antiform (Salamanca) indicates that the low-pressure metamorphism and the subhorizontal D2 shearing were not synchronous throughout the CIZ, and some where developed at 316-314 Ma, apparently in associatition with the widespread plutonism contemporaneous with the D3 upright folding.

The low-grade suprastructure of the CIZ does not have any structures that evidence significant crustal thickening, in contrast to the large-scale recumbent folds and thrusts that affect the surrounding foreland. This apparent paradox suggests that the D1 crustal thickening leading to Barrovian metamorphism at 337-328 Ma had to be accomplished by thick-skinned tectonics. The D2 extensional lineations in the metamorphic complexes indicate orogen-parallel crustal flow and extrusion towards the southeast, while thrusting was taking place in the foreland at 325-320 Ma. Subsequent intrusion of the large volumes of 316-310 Ma granitoids and mantle-derived hybrid melts was associated with major transcurrent movements during the D3 event, which are most significant in the portuguese sector of the CIZ (orogen root removal and escape tectonics?).

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