A two-stage collision in the origin of Pangea: Evidences in NW Iberian Massif

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Abstract

In the allochthonous complexes of NW Iberia, the tectonothermal evolution of the continental terranes bounding the Variscan suture zone records two consecutive events of deep subduction. The Upper Units record an initial high-P/ultra-high-P metamorphic event that occurred at c. 400-390 Ma, while the Basal Units were affected by a second high-P/low-to-intermediate-T metamorphic event dated at c. 370 Ma. Continental subduction affected the most external margin of Gondwana in a context of dextral convergence with Laurussia. Development of the two high-P events alternated with the opening of an ephemeral oceanic basin, probably of pull-apart type, in Early Devonian times. This ephemeral oceanic domain is suggested as the setting for the protoliths of the most common ophiolites involved in the Variscan suture along the belt, dated at c. 395 Ma. Recent Lu-Hf zircon data obtained from these ophiolites indicate interaction between the gabbroic magmas and old continental crust. Hence, the ophiolites could not have originated in a deep ocean basin associated with a mature mid-ocean-ridge or intraoceanic subduction.

Current ideas for the assembly of Pangea advocate a single collisional event between Gondwana and Laurussia in Carboniferous times. However, the new evidence from the allochthonous terranes of the Variscan belt suggest a more complex scenario for the assembly of the supercontinent, with an interaction between the colliding continental margins that started earlier and lasted longer than previously considered. Based on modern analogues of continental interaction, the development of complex collisions, as here suggested for Gondwana and Laurussia during the assembly of Pangea, could have been the norm rather than the exception throughout Earth history.

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