Dismantling of the Variscan belt of Europe and early fragmentation of the Pangea: The key role of the Paleotethys subduction

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Résumé

The Variscan belt of Europe recorded a long period of reorganization from the late Carboniferous to the middle Permian that coexists with the final assembly of the Pangea and its early dismantling. We have undertaken 3D tectonic reconstructions by considering structures, magmatic and metamorphic evolutions, and modern paleo-geodynamic reconstructions, to understand the interaction between deep mantle, far-field, and body forces in the Pangea superplate. We propose a scenario that highlights the key role of the Paleotethys Ocean that underwent subduction processes in the core of the imperfect Pangea superplate. The initiation of the subduction of the Paleotethys induced by the final consumption of the Rheic led to the formation of a non-cylindrical belt, i.e., an intracontinental orogeny (Alleghanian) and an ocean-continent active margin. The Paleotethys subduction led to back-arc type extension in the southern European realm and the creation of a free-edge absorbing part of the material transfers associated with the dismantling of the Variscan belt by trench-directed deep crustal flow and strike-slip tectonics. It shows that gravitational collapse is not the only cause of a rapid return to equilibrium of the Variscan crust as the later was favored by the ongoing subduction of the Paleotethys and associated slab retreat since the Late Carboniferous. Moreover, the early dismantling of the Pangea superplate induced by back-arc and wide-rift extension in Early Permian was favored by the weakening of the continental lithosphere (i.e., the overriding plate) due to delamination processes in Late Carboniferous.

Mots-Clés: Rifting, horizontal strain partitioning, back, arc extension, Paleotethys

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