

The Alpine puzzle and its link to the Tethyan and Atlantic paleogeographic evolution

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The paleogeographic evolution of the Alpine system in Western Europe has been the subject of numerous scientific debates between different schools. However, none of them can convincingly explain the interaction between the European, Iberian and Adriatic plates during their separation and subsequent amalgamation. Rifting separated strong lithospheric domains (e.g. Adria, Iberia and other micro-plates) and led to strongly extended basins floored by exhumed crust and/or sub-continental mantle or even by proto-oceanic crust. These basins formed as the consequence of multiple rift events from the Triassic in the east (Meliana/Vardar/Eastern Mediterranean), to the Lower-Middle Jurassic (Alpine Tethys: Liguria, Piemonte, Valais) to Late Jurassic and Early Cretaceous to the west (Iberia/Orphan/Biscay/Pyrenees) leading to a final breakup in the southern N-Atlantic domain in Aptian/Albian time. Subsequent convergence initiated in middle Cretaceous in the east (eo-Alpine event >84Ma) before it stepped into the Alpine/Pyrenean system (<84Ma). Two major phases characterized the Alpine domain: a meso-Alpine phase corresponding to the subduction of the Alpine Tethys (84 to 35Ma) and a neo-Alpine phase that was linked to a re-organization and retreat of the subduction in the Mediterranean domain simultaneous with convergence in the Western Alps and Apennines. The Alps s.str. are the cornerstone of this system and resulted from the reactivation of multiphase Mesozoic rift systems during different stages of subduction and collision. In the course of this evolution parts of the Alpine system flipped from a lower to an upper plate position of the active subduction, adding additional complexity to the metamorphic and structural evolution of some domains. Unravelling the jigsaw-like arrangement of the different micro-plates and related timing and kinematics is a complex task and can only be achieved if the Mesozoic paleogeographic evolution of the Tethys and Atlantic rifts/rifted margins are integrated in the Late Cretaceous – Cenozoic convergence between African and Europe. In our presentation we review the paleogeographic evolution of the Tethys-Atlantic systems and discuss, using examples, their role in controlling the subsequent subduction and collisional systems in the Alpine domain in Western Europe.