Kinematic reconstructions of the Western Mediterranean area since Triassic time: possible scenarios and their implications for the Apennines

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The Western Mediterranean-Alpine belt is remarkable for its tectonic complexity, i.e. strong arcuation of plate boundaries, fast trench retreat, upper-plate extension and switch of subduction/collision polarity around the Adriatic plate (Adria). The kinematic evolution of the Western Mediterranean area is enigmatic due to the intermittently motion of small continental plates (Adria, Iberia and Sardinia-Corsica) that are caught between two major plates (Africa and Europe), converging since Cretaceous time. Reconstructing the past motion of these micro-plates is challenging due to the strong deformation of their boundaries but is key to understand the geodynamic evolution of the whole area.

The Neogene tectonic evolution is well constrained using magnetic anomalies and transform zones in the Atlantic Ocean for the motion of Europe, Iberia and Africa, and by reconstructing the amount of convergence along fold-and-thrust belts (Apennines, Alps, Dinarides, Provence) and coeval divergence along extensional basins (Liguro-Provencal and Tyrrhenian basins, Sicily Channel Rift Zone) for the motion of Adria and Sardinia-Corsica. Those reconstructions show that Adria had a slight independent motion from Africa and rotated counter-clockwise of about 5° relative to Europe since 20 Ma. However, uncertainties increase and debates arise as one goes back in time. The main debates concern the past motion of Iberia and where its motion relative to Europe is being accommodated in Mesozoic time. Different kinematic scenarios have been proposed depending on the interpretation of paleomagnetic dataset of Iberia, magnetic anomalies in the North Atlantic, and geological-geophysical record of deformation in the Pyrenees and between Iberia and Sardinia-Corsica. Those scenarios have different implications for the tectonic evolution of the Apennines, especially for the Permian-Triassic paleo-tectonic setting of Sardinia, Calabria and Adria, and for the extent and timing of closure of the Liguro-Piemont Ocean. It is important to discuss those implications to better understand subduction processes in the Apennines and their driving forces.