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From Tethyan Oceans to the Western Mediterranean I - Plate reconstructions from the Present back to the Early Mesozoic

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A new reconstruction of the branches of Alpine Tethys combines available plate kinematic models of Africa-Europe motion with a wealth of new geological and geophysical data (seismic tomography and paleomagnetics) to shed light the evolution of the Western Mediterranean-Alps system, from sea-floor spreading through subduction to collision. Unlike previous models which relate the fate of Alpine Tethys solely to relative motions of the African plate with respect to Europe during opening of the Atlantic, our reconstruction invokes motions and rotations of four additional and temporarily independent microplates: Adria, Iberia, Alcapia and Alkapecia. Translations and rotations of these microplates with respect to Europe are constrained in the following way: (1) The retro-translations of Adria back to 94 Ma are obtained from shortening estimates in the Alps along geological-geophysical transects of the Alpine orogen and from geobarometric estimates of subduction depth in tectonic units that underwent high-pressure and ultrahigh-pressure metamorphism. Rotations are based on paleomagnetic data of Márton et al. (in press); (2) Iberia follows the motion paths of Savostin et al. (1986), based on magnetic anomalies in the Central and Northern Atlantic; the Corsica-Sardinia block later rifted from Iberia leading to Burdigalian opening of the Liguria-Provençal basin (Serranne 1999). (3) The Alcapia microplate, whose name is derived from the acronym ALCAPA (Alps-Carpathians-Pannonian Basin), separated from Adria in Cretaceous times. Its movement with respect to Adria was absorbed by Cretaceous orogeny in the Eastern Alps, constrained by the Adria-Europe displacement and rotation path; later, during Cenozoic orogeny in the Alps, associated with the closing of the Alpine Tethys, it became part of the Adria microplate again. (4) The introduction of an independent Alkapekia continental fragment and independent microplate during the Late Cenozoic only (Alboran-Kabylia-Peloritani-Calabria; Michard et al. 2002) is rendered necessary for two principal reasons: (a) the contrasting tectonometamorphic evolution of the West Ligurian Ocean (future Alps-Corsica-Betics) and the East Ligurian Ocean (future Apennine) make it necessary to kinematically decouple the fate of these two branches of Alpine Tethys located on opposite sides of the Alkapekia continental block; (b) Alkapecia that was formerly part of the African and/or Adriatic plate overrode parts of the Iberian, African and Adria plates as an independent continental microplate during Late Cenozoic rollback subduction leading to the present-day Betic-Rif arc and the Calabrian Trench-Arc system. Our complex five-plate model provides an explanation of the equally complex evolution of the Western Mediterranean-Alps system, as discussed in part II of this contribution (Handy et al.).

Márton, E., Zampieri, D., Grandesso, P., Ćosović, V., Moro, A., submitted to Tectonophysics. New Cretaceous paleomagnetic results from the foreland of the Southern Alps and the refined apparent polar wander path for stable Adria.

Savostin, L.A., Sibuet, J.-C., Zonenshain, L.P., Le Pichon, X., Roulet, M.-J., 1986. Kinematic evolution of the Tethys belt from the Atlantic ocean to the Pamire since the Triassic. Tectonophysics 123: 1-35.

Séranne, M., 1999. The Gulf of Lion continental margin (NW Mediterranean) revisited by IBS: an overview. In: B. Durand, L. Jolivet, F. Horvath, M. Séranne (Editors), The Mediterranean Basins: Tertiary Extension within the Alpine Orogen. Geological Society, London, Special Publications 156: 15-36.

Michard, A., Chalouan, A., Feinberg, H., Goffé, B., Montigny, R., 2002. How does the Alpine belt end between Spain and Morocco? Bullétin Societé géologique de France 173: 3-15.