



The fate of Alpine Tethys in light of Jurassic-Tertiary plate motions between Europe and Africa

M.R. Handy (1), R. Bousquet (2), E. Kissling (3), and D. Bernoulli (4)

(1) Dept. Earth Sciences, Freie Univ. Berlin (mhandy@zedat.fu-berlin.de, +49-30-838-70734), (2) Inst. Geowissen., Univ. Potsdam, Germany (romain@geo.uni-potsdam.de, +49 -331-977-5060), (3) Inst. Geophysik, ETH-Zürich, Switzerland (kissling@tomo.ig.erdw.ethz.ch, +41-1-633-1065), (4) Geol.-Pal. Inst., Univ. Basel, Switzerland (Daniel.Bernoulli@unibas.ch, +41-61-267-3613)

We propose a new reconstruction of Alpine Tethys (Piemont-Liguria basin = PL, Valais basin = V) based on estimates of shortening, extension, burial and exhumation in the Alpine chain. These constrain Jurassic-Tertiary motion of the Adriatic plate with respect to other small plates (Iberia, Alcapa) between Europe and Africa. Alpine Tethys opened and then closed in three stages: (1) E-W spreading of PL (400-600 km wide, 165-145 My) was linked to subduction of Triassic Tethyan oceanic lithosphere in the E (Meliata-Meliac-Vardar) by a putative E-W sinistral transform system; (2) This transform system then coupled opening of the Bay of Biscay and of V (100-200 km wide, 145-84 My) to intracontinental subduction and W-directed crustal nappe stacking (110-84 Ma, Austroalpine orogenesis) in the Alcapa plate, between Adria and Europe. Orogenesis coincided with E-dipping intra-oceanic subduction of PL (110-84 Ma) beneath Adria. This early subduction of PL may have been triggered by Iberia's E motion with respect to Adria, by westward delamination of Alcapa's mantle lithosphere, or by some combination of both; (3) After 84 Ma, Adria's motion changed to N-ward with respect to the other plates, leading to a second stage of subduction (70-35 Ma) of remaining Alpine Tethyan lithosphere (PL + V) attached to Europe. Adria moved faster to the N toward Europe than Africa, consistent with Eocene roll-back subduction of Alpine Tethys between Adria and Europe, and widening of the already existant Mesogea (Ionian) basin between Adria and Africa. The closure of Alpine Tethys ended with subduction of part of the European continental margin in Late Eocene time. Subducted lithosphere in this reconstruction can be correlated with high-velocity slab material imaged by seismic tomography at the base of the mantle transitional zone beneath the Alps and Apennines, as well as beneath parts of the Pannonian Basin, the Adriatic Sea and the W. Mediterranean.