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Neogene to Recent Motion of Adria, formation of the Friuli orocline, and deformation of Eastern Alps and northeastern Dinarides

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Based on deformational characteristicss and palaeomagnetism of Alps, the Adriatic microplate is interpreted to have moved first to the NW (ca. Oligocene) and later to N (mostly Miocene). In eastern sectors, the stiff South-Alpine block in front of the Adriatic microplate indented into the weak Alpine orogen and contributed to crustal thickening, exhumation of previously subducted Penninic units, and to lateral extrusion of central sectors of Eastern Alps. This scenario indicates a dextral Late Miocene-Pliocene transpressional setting in Dinarides and back-thrusting along the front of Southern Alps. As GPS data and seismicity suggest, the northward motion is still ongoing, although slowed down, and is diminishing towards north (to ca. 2.4 mm/a) and is east-directed (ca. 1 mm/a) in Eastern Alps. In this scenario, several features remain unexplained: (1) the age and mode of formation of the Friuli Orocline, a feature showing the change from ENE-strike to SE-trend of Dinarides in front of the Venetian Platform; (2) the apparent ca. 20–25 degree Late Miocene-Pliocene counterclockwise block rotation of combined Eastern Alps, Adria, and northeastern Dinarides with a pole of rotation to the SW of present Italian peninsula (Márton et al., 2003, Tectonophysics 323, 163-182; Thöny et al., 2006, Tectonophysics 414, 169-189); and (3) the sharp Pleistocene sediment accumulation (1 mm/a) of northern Adria (around Venice) in front of the Friuli Orocline (Stefani, 2002, Sed. Geol. 153, 43-55).

Based on detailed field studies in Eastern Alps, I present here evidence for the motion path of Adria, particularly new arguments for post-extrusional, post-Middle Miocene and Pliocene fault reactivation and partly shear reversal in Eastern Alps in support of late-stage counter-clockwise rotation of the above mentioned block. These faults

includes E-/ENE-trending dextral segments of the Mandling fault (creating the Mandling wedge as a strike-slip duplex), the dextral Enns-Salzach fault, the dextral fault array of Görtschitz and Lavant, and Mittagskogel faults transecting the Periadriatic fault, too, and the Save-fault. Furthermore, Quaternary narrow, mostly ca. N-trending graben-type extensional structures are common in Eastern Alps and are formed either by E-W extension according to N-S compression or by extension adjacent to

Sedimentological data from the borehole Venice 1 in front of the Southalpine frontal thrust indicate a cyclic change between two sources, siliciclastic (Po) and carbonatic (Piave). These changes can tentatively be correlated with changing palaeogeography due to Pleistocene eustasy, base level change and glaciation. Bearing this in mind and the great thickness of Pliocene and Quaternary deposits on the Venetian Platform, this opens the opportunity to distinguish climatic and tectonic effects and source-sink relationships. The sharp subsidence of Northern Adria is opposite to surface uplift to the N of Alps and Pannonian basin and could be explained by flexural loading or by slab pull in front of a slab tear as slab-break-off at the transition southeastern Alps to Dinarides has been suggested by Schmid et al. (2002, Mem. Sci. Geol. Padova 54, 257–260).