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Neotectonics of the Periadriatic Fault System (Eastern and Southern Alps)

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The Periadriatic Fault System (PFS) is the surface trace of the leading edge of the present Adriatic microplate, which has indented the European lithosphere since at least Miocene time. The PFS is also the tectonic boundary between the Southern Alps with its S-directed fold-and-thrust belt and the rest of the Alps that experienced Cretaceous and Tertiary metamorphism and deformation. In contrast to other Oligo-Miocene faults in the Eastern Alps (Engadine, Brenner and Inntal faults, Friuli-Trieste and the Giudicarie thrust systems) the PFS is seismically silent. In reassessing recent GPS data of Devoti et al. [2008], we find that the northward component of Adriatic motion is accommodated primarily by the Friuli-Trieste and Giudicarie thrust belts. This is manifested by a step-like decrease of the northward-component of Adriatic convergence and a drastic reduction in the seismic activity going from south to north along the Giudicarie belt. Nevertheless, the PFS may still be active, as indicated by an M=4.8 earthquake in 2001 near Merano. Geochronological ages show no evidence for tectonic movements younger than mid-Miocene along the PFS, except along the Giudicarie thrust system where exhumation rates have increased since the Messinian [Martin et al., 1998; Müller et al., 2001].
To investigate the current role of the PFS in accommodating Adriatic indentation, we tried to quantify deformation along the PFS over a time span longer than that accessible through seismic or GPS data, but shorter than that constrained by Rb-Sr or Ar-Ar geochronology. For this purpose, we analysed the geomorphology along the PFS in the Eastern Alps, using surface markers to identify possible offsets (e.g., alluvial fans, river terraces or thalwegs). First analyses of aerial photos and river networks combined with DEMs reveal a clear influence of the PFS on the morphology and on drainage network. For example, river channels along the Gailtal fault have apparent dextral offsets of up to 4 km; the dextral displacement is consistent with that inferred for early Miocene tectonics and consistent with that expected for accommodating the currently measured counter-clockwise rotation and WNW indentation of the Adriatic plate [e.g., Vrabec et al., 2006]. Unfortunately, geomorphological markers with unequivocal offsets are lacking along the Pustertal Fault. We can only speculate that the westernmost part of the PFS (i.e., the Pustertal fault) is either inactive or creeps at much lower rates than the eastern part (the Gailtal fault). If so, the PFS could be interpreted as a stretching fault. This interpretation is consistent with the concentration of seismicity in the “Gurktal block” rather than in the “Tauern window block”.

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