Neotectonics of the Periadriatic Fault System, in the Eastern and Southern Alps

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The Periadriatic Fault System (PFS) represents the tectonic boundary separating the Southern Alps, deformed during the Alpine orogeny but without a related metamorphic overprint, from the more strongly deformed Western, Central and Eastern Alps. It also separates northward-verging and westward-verging post-nappes folds to the north from a southward-verging fold-and-thrust belt in the Southern Alps. In contrast to other Tertiary faults, like the Engadine fault, the Brenner fault, the Inntal fault, the Friuli-Trieste and the Giudicarie thrust systems, the PFS appears seismically silent. The present reassessment of existing GPS data from Devoti et al. [2008] shows that the northward-component of Adria convergence is accommodated primarily in the Friuli-Trieste and Giudicarie thrust systems. We observe that a clear step-like decrease of the northward-component of Adria convergence correlates with a drastic diminution of the seismic activity north of the Giudicarie belt, pointing to the present activity of the latter structure. 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, excepted along the Giudicarie thrust system where exhumation rates increased since the Messinian [e.g. Martin et al., 1998; Müller et al., 2001].

To investigate the role of the PFS in the present-day deformation of the Eastern Alps, we intend to study deformation along the PFS over a time span longer than that accessible through seismicity or GPS data, but shorter than the one constrained by Rb-Sr or Ar-Ar geochronology. For this purpose, we performed geomorphological analysis along the PFS in the Eastern Alps in order to recognize surface markers that may be offset by the PFS. These markers include alluvial fans, river terraces or thalwegs. First analyses of aerial photos and river networks combined with DEMs indicate the clear influence of the PFS on the morphology and on the drainage network. Along the Gailtal fault, river channels appear to have apparent offsets of up to 4 km and with a displacement sense consistent with that inferred for early Miocene tectonics. In contrast, along the Pustertal Fault, unequivocally offset geomorphological markers are lacking.

In the absence of age data on the offset geomorphological markers, we can only speculate that the activity of the westernmost part of the PFS (i.e., the Pustertal fault) terminated or was strongly reduced compared to the eastern part of the PFS (i.e., the Gailtal fault), which still accommodates lateral displacement. This interpretation is consistent with the spatial distribution of seismicity, which is concentrated in the “Gurktal block” rather than in the “Tauern window block”.

References

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