AlpShape2 – Present-day kinematics of the Southern and Eastern Alps

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This project complements the DFG MB-4D priority programme with a geodetic component. It focuses on the seismically abundant Southern and Eastern Alps, where today the Adriatic plate subducts under the Alps resulting in N-S shortening of the Earth's crust (Fig. 1). This region hosts M6 earthquakes every ~100 years, with the last event being the devastating 1976 M6.5 Friuli earthquake, killing nearly 1000 people and leaving 160 000 people homeless. Using accurate positioning time-series (GNSS) and interferometric radar data (InSAR) we aim to monitor and quantify the crustal deformation in unprecedented detail. The available GNSS data base will partially be extended in additional measurement campaigns. Radar imagery is made available through the Sentinel-1 radar satellite mission of the European Space Agency. We will compare our observations to kinematic and finite-element models in order to constrain the geometry and kinematics of active faults in the region. Fault geometry and (basin) rheologic model parameters will be partially constrained in consideration of new findings from the seismic data of the SWATH-D/AlpArray project (Kummerow & Cesca) and the INTEGRATE projects (Scheck-Wenderoth et al.), respectively. Our resulting kinematic results will be compared to the historical and paleo-slip activity as analyzed in the ALPQUAKE (Grützner et al.) and PERIADRIA projects (Ustaszewski et al.). The overall aim of AlpShape2 is to better understand the underlying crustal processes and how they are linked to mantle-scale dynamics.
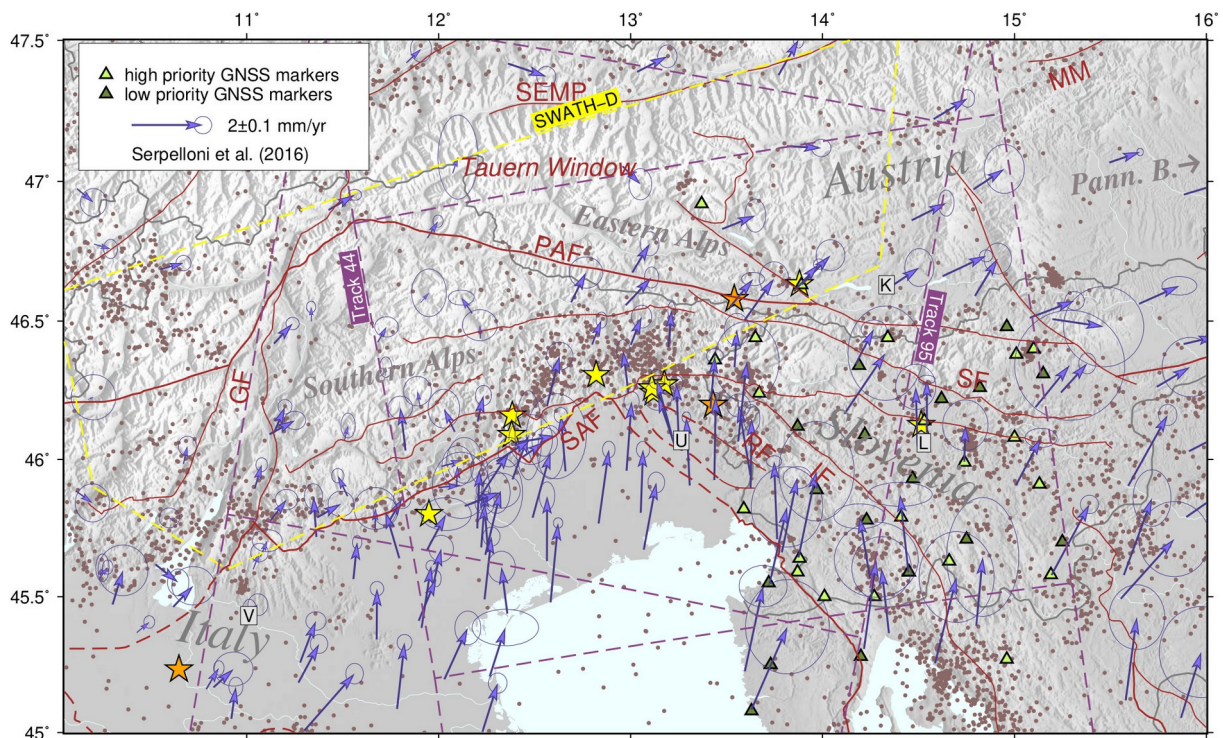

Figure 1: Tectonic overview of the Southern and Eastern Alps, including Neogene faults (brown), micro-seismicity (brown dots), M>6 and M>6.9 earthquakes since 1000 (yellow/orange stars) and published GNSS rates (purple arrows). Satellite radar tracks and example foot prints are indicated with a dashed, purple line; the extent of the SWATH-D temporary seismic network with a dashed, yellow frame. Potentiall survey GNSS locations are marked with triangles. GF – Giudicarie fault, IF – Idrjia fault, MM – Mur-Müritz fault, RF – Raša fault, SAF – Southern Alpine Front, SF – Sava fault, SEMP – Salzach-Ennstal-Mariazell-Puchberg fault, PAF – Peri-Adriatic fault. Cities: Klagenfurt (K), Ljubljana (L), Udine (U), Verona (V)