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ALPAACT - seismological and geodetic monitoring of ALpine-PAnnonian ACtive Tectonics

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The Mur-Mürz (MM) and the Vienna transfer (VT) fault system represents the most active tectonic zone at the transition from the Eastern Alps to the Pannonian domain. Large scale GPS-campaigns revealed an ongoing extrusion process of East Alpine units toward the Pannonian basin. Seismic activity is not equally distributed along the MM and VT fault system and a seismic slip deficit has been derived from the comparison with the geodetic data. Instrumentally recorded earthquakes exceed M=5 only slightly. However, paleo-seismological studies suggest the occurrence of an M$\sim$7 earthquake in the Vienna basin. The ALPAACT project will contribute to a deeper understanding of the complex tectonic processes, especially the relations between seismic activity (location and source mechanism), geodetically determined deformations, and the geometry of the main tectonic structures.

Data of a local GNSS network comprising 23 stations have been reprocessed and time series of the displacements in the ITRF2000 reference frame were derived from 2008-2012. The velocities relative to the European plate amount on average vE = 2.7 mm/year and vN = -0.8 mm/year. The local network data indicate a sinistral strike-slip movement of $\sim$0.5 mm/year along the MM and VT fault system. However, the scatter of the station velocities is relatively high and longer time series will be necessary to reveal a more detailed solution. Relocation of earthquakes is based on data from observatories and a local seismic network which currently comprises 7 broadband stations. High absolute location accuracy is achieved by the implementation of the P- and S-wave velocity model generated during the CELEBRATION 2000 and ALP 2002 projects. The relocated earthquakes allow for a better identification of individual clusters along faults. An example is the identification of earthquakes along the eastern prolongation of the SEMP (Salzachtal-Ennstal-Mariazell-Puchberg) fault. The magnitude of most earthquakes range from Ml = 1.5 to Ml = 2.5, thus making the determination of the focal mechanism a difficult task. Currently an automated method is tested. This method is based on the stacking of P-, SH-, and SV-wavelets, after reversal to a unique polarity. Future work will comprise relative relocations of earthquake clusters using the double-difference method.

The data from the ALPAACT local seismic network reduced the limit for detection and location to Ml$\sim$1.5, thus allowing for a better determination of the b-value of the Gutenberg-Richter relation. A reliable estimate of the MCE (maximum credible earthquake) along the MM and VT fault system will be possible on the basis of an improved b-value, the geodetically determined slip-rate, and the segmentation of the fault planes by the seismological data.