Crustal Deformation and Seismicity in Southern Bavaria revealed by GNSS observations

C. Völksen (1) and M. Hackl (2)

(1) Commission for Geodesy and Glaciology, Bavarian Academy of Sciences and Humanities, Munich, Germany (voelksen@keg.badw.de), (2) Department of Earth and Environmental Sciences, LMU, Munich, Germany (hackl@geophysik.uni-muenchen.de)

A geodetic network consisting of approximately 30 GNSS stations in Southern Bavaria, bordered by the Alps and the river Danube within Bavaria, has been analysed over the past 5 years. The network itself consists of several GNSS stations that have been installed for crustal deformation studies in the Bavarian Alps, some sites of the EU-REF Permanent Network (EPN) and mainly stations of the GNSS network of the Bavarian Office for Surveying and Geographic Information. The later stations mainly serve for real-time positioning at the 1 cm level for engineering surveys, land register, aerial imagery and other surveying applications. For these sites it is crucial that the data are permanently available, reliable, integrity monitored and well maintained. Since the focus of these sites is not crustal deformation monitoring they are continuously modernized and the equipment is regularly exchanged to fulfil the most recent real-time standards, which in turn provokes frequent coordinate jumps due to the systematic biases caused by the different GNSS antennas or receivers. It is therefore necessary to analyse the time series of the coordinate changes very carefully in order to estimate a reliable mean velocity along with the uncertainty for each site with frequent position shifts within the entire observation period.

The derived geodetic velocity models can be used to identify rotations of the continental crust or even active geological features. In addition 2-D strain rate tensors have been derived based on the geodetic velocity model. The analysis of the tensors provide strain characteristics like dilatation and shear strain rates, which in turn support the seismic hazard assessment. Based on the analysed data, two areas of high strain rates have been identified that agree very well with the observed seismicity in Bavaria.