



Determination of 3D surface displacement rates in the Upper Rhine Graben based on GURN (GNSS Upper Rhine Graben Network)

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In September 2008, the Institut de Physique du Globe de Strasbourg (Ecole et Observatoire des Sciences de la Terre) and the Geodetic Institute of Karlsruhe University (now: Karlsruhe Institute of Technology) established the transnational cooperation GURN (GNSS Upper Rhine Graben Network). Within the GURN initiative, these institutions are cooperating in order to carry out geo-scientific research in the framework of the transnational project TOPO-WECEP (Western and Central European Platform; link: <http://www.topo-wecep.eu/>), which succeeded the former project URGENT (Upper Rhine Graben Evolution and NeoTectonics; link: <http://comp1.geol.unibas.ch>) of the EUCOR universities (European Confederation of Upper Rhine Universities).

The Rhine Graben is the central segment of the European Cenozoic rift system, which extends from the North Sea through Germany and France to the Mediterranean coast over a distance of some 1100 km. GURN focusses on the Upper Rhine Graben (URG). The URG is a 300 km long and 40 km wide SSW-NNE trending rift, extending from Basel (Switzerland) to Frankfurt (Germany). It is limited to the west by the Vosges Mountains and to the east by the Black Forest Mountains, culminating in elevations of approx. 1500 m. The uplifted area of the Rhenish Massif bounds the URG to the north. To the south, the Leymen, Ferrette, and Vendlincourt folds represent the northernmost structural front of the Jura fold and thrust belt. Present-day distribution of the seismicity in the URG area is classified as moderate but not null. Expected velocities and strain rates are very low (relative velocities lower than 0.1mm/yr).

The research is actually based on data of GNSS (Global Navigation Satellite Systems). A highly precise and highly sensitive geodetic network of permanently operating GNSS sites region has been established in the URG region in order to detect recent short-term (data base starting in year 2002) crustal movements based on displacements of GNSS sites. The regional network GURN actually consists of approx. 80 permanently operating GNSS sites of different data providers in Germany, France and Switzerland.

The first work steps in the context of GURN were dominated by a detailed analysis of the GNSS data base (e.g., instrumental change artefacts). This analysis included a comparison of the working group related results (EOST, GIK), where different software packages and data handling strategies were used to derive 3D coordinate time series as basis for the determination of a 3D surface displacement field. Due to very small expected velocities in the URG region, the recent GURN focus is on the reliable derivation of site velocities, therefore effects of datum realisation have to be handled with care.

The presentation gives an insight into the joint venture GURN focussing on recent results (e.g., 3D surface velocity field).