Recent Site Motions in the Lower Rhine Embayment and the Eifel from 15 years of GPS data

Barbara Görres, University of Bonn

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As a part of the West European Rift System horizontal and vertical site motions occur in the Lower Rhine Embayment due to present-day seismo-tectonic activity as well as extensive brown coal mining. The intensive brown coal mining activities occurring since the mid-fifties of the last century in the Lower Rhine Embayment have caused effects on the earth’s surface such as ground movements which are mainly due to groundwater withdrawal associated with the ongoing open pit mining activities. Larger discontinuities in the pattern of motion tend to appear at pre-existing fault lines and are causing sizable damage to buildings and roads.

As a recent example, the measurements of the local deformation GPS network ‘Donatussprung’, a section of the Erft Fault system where the surface trace can be identified from topography and effects on buildings and roads, have revealed displacements of up to 6 mm/y in horizontal and 22 mm/y in vertical direction with high accuracy (Görres & Kuhlmann 2008). The observed pattern of vertical and horizontal velocity vectors shows a remarkable difference in the motion of point groups on either side of the fault.

Less prominent are the site motions due to recent tectonics smaller by at least an order of magnitude and only marginally detectable. Indications of a south-west to north-east extension of the Lower Rhine Embayment had been visible after 7 years (Campbell et al. 2002). Also visible was a small uplift of about 1 mm/y at two points in the Eifel near the Belgium Border which seems to be consistent with the uplift of the Rhenish Shield as seen in earlier levelling results.

Having continued with the GPS observations and carried out an extension of the network as a coverage of the Northern Rhenish Massif up to 50 measuring points can be analysed which also include the observations in the Ardennes on Belgian territory (HAR – network, Demoulin et al. 2005).

There is reasonable hope that after 15 years of annual GPS observations in an entire reprocessing of all points and all observation epochs (currently worked on) the indications (Extension and Uplift) can be clarified.

REFERENCES

