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# First Assessment of Vertical Crustal Motion by Space borne and Local Observations in the Rhine-Main and Upper Rhinegraben Region

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## Abstract

The Upper Rhinegraben is one of the main tectonically active regions in Germany. Related to the Alpine orogenesis, subsidence was initiated and up to 3000 m of sediments accumulated in its Northern part. The region located roughly between the cities of Frankfurt and Karlsruhe is an important zone of metropolitan development and of economic interest in view of groundwater, oil and gas reservoirs, shallow geothermal energy, and raw materials. Integrated environmental monitoring and monitoring of faults, crustal motion and landslides, as well as other parameters like radon emission are required for supporting sustainable land use management and geological exploitation. Besides of a detailed 3D geological modelling geodetic observations are required to detect and monitor natural and anthropogenic changes of surface elevation and fault activity.

An integrated approach of space geodetic and local observations is anticipated for this task. Space based data from a network of about 50 GNSS stations, PS-Interferometry by Sentinel 1 INSAR-scenes and repeated levelling are available in the region. In addition, at the outcrop of the eastern master fault of the Upper Rhine Graben in Darmstadt a local observatory with an ensemble of in situ instruments is installed to monitor faulting activities directly. It comprises a crack-gauge, measurement of radon emission and a strong motion seismometer. We give a review of results from all techniques up to now and discuss sources of detected motion patterns and rates.

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