Long-term monitoring of tilt, well level height and environmental parameters at a tectonic fault, close to a waterworks in the Lower Rhine Embayment, Germany

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From 1999 till 2002, data of ground tilt, well level height and of environmental parameters like precipitation, soil-temperature and air-pressure were recorded at a site in the Lower Rhine Embayment. The investigation was aimed to improve understanding of subsurface groundwater dynamics by monitoring the surface deformation field. Three high-resolution biaxial bubble-tiltmeters of type Applied Geomechanics Inc. 722a were installed at shallow depth. One was installed in close vicinity of a tectonic fault, the two others were placed close to a nearby located waterworks, at several hundred meters distant from the former one. The waterworks is continuously operating. It produces up to several hundred $\frac{3}{h}$ of fresh water, at variable production rates. Well level height were measured in the production wells and in nearby observation wells. It is believed that the tectonic fault acts as a hydraulic barrier, but nonetheless a larger amount of groundwater can cross the fault from the waterworks side to the other side that is drained due to open pit lignite mining. We observed mostly stable long-term tilt near the waterworks, whereas data from the tiltmeter at the fault is characterized by a long lasting trend. Rather, this instrument has indicated occurrence of micro-subsidence on the waterworks side of the fault and/or tectonic activity and micro-uplift on the opposite side.

The poster provides an overview of the long-term data available from the site, shows selected events in tilt caused by e. g. rain fall or pump activity, and summarizes on possible causes for the observed signals in tilt and environmental parameters. The study is a continuation of the investigations of Kümpel et al. (2001) and Fabian (2004).

References:


Web page: http://www.geo.uni-bonn.de/user/fabian/disszusammen.htm
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Beitrag
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Präsentationsform: Poster
gewünschte Vortragsreihe: GD - Geodynamik
Stichworte:
Beitrag zum Schwerpunktthema:
Info WWW: http://www.geo.uni-bonn.de/user/fabian/disszusammen.htm
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