



## **Monitoring and modelling of fluid induced deformation of the upper crust of the Earth: The tiltmeter-array at the KTB / Germany**

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A tiltmeter array, consisting of five high resolution ASKANIA borehole tiltmeters, was installed in the surrounding area of the KTB location in mid 2003. The aim of the research project is to observe the deformation of the upper crust, caused by the injection of water at a rate of 180 liters/day into the KTB pilot borehole. The injection started in May, 2004. More importantly, the deformation will be detected at kilometer scale and interpreted by numerical modelling. The induced tilt signals yield an additional drift behaviour, which is superimposing the always existing long- or aperiodic drift of the system borehole / tiltmeter. For the separation of the induced drift signal it is necessary to eliminate locally induced interference, e.g. arising from groundwater variations. The pore pressure changes, observed at all stations show significant correlations with the recorded tilt signals. To quantify the expected additional drift for different injection scenarios at each tiltmeter site, numerical modelling is carried out using the program POEL. It can be demonstrated that the tilt signals caused by injection intervalls of less than three days are not detectable by the tiltmeter array. But for long term injection phases of up to four months a maximum tilt effect of about 40 nrad is modelled, which should be detectable. In addition, the induced tilt effect can also influence the earth tidal parameters, which are very sensitive against changes of the elastic properties of the earth's crust. At this very early stage of data evaluation first tidal analyses seem to indicate a trend of a slow increase of the tidal parameters of the main tidal constituents M2 and O1.