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First Results of Monitoring Displacements with the Ground Based SAR IBIS-L

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Monitoring of surface deformation is a major component in early warning systems for all kinds of natural hazards. Volcanic unrest and eruptions, besides tremor or outgassing, are often accompanied by deformation signals, like flank movement and landslides. Forecasting volcanic eruptions is a challenge because of the variety of processes involved. A successful Early Warning System must therefore combine several observation techniques.
Within the framework of the Geotechnologien Programme for Natural Hazard mitigation, the Exupéry project has the goal to design a Volcano Fast Response System (VFRS). One part of the VFRS is a hybrid deformation monitoring system, which combines Global Positioning System (GPS) sensors and the ground based Synthetic Aperture Radar (GB-SAR) IBIS-L. IBIS-L operates with a frequency of 17.2 GHz (Ku-Band) with a bandwidth of 200 MHz and has a maximum range of 4 km. The radar unit moves along a linear rail of 2 m length and generates interferograms at 10 min intervals. The surface motion can be resolved with a resolution below the millimetre under ideal conditions.

Here we present first results of tests at two different locations with the GB-SAR IBIS-L. The first test site is an active quarry in Dieburg, Germany monitored between 28 Jul. and 1 Aug. 2008. The maximum range is 300 m. The second test site is the Hochstaufen, a mountain with a height of 1771 m in Bad Reichenhall, Germany. The mountain flank was monitored from 24 Sep. to 3 Oct. 2008. The maximum range is 2300 m. The major difficulty one has to face with SAR measurements is the atmospheric distortion. In our analysis we show different methods of correcting the atmospheric errors. The results are analyzed and compared and the estimated deformations at the two sites are presented and discussed.