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Continuous monitoring of landslides with ground based SAR: A case study at Steinlehnen, Austria

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In the last years, ground based SAR has proven to be a powerful tool for the monitoring of landslides and mass movements. The measurements presented here were carried out with the ground based SAR IBIS-L, which allows the remote monitoring of an object at a distance of up to 4 km. It delivers two-dimensional displacement maps with a high temporal and spatial resolution. Every 5 to 10 minutes, an image is generated with a range resolution of 0.75 m and a cross-range (azimuth) resolution of 4.4 mrad (4.4 m at a distance of 1 km). The accuracy that can be achieved for displacements depends on surface material and atmospheric conditions. At rock faces accuracies less then 1 mm are possible. The processing of the data was done with a real-time capable Persistent Scatterer analysis package developed at the Institute of Physical Geodesy, TU Darmstadt. It allows the on-line analysis of the state of a landslide with the least delay possible (several minutes to one hour) after an image is captured.

In June/July 2010, the landslide Steinlehnen, located near Innsbruck in the Austrian Alps, was monitored continuously for one month with a sampling rate of 7 min. The highly variable weather conditions during this period caused considerable movements. An acceleration of the landslide was observed during heavy rain and snowfall with a following slowing down of the rate of motion when the weather changed to dry conditions again.