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Global quantification of InSAR sensitivity for landslide deformation tracking

Adriaan van Natijne[1], Roderik Lindenbergh[1], and Thom Bogaard[2]
[1]Delft University of Technology, Civil Engineering and Geosciences, dept. of Geoscience and Remote Sensing, The Netherlands (A.L.vanNatijne@tudelft.nl)
[2]Delft University of Technology, Civil Engineering and Geosciences, dept. of Water Management, The Netherlands

Landslides are lurking hazards, that often remains unnoticed. Fortunately, unstable slopes frequently show precursory deformation preceding more destructive accelerations. Thanks to satellite remote sensing, regional deformation monitoring is now available in near real-time.

Deformation time series are required for both training and validation of models for landslide nowcasting and forecasting. Various studies have shown that satellite Interferometric Synthetic Aperture Radar (InSAR) is capable of delivering the desired deformation time series. Although satellite radar data, such as from the Copernicus Sentinel-1 program, is freely available, application is not (yet) straightforward: InSAR processing is complex, computational intensive and requires specialist knowledge. Moreover, assessment of the potential of the technique on specific slopes requires experience.

Therefore, we present two concepts to a-priori assess the potential of InSAR landslide deformation tracking. First, the sensitivity index, available globally, indicates the minimum visibility of deformation in the radar signal on any slope. Second, the detection potential indicator, provided as Google Earth Engine application, performs a preliminary analysis of the Sentinel-1 data available at any specific location. Our analysis shows that on 89% of the world's slopes deformation is likely to be detectable with InSAR.

The detection potential indicator is a valuable tool in the project planning phase, while exploring the site specific possibilities for InSAR deformation monitoring. Furthermore, the sensitivity index provides overview of the slopes where large scale, machine learning driven, landslide nowcasting and forecasting are likely to succeed. We will present an analysis of the global sensitivity index, as well as demonstrate how to apply our detection potential application on a case study.