InSAR for Deformation Monitoring of Infrastructural Assets

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SUMMARY

Rijkswaterstaat monitors an important part of their assets such as viaducts, bridges, tunnels, ship locks and storm barriers by carrying out deformation measurements. This is mostly done by on-site leveling and tacheometry. Despite the costly monitoring effort only a limited number of objects can be monitored in this way each year. Also, blocking of highway lanes and tunnel tubes during the measurements hinders traffic, and the safety of geodetic personnel as well as road users is a serious concern. The national monitoring program is mostly planned and not based on actual risks, this means that in many instances no significant deformations are measured. The authors therefor propose using remotely sensed deformation data to limit the annual scope of on-site measured objects. The accuracy and reliability of the satellite measurements were tested in two pilot studies. The InSAR based deformation measurements of a large bridge near Amsterdam and also of 20 viaducts with known deformations were validated using terrestrial measured data. All measurements had good overlap in time and place. The authors conclude from these pilots that InSAR can give a good indication of the vertical deformations of larger pavement and bridge structures. The accuracy and reliability of vertical movements are comparable to the terrestrial measured rates. A nationwide deformations map based on Sentinel-1 radar satellite data will become available in the spring of 2020. The authors will then do a risk assessment of deformations for all ‘visible’ assets to single out assets that are at risk of deformations and assets that are not. The assets that are at risk will then undergo a further investigation, first still by terrestrial measurements but in the future possibly also by for example just high-resolution SAR data. The authors therefore believe that with the use of InSAR deformation maps the resources for the traditional terrestrial monitoring program will be targeted more effectively and that this development will contribute to the lean and green ambitions of Rijkswaterstaat.