

## On the quality checking of persistent scatterer interferometry by spatial-temporal modelling

Mohammad Omidalizarandi<sup>1</sup>, Bahareh Mohammadivojdan<sup>1</sup>, Hamza Alkhatib<sup>1</sup>,  
Jens-André Paffenholz<sup>2</sup>, Ingo Neumann<sup>1</sup>

<sup>1</sup> Geodetic Institute Hannover, Leibniz University Hannover, 30167 Hannover, Germany,  
([zarandi@gih.uni-hannover.de](mailto:zarandi@gih.uni-hannover.de); [mohammadivojdan@gih.uni-hannover.de](mailto:mohammadivojdan@gih.uni-hannover.de); [alkhatib@gih.uni-hannover.de](mailto:alkhatib@gih.uni-hannover.de);  
[neumann@gih.uni-hannover.de](mailto:neumann@gih.uni-hannover.de))

<sup>2</sup> Institute of Geo-Engineering, Clausthal University of Technology, 38678 Clausthal-Zellerfeld, Germany,  
([jens-andre.paffenholz@tu-clausthal.de](mailto:jens-andre.paffenholz@tu-clausthal.de))

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### ABSTRACT

Today, rapid growth in infrastructure development and urbanization process increases the attention for accurate deformation monitoring on a relatively large-scale. Furthermore, such deformation monitoring is of great importance in the assessment and management of natural hazard processes like landslides, earthquakes, and floods. In this study, the Persistent Scatterer Interferometry (PSI) technique is applied using open-source synthetic aperture radar (SAR) data from the satellite Sentinel-1. It allows point-wise deformation monitoring based on time series analysis of specific points. It also enables performing spatio-temporal area-based deformation monitoring. Currently, these data do not have a sophisticated quality assurance process to judge the significance of deformations. To obtain different quality classes of the Persistent Scatterer (PS) data points, the first step is to classify them into buildings and ground types using LoD2 building models. Next, time series analysis of the PS points is performed to model systematic and random errors. It allows estimation of the offset and the deformation rate for each point. Finally, spatio-temporal modelling of neighbourhood relations of the PS points is carried out using local geometric patches which are approximated with a mathematical model, such as, *e.g.*, hierarchical B-Splines. Subsequently, the quality of SAR data from temporal and spatial neighbourhood relations is checked. Having an appropriate spatio-temporal quality model of the PS data, a deformation analysis is performed for areas of interest in the city of Hamburg. In the end, the results of the deformation analysis are compared with the *BodenBewegungsdienst* Deutschland (Ground Motion Service Germany) provided by the Federal Institute for Geosciences and Natural Resources (BGR), Germany.

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