InSAR for risk-based asset management of pipeline networks

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Pipeline networks for gas and water are the lifelines of our society. Most pipelines are buried, which impedes direct monitoring of the structural reliability of the networks. The behavior of the soil surrounding the pipes may impose hazardous loads or deformations threatening the integrity of the network or even cause failure of pipes. This is especially true for subsidence due to shallow compaction.

The paper describes the outline and first results from a Dutch joint research project with partners from applied research, consultancy, gas and drinking water suppliers. In this project the deformation of the terrain surface is measured by InSAR and translated to a risk map to assess the structural reliability of all pipe segments of the network. For this risk mapping, heterogenous data sources are integrated using a probabilistic approach. Examples of these data sources are soil layering, information on civil works, and physical and structural properties of the pipelines. The mapping involves geological, geotechnical and structural models. One of the main aims of the project is to construct a nation-wide risk map that is expected to play a key role in future risk-based asset management strategies.

InSAR is an important and relatively new data source for reducing the uncertainties of soil displacements around pipelines. The paper will focus on the wide-area InSAR processing of very high resolution imagery and its application for asset management of pipeline networks.

Subsidence of a pipeline network measured with InSAR (mm/yr).