CERIS : Civil Engineering Research and Innovation for Sustainability

Towards real-time risk assessment of geotechnical structures using InSAR processing tools

Summary

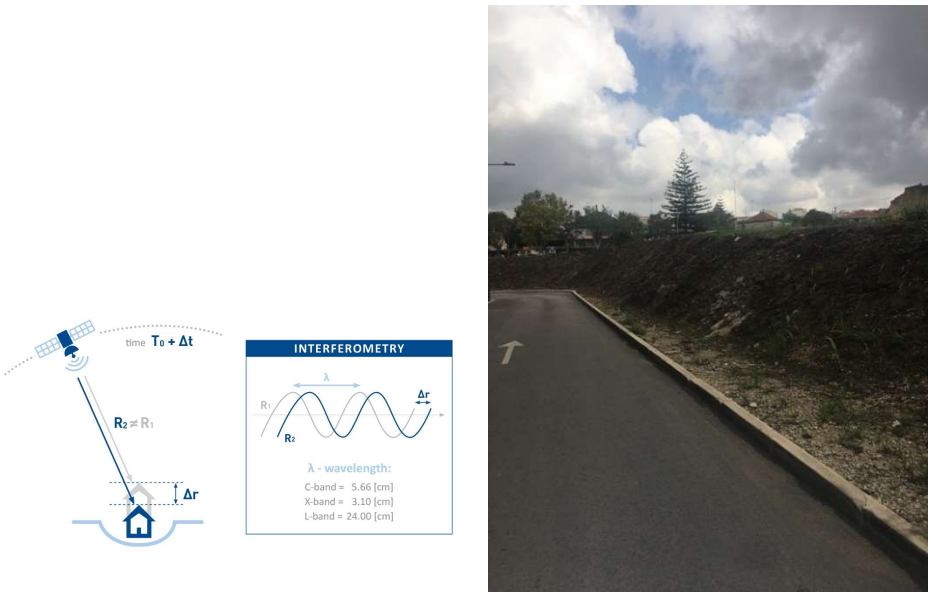
Landslides are a natural hazard that heavily impacts our society. Current assessment of landslide risk is qualitative, relying on indirect factors. Including kinematic parameters into the risk assessment model can be an extraordinary advancement, as they directly monitor the landslide evolution.

Remote Sensing represents a time-saving and cost-effective approach for monitor landslides kinematics and Interferometric techniques are well-established for very slow movements (mm/year). The new SAR missions, with better spatial resolution and providing new near real-time images available every 6 days, supported by a local geodetic network, allows to measure faster movements (mm/week) compatible with landslides and retaining walls movements. This approach was already successfully tested in specific case studies, and can be generalized to a larger region through a risk assessment model. The methodology will be tested against the failure events occurred in Lisbon in the last decade, and it is foreseen its application at regional/national level.

The work aims to (i) define a risk assessment model adequate to landslides, integrating kinematic parameters into existing models that are based on susceptibility and triggering factors (ii) define an InSAR incremental processing method, by selecting the Multitemporal Interferometric (MTI) technique, the image geometry and the main characteristics of the reference(s) point(s), to feed the real time risk assessment model of landslides and retaining walls, (iii) define the guidelines to set-up a passive corner reflectors network that will assist the local validation of the MTI results, (iv) implement a user-friendly interface to download in incrementally process InSAR images to automatize the process and help the MTI time series analysis and (v) implement a user-friendly interface to gather and process relevant information for the risk assessment models and map areas with high risk.

Keywords

Geotechnical structures, risk assessment, InSAR processing tools, nearly real-time.



Principle of interferometry (left) and landslide case study in Oeiras (right).

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