

## Displacement measurement through InSAR geodesy for structural health monitoring

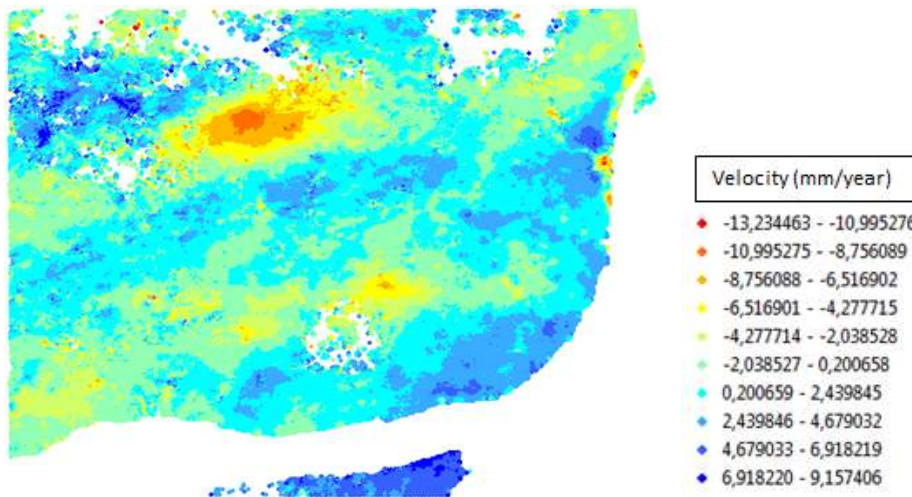
### Summary

The main objective is to create new or to complement existing geodetic monitoring systems for structures and their surroundings using data acquired through synthetic aperture radar (SAR) technology. Interferometric SAR (InSAR) is an applied geodesy technique for displacement measurement through satellite images acquired on the microwave band of the electromagnetic spectrum. Traditional geodetic monitoring systems consider displacements measured for a small number of points on the structure. The inclusion of InSAR data on the monitoring systems may increase both the number of observed points and the observation frequency. Besides, it may extend the monitoring system to the structure surroundings, whose behaviour is equally important but rarely monitored.

This study is divided into three parts: (i) evaluation of displacements at a regional scale for the city of Lisbon and its neighbourhood; (ii) integration of InSAR displacements on the monitoring systems of dams and their surroundings and (iii) assessment of the uncertainty of InSAR displacements. The first part is being addressed through the application of data mining techniques in order to exploit the large amount of information provided by the InSAR data. In the second part, InSAR displacements will be included on monitoring systems of earth and concrete dams already monitored through levelling, tacheometry and global navigation satellite systems (GNSS). For the third part, an infrastructure of artificial reflectors for SAR signal has been installed at LNEC campus, whose displacements are being measured through levelling and GNSS, and will be used to validate InSAR displacements and to assess their uncertainty.

### Keywords

Interferometric synthetic aperture radar (InSAR), geodesy, remote sensing, geodetic monitoring systems, data mining, uncertainty analysis, structural health monitoring.



Velocity map for Lisbon and its neighbourhood between 2008 and 2010.



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