

High-resolution subsidence observations in Mexico City using InSAR.

Ground subsidence in Mexico City is a well-documented process since the 70's. Its impact in the population and infrastructure has increased, mainly associated to a regional water-level drop and to the lack of planning in the urban growing into the areas with the highest subsidence velocities. Our interest in observing the deformation on the surface sections of the subway system and in some of the most emblematic buildings of the downtown has given us a chance to demonstrate the utility and importance of performing high-resolution Interferometric synthetic aperture radar (InSAR) analysis.

In this work, we used the Stanford Method for Persistent Scatterers (StaMPS) to extract ground deformation displacements from time series of 35 Synthetic Aperture Radar (SAR) acquisitions from mid 2011 to mid 2013 in Stripmap mode obtained by the TerraSAR-X satellite. Our results include displacement maps with a ground resolution close to 3 meters (as in Figure 1), and derived Persistent Scatterers (PS) time series.

We observe very localized deformation patterns and its extension in time and space in some areas of the city, which allow us to analyze the vulnerability of some structures to differential deformation as well as ground failure. Our field observations give us a reference of the importance of identifying areas with increased vulnerability to suffer deformation and stress due to ground subsidence.

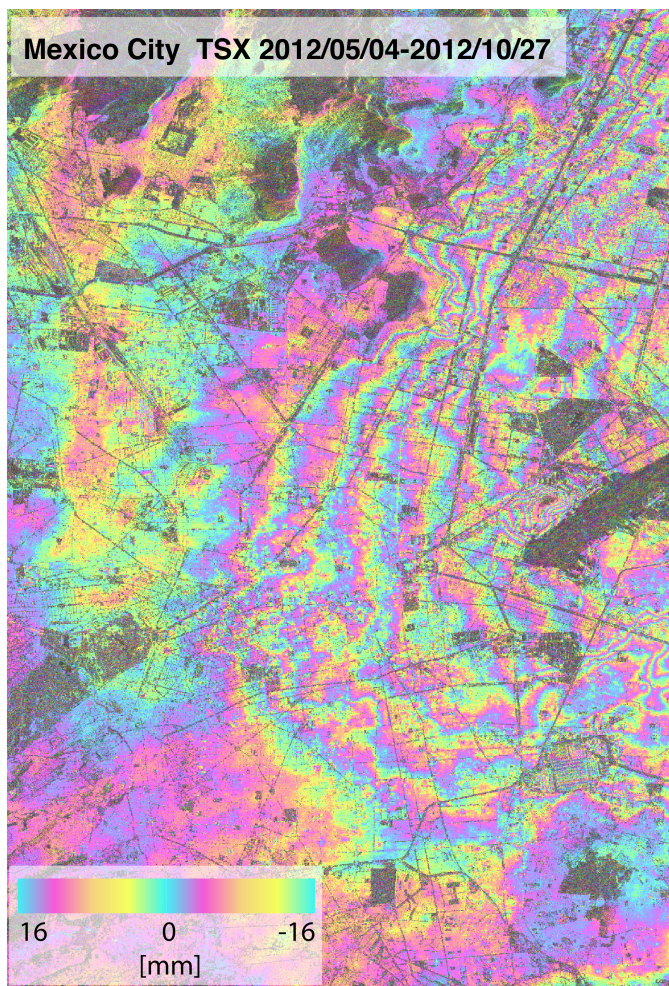


Figure 1. Example of a wrapped-phase interferogram in Mexico City in a 5-month interval produced using TerraSAR-X SAR acquisitions.