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Subsidence history of the city of Morelia, Mexico based on InSAR images processed as time series

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The city of Morelia in central Mexico sits on lacustrine and fluvio-lacustrine deposits. Subsidence due to the extraction of water from the subsoil is evidenced by the presence of differential soil compaction, causing faulting and cracking of the ground and adjacent constructions. In order to study the subsidence history of the past nine years, twenty-eight ENVISAT Synthetic Aperture Radar (SAR) images acquired between May 2003 and September 2010 were processed using ROI_PAC. All scenes are descending orbit images. The resulting interferograms were filtered using an adaptive filter and, in order to increase coherence and signal-to-noise ratio, they were unwrapped using the "branch-cut" algorithm. A subset of the resulting interferograms was selected based on the following criteria. Only interferograms with spatial baseline of less than 400 m and a temporal baseline of less than 420 days were considered. The primary objective of our work was to determine the temporal evolution of the subsidence in different parts of the city. To this end, selected pixels are inverted in an independent manner from neighbouring pixels using a time series analysis. Preliminary results suggest that the central part of the basin, near the fault known as the "Central Camionera", the subsidence is almost constant with a value of 3 to 4 cm/yr until 2008. From this date on, the subsidence rates increase to values with an average of 7 to 8 cm/yr. This increase in the subsidence rate is clearly appreciated in the appearance of two clearly visible circular patterns from 2008 to 2010. Currently, an inversion is being conducted to obtain the overall subsidence history of the basin.