Persistent Scatterer Interferometry based detection of strong subsidence in Semarang, Indonesia

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The City of Semarang (Indonesia) faces land subsidence since more than 100 years. The impact for the cities approximately 1.3 million inhabitants is severe: strong subsidence (up to several cm per year) affect the living environment, buildings and infrastructure. The main reasons for the subsidence is groundwater extraction, compaction of coastal sediments and construction load. In order to monitor the spatio-temporal variability of the subsidence phenomena the Persistent Scatterer Interferometry (PSI) is used. The presentation will show multiple PSI results and assess their characteristics with respect to PS density and coverage.

The PSI analysis is based on SAR data stacks from ERS-1/-2 C-band data (1996-2000), ERS-1/-2 & Envisat-ASAR C-band data (2002-2006) and ALOS-Palsar L-band data (2006-2011). For the assessment of the PSI results thematic data (geological, hydrogeological maps) as well as orthorectified optical images (IKONOS 2005) are used. All three PSI results show an overall pattern of increasing subsidence towards the coastline where the subsurface is built up by unconsolidated coastal sediments. However, the PSI results based on C-band SAR data show a lower PS density (< 100 PS/km2 versus > 500 PS/km2 in urban areas) and PS coverage (no PSs in areas with rural land cover in the PSI results based on C-band) compared to the PSI result based on L-band SAR data. The main reason for this differences is the longer wavelength of the L-band ($\lambda = 23.6$ cm) compared to the C-band ($\lambda = 5.6$ cm) resulting in less temporal phase decorrelation through an increased penetration depth and higher capability to detect fast displacements.