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# InSAR time series monitoring at Istanbul city shows faulting, landslides and soil compaction

K. Wiencke (1), T. R. Walter (1), M. Manzo (2), A. Manconi (3), G. Solaro (2), and R. Lanari (2)

(1) GFZ Potsdam, 2.1, Potsdam, Germany (twalter@gfz-potsdam.de), (2) IREA-CNR, Via Diocleziano, 328, 80124 Napoli, Italy, (3) IRPI-CNR, Strada delle Cacce 73, 10135 Torino, Italy

Satellite remote sensing data is providing important information for understanding and monitoring geohazards, yet availability of such data often has remained difficult. In an attempt to ease access to earth science and especially satellite radar data in near real time, the geohazard scientific community initiated the Geohazard Supersites. As a contribution to the Group on Earth Observations (GEO), this concept is supported by the European Space Agency (ESA). Here we describe the use of the Geohazard Supersites platform to understand and monitor deformation activity in the vicinity of Istanbul city.

Istanbul, with more than 10 million inhabitants, is one of the largest multiethnic cities in the world. Among several problems, this megacity is menaced by the hazard of earthquakes. In the 20th century, a progressive westward migration of earthquake events has ruptured more than 700 km of the North Anatolian Fault. The presence of a seismic gap implies that the next major event could occur nearby the city centre itself. We have used the Small BAseline Subset (SBAS) approach, to study the evolving deformation history of the last two decades at unprecedented spatial and temporal detail. Images provided by ESA and acquired by the ERS1, ERS2 and ENVISAT satellites between 1992 and now have been analyzed. Our results show several ongoing deformation phenomena, in particular, the co-seismic displacement caused by the North Anatolian Fault seismic events, and the extended subsidence pattern in urban areas underlain by young sediments. As seen from the InSAR time series data, subsidence rates changed after 1999. The rate of change may relate to time-dependent rheologic responses that will be investigated in further detail in a separate paper. Singular value decomposition of these data significantly augments the interpretability of the observed deformations. We find that deformation regions are overlapping in time and space, though at different signatures, trends and periodicities.

Since natural hazards, involving earthquakes, landslides and flooding, have to be explored in a dynamically evolving context, the spatial and temporal resolution of satellite geodesy provides additional information and offers a new, invaluable monitoring capability for complex scenarios as those demonstrated here for Istanbul.