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[Volume XL-7](#)

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-7, 19-21, 2014
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-7/19/2014/
doi: 10.5194/isprsarchives-XL-7-19-2014

Analysis of deformation patterns through advanced DInSAR techniques in Istanbul megacity

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Keywords: Differential SAR Interferometry, Small BAseline Subset, TerraSAR-X, Deformation, Monitoring

Abstract. As result of the Turkey' s economic growth and heavy migration processes from rural areas, Istanbul has experienced a high urbanization rate, with severe impacts on the environment in terms of natural resources pressure, land-cover changes and uncontrolled sprawl. As a consequence, the city became extremely vulnerable to natural and man-made hazards, inducing ground deformation phenomena that threaten buildings and infrastructures and often cause significant socio-economic losses. Therefore, the detection and monitoring of such deformation patterns is of primary importance for hazard and risk assessment as well as for the design and implementation of effective mitigation strategies. Aim of this work is to analyze the spatial distribution and temporal evolution of deformations affecting the Istanbul metropolitan area, by exploiting advanced Differential SAR Interferometry (DInSAR) techniques. In particular, we apply the Small BAseline Subset (SBAS) approach to a dataset of 43 TerraSAR-X images acquired, between November 2010 and June 2012, along descending orbits with an 11-day revisit time and a 3 m × 3 m spatial resolution. The SBAS processing allowed us to remotely detect and monitor subsidence patterns over all the urban area as well as to provide detailed information at the scale of the single building. Such SBAS measurements, effectively integrated with ground-based monitoring data and thematic maps, allows to explore the relationship between the detected deformation phenomena and urbanization, contributing to improve the urban planning and management.

[Conference Paper](#) (PDF, 604 KB)

Citation: Balik Sanli, F., Calò, F., Abdikan, S., Pepe, A., and Gorum, T.: Analysis of deformation patterns through advanced DInSAR techniques in Istanbul megacity, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-7, 19-21, doi:10.5194/isprsarchives-XL-7-19-2014, 2014.

