Session 6

SAR, InSAR and forthcoming techniques for Geodynamics

06-02

Satellite Interferometric Observations of Displacements Associated with Urban Subsidence in Suzhou, China

Chao Wang[1], Hong Zhang[2] and Zhi Liu[3]

Institute of Remote Sensing Applications, Chinese Academy Sciences,
Box 9718, Beijing 100101, China
[1]cwang@public.bta.net.cn [2]zhangh61@sina.com [3]zhiliu@371.net

ABSTRACT

Since 1980's the excessive ground water exploitation in a lot of cities has resulted in significant land subsidence that has damaged buildings, roads, and pipelines. It has also changed the areas affected by flooding. And in recent years the subsidence of megalopolis has been increasingly serious. Differential SAR interferometry (D-InSAR) with ERS-1/2 SAR data has a high potential for surface displacement mapping in the *mm* to *m* range. In this paper the potential of ERS-1/2 SAR interferometry for mapping of subtle land subsidence has been investigated. Our measurements were taken on Suzhou city, Jiangsu province, China. We collected a time series of ERS-1/2 SAR data from February 1993 to February 2000, Eight ERS-1/2 SAR images were used to create seven interferograms, three differential interferograms were produced using three-pass method, which clearly showed the spatial extent of subsidence. The D-InSAR deformation maps were validated by leveling surveys. The correlation between D-INSAR observations and leveling observations was 0.943 and standard error was 0.1706. Based on seven benchmarks, the subsidence rates were estimated the overall trend were in close agreement with D-InSAR results. We concluded that for the mapping of land subsidence in urban environments D-InSAR had a strong potential with regard to cost effectiveness, resolution and accuracy. In many other cities affected by subsidence, D-InSAR should be operationally applied.

06-03

The Pre- and Co-Seismic Ground Displacements of the 1999 Chi-Chi Earthquake from ERS-SAR Interferometry

GX Liu, XL Ding, YQ Chen, ZL Li and ZW Li

Deptepartment of Land Surveying & Geo-Informatics
The Hong Kong Polytechnic University, Hung Hom, KLN, Hong Kong. China

SB Yu
Institute of Earth Sciences, Academia Sinica, Taiwan

ABSTRACT

Repeat-pass ERS-1/2 synthetic aperture radar (SAR) images were used to study the pre- and co-seismic deformation fields of the September 1999 earthquake in the area of Chi-Chi, Taiwan. First, a tandem SAR image pair was used to derive a digital elevation model (DEM) that is necessary for the subsequent differential interferometric processing. Second, the coherence characteristics of all the possible interferograms in the region were studied and an area of some $50\,\text{km} \times 30\,\text{km}$ along the western coast and covering the epicentre of

the earthquake was identified to be suitable for InSAR study. Third, the long-term pre-seismic differential interferograms of the area covering three years leading up to the earthquake were generated. Fourth, multi-baseline co-seismic differential interferograms of the area were derived. The results show a consistent fringe systems corresponding to the ground displacements caused by the earthquake. The interferograms were also integrated to remove the anomalies caused by atmospheric delays. Finally, the co-seismic displacement field thus derived was validated with GPS measurements.

06-04

Surface Displacement of the 10 January 1998 Zhangbei-Shangyi Earthquake Observed by Differential SAR Interfarometry

Chao Wang[1], Hong Zhang[2] and Zhi Liu[3]

Institute of Remote Sensing Applications, Chinese Academy Science,
Box 9718, Beijing 100101, China
[1]cwang@public.bta.net.cn [2]zhangh61@sina.com [3]zhiliu@371.net

ABSTRACT

An Ms=6.2 earthquake occurred on January 10, 1998, in Zhangbei-Shangyi region, Hebei province, northen China. The coseismic deformation produced by Zhangbei Earthquake were measured by the differential synthetic aperture radar interferometry (D-InSAR) technique using the European Remote Sensing satellite (ERS) SAR data. Interferograms are constructed from ERS-1/2 SAR data by three-pass method. The line-of-sight displacement map indicates that the deformation center of the earthquake is located at N114^o 20', E40^o 57', with the maximum uplift of 25 cm. The extent of the displacement is around 300 km^2. An elastic dislocation formulation for coseismic displacements was used to model interferogram and estimate the focal mechanism and earthquake-induced structures, The focal mechanism parameters were compared with seismological determinations.