

GEOMATICS FOR THE CONTROL OF GROUND SUBSIDENCE AND LONG-TERM PHENOMENA

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Ground subsidence (of natural type or man-induced, e.g. by fluid withdrawal) can be a critical aspect in territory management. Geometrical surveying and monitoring are the first essential steps for the knowledge and understanding of the phenomenon, to detect entity, trend and spatial arrangement of the movements. Different techniques have been applied and integrated over the years by the team: from spirit leveling ('70s) to space geodesy (the '90s), and finally to the recent use of interferometric analysis of satellite radar images (PSInSAR). The research was carried out in national and international projects or with public authorities (Regions, Provinces, Municipalities, ARPA) and large private companies. The primary area of study is the Po Valley, with researches at regional, provincial or basin scale; a specific interest is furthermore towards coastal zones (EU FP7 project). The activity is also carried out at urban scale, monitoring single buildings and structures in city centers (e.g. Bologna) by high precision topographic techniques.

The work involves the production of technical specifications, design and realization of networks, monitoring through repeated measurement campaigns, quality verification, realization of GIS databases, production of maps of subsidence rate and other related products.

Other long-term phenomena can be studied using historical data, among them old aerial photographs. The so-called Archival Photogrammetry is made today through advanced digital techniques that complement the traditional photointerpretation for multi-temporal landslide studies, evolution of glaciers, change detection in urban centers, changes in the coastline, changes in forest cover.

For this purpose it is frequently necessary to realize Digital Terrain Models (DTM) or surface models (DSM) that allow for a metric definition of the 3D form; image matching techniques are applied on historical photogrammetric images or satellite stereo-couples, and airborne or terrestrial laser scanning is an effective solution for current situations.

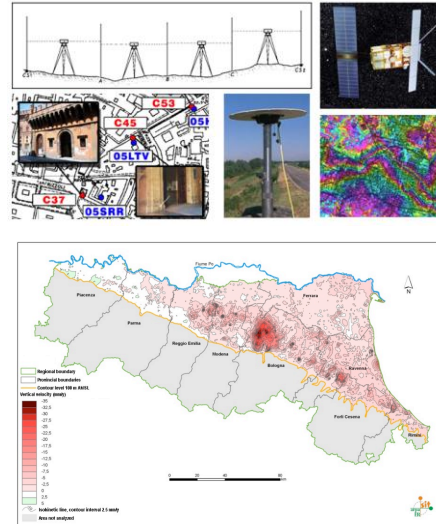


Fig. 1. Integration of geometric levelling, spatial geodesy and SAR interferometry for the control of subsidence; speed of ground vertical movements in the valley of Emilia-Romagna, obtained by radar interferometric analysis 2006-2011, (Bitelli et al., 2015).

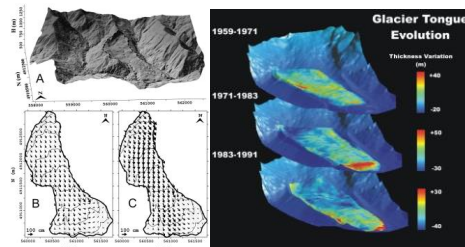


Fig.2 Multitemporal analysis of a landslide area and of a glacier (picture by Zanutta).

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