Geophysical Research Abstracts, Vol. 9, 03358, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03358

Significance of the short base line (Sb) and permanent scatterers (Ps) DiffSAR techniques in the study of the slope instabilities.

V.Rizzo (1), A.Iodice (2), A.Calendino (1), P. Caruso (1), G. Curcio (1), M. Miceli (1)

(1) Cnr Irpi Dipartimento di Cosenza, Italy. (2) Dipartimento di Ingegneria Elettronica e delle Telecomunicazioni, Università di Napoli “Federico II”, Napoli, Italy

A comparison, carried out within a GIS environment, between soil movements obtained by "short base line" ("Sb") [1-2] and "permanent scatterers" ("Ps") [3] Differential SAR Interferometry (DiffSAR) techniques is presented. Such comparison has been based on a "ground truth", represented by the result of the surveys realized “in situ” on the stability characteristics of the slopes. This work been performed in the framework of a European project called the Riscmass Project (www.riscmass.eu). The studied area has an extent of about 100 km2 and is placed along the western edge of the Crati graben, Calabria (Italy). Data elaborated through the "Sb" DiffSAR techniques related to 27 satellite acquisitions (ERS-2 and ENVISAT) from 1997 to 2005, and were provided by UNINA1. While, those elaborated via the "Ps" algorithm related to 103 acquisitions (ERS, RADARSAT and ENVISAT), carried out between 1992 and 2005, and were provided by UNIFI2. For the "ground truth" analysis, two procedures have been used. In the first one, the statistic distributions of the measured displacement velocities have been compared for single portions of territory (pixels of 60 by 60 m) in the areas subject or not to landslides. The velocity obtained in this way have been compared. The performed elaborations emphasize that the differences of the two approaches are distributed as blocks and affected by some factors connected to their territorial distribution. Besides, measured velocity in some zones show costant differences, and those obtained with the Sb algorithm are generally more varying in comparison to values obtained by Ps method. In the second procedure, the comparison has been performed by subdividing “landslide populations” in geologically and geomorphologically homogeneous groups, and by defining dangerousness indices calculated on the

basis of the DiffSAR-monitored velocity for every landslide. The dangerousness indices, I1, I2, I3, represent the uniformity of movement, the condition of local breaking, and the proximity of the monitored velocity to the determined critical values, respectively. Besides, a composed index I4 = I2*I3 has been defined. We then compared the average values of the indices which were calculated within the three principal groups of populations subject to landslides (quiescent landslides, recent landslides, and very recent landslide, i.e., landslides collapsed between the years 2000 and 2005). The statistical data analysis emphasizes that the recent and, above all, very recent landslide areas are characterized by the highest values of dangerousness indices, as expected. This is more evident for the indices evaluated from Ps data, and even better results are obtained by using a combination of Ps and Sb data. Accordingly, obtained results suggest that the combined use of the two techniques may improve the evaluation of hydro-geological risk.

References [1] P. Berardino, G. Fornaro, R. Lanari, E. Sansosti, “A New Algorithm for Surface Deformation Monitoring Based on Small Baseline Differential SAR Interferograms”, IEEE Trans. Geosci. Remote Sens., Vol. 40, No. 11, pp.2375-2383, 2002. [2] P.Berardino, M.Costantini, G.Franceschetti, A.Iodice, L.Pietranera, V.Rizzo, “Use of Differential SAR Interferometry in Monitoring and Modelling Large Slope Instability at Maratea (Basilicata, Italy)”, Engineering Geology, Vol. 68, nn. 1-2, pp. 31-51, 2003. [3] A.Ferretti, C.Prati, F.Rocca, “Permanent Scatterers in SAR Interferometry”, IEEE Trans. Geosci. Remote Sens., Vol. 39, No. 11, pp.8-20, 2001.

1Università di Napoli “Federico II”, Dipartimento di Ingegneria Elettronica e delle Telecomunicazioni. 2Università di Firenze, Dipartimento di Scienze della Terra.