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PAOLO MORA (*), MARCO GUALDRINI (**) & MASSIMO FABRIS (***)

PHOTOGRAMMETRIC DEMS AND SPATIAL ANALYSIS TECHNIQUES IN LANDSCAPE EVOLUTION STUDIES

ABSTRACT: MORA P., GUALDRINI M. & FABRIS M., *Photogrammetric DEMs and spatial analysis techniques in landscape evolution studies*. (IT ISSN 1724-4757, 2005).

The comparison of multitemporal Digital Elevation Models (DEMs) of the same area is a powerful tool in an integrated approach for studying Earth surface features and their evolution. At the same time, the differences in the techniques used to generate different datasets and the presence of artefacts constitute an important problem that must be solved in order to allow a meaningful study of the geomorphologic evolution of the area.
Geographic Information Systems (GIS) tools can be of great help in this approach, allowing users to obtain significant morphometric parameters from co-registered DEMs and giving at the same time the possibility to estimate artefacts in the datasets, to evaluate differences between ground surfaces in the different years and to validate results through geostatistical processes.
In this study photogrammetry has been applied to extract multitemporal DEMs datasets of a hydrographic basin affected by landslides (Bologna, Italy) and GIS techniques have been used for morphologic enquiry on the test site.
A time series of stereo digital images, derived from aerial photogrammetric surveys (1976, 1986, 1988 and 1993), was analysed and processed for obtaining high spatial resolution DEMs through softcopy photogrammetric techniques. DEMs accuracies, strictly related to the quality of images, to the adopted systems and strategies and to the morphologic features of the test area, were estimated.
The analysis of the derived data in a GIS environment allowed the generation of correction maps and shaded relief maps for each dataset, evidencing various types of 3-Dimensional (3-D) artefacts in the models.
After appropriate filtering of data, in order to make datasets comparable, geomorphologic features of the site were studied by means of 3-D raster analysis techniques. GIS functions were applied to the DEMs in order to display morphometric parameters for each dataset (elevation, slope, aspect, curvature) and to compare the ground surfaces, generating differential elevation maps for the whole of basin.
Generally, differential movements inside the landslide areas in the basin appear to be comparable to the movements of the whole of basin in the considered time span: these differences must otherwise be weighted and validated, considering the accuracy of the different datasets and the limits of these comparison techniques.

KEY WORDS: Landscape evolution, Digital Elevation Models, Digital photogrammetry, Geographic Information Systems, Spatial analysis.

(*) *Alma Mater Studiorum - Università di Bologna, Dipartimento di Scienze della Terra e Geologico-Ambientali, via Zamboni 67 - 40127 Bologna (BO), Italy.*
(**) *GEOgrafica, via Fornarina 3 - 48018 Faenza (RA), Italy.*
(***) *Alma Mater Studiorum - Università di Bologna, Dipartimento di Fisica, Settore Geofisica, viale Berti Pichat 8 - 40127 Bologna (BO), Italy.*