

GIS INTEGRATION OF ASTER STEREO IMAGERY FOR THE SUPPORT OF WATERSHED MANAGEMENT

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EXTENDED ABSTRACT

In this study, high spatial resolution stereo imagery from ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer), onboard Terra satellite, was analyzed in combination with Global Positioning System (GPS) data and field observations, using GIS techniques to examine the potential of high spatial resolution multi-spectral remote sensing to support watershed management. Terrain elevation data were derived by applying photogrammetric processes to overlapping ASTER stereo pairs for the region of Heraklion, Crete, whereas land cover data were derived by applying supervised classification techniques on ASTER multispectral imagery.

ASTER method gives a strong advantage in terms of radiometric variations versus the multi-date stereo-data acquisition with across-track stereo, which can then compensate for the weaker stereo geometry. Nadir-looking and Backward-looking scenes were used and the output pixel spacing of 15 m was specified. A set of stereo (Ground Control Points) GCP was used for the registration of both scenes. A digital stereo correlation approach and a rigorous parametric model used to calculate parallax differences in ASTER stereo pairs. These GCP were collected with the use of differential ground GPS (Global Positioning System) station of the Regional Analysis Division of FORTH/IACM (Foundation for Research and Technology – Hellas, Institute of Applied and Computational Mathematics). The accuracy for the along-track stereo derived DEM (Digital Elevation Model) from ASTER, was greater than 20 meters (planimetric) and greater than 15 meters (elevation). Supervised classification techniques were applied for land cover production using ASTER multispectral imagery and field observations at predefined application sites. The determination of training areas required in the supervised classification scheme was based on these observations. Finally, GIS methods were applied to estimate watershed characterization parameters for the study area offering the advantages of spatial data handling capabilities and automatic extraction of thematic information. The drainage pattern, which was derived, provided a generally representative depiction of the watershed. The output pixel spacing of 15 m of the produced DEM as well as the high spatial resolution of ASTER imagery found to be quite satisfactory for the watershed characterization of the study area, indicating the high potential of ASTER multispectral imagery to support watershed management. It is therefore expected, the proposed method to provide valuable information to hydrological research and modelling in Greece.

Key words: Stereoscopy, Digital Elevation Model, Global Positioning System, Multispectral Classification, Geographic Information System, Watershed Management.