Using very high resolution satellite images to identify coastal zone dynamics at North Western Black Sea

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The availability of updated information about the extension and characteristics of land cover is a crucial issue in the perspective of a correct landscape planning and management of marine coastal zones.

Satellite remote sensing data can provide accurate information about land coverage at different scales and the recent availability of very high resolution images definitely improved the precision of coastal zone spatio-temporal changes.

The Romanian North Western coastal and shelf zones of the Black Sea and Danube delta are a mosaic of complex, interacting ecosystems, rich natural resources and socio-economic activity. Dramatic changes in the Black Sea's ecosystem and resources are due to natural and anthropogenic causes (increase in the nutrient and pollutant load of rivers input, industrial and municipal wastewater pollution along the coast, and dumping on the open sea). A scientific management system for protection, conservation and restoration must be based on reliable information on bio-geophysical and geomorphologic processes, coastal erosion, sedimentation dynamics, mapping of macrophyte fields, water quality, and climatic change effects. Use of satellite images is of great help for coastal zone monitoring and environmental impact assessment. Synergetic use of in situ measurements with multisensors satellite data could provide a complex assessment of spatio-temporal changes.

In this study was developed a method for extracting coastal zone features information as well as landcover dynamics from IKONOS, very high resolution images for North-Western Black Sea marine coastal zone. The main objective was obtaining reliable data about the spatio-temporal coastal zone changes in two study areas located in Constanta urban area and Danube Delta area.

We used an object-oriented approach based on preliminary segmentation and classification of the resulting object. First of all, segmentation parameters were tested and selected comparing segmented polygons with independently-obtained land cover data. Then a set of features (mean, standard deviation and shape objects features) were processed beginning from IKONOS original and derivative bands. Finally, the nearest neighbor classifier was applied on a subset of features selected through an optimization procedure and the results were evaluated with reference to accuracy measures.

In this study an object-based approach, including image segmentation and object-oriented classification, implemented in the image analysis software ENVI 4.6 and ILWIS 6.3 was applied to the analysis of IKONOS images acquired 12/06/2004, 29/07/2005 and 16/08/2007. The results have been evaluated with reference to classification accuracies. In conclusion, the segmentation procedure allowed to effectively discriminating marine coastal zone elements from other land cover classes objects while classification outputs needed a substantial manual revision in order to reach the required accuracy.