Coastal zones monitoring using remote sensing satellite data

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Portugal has a considerable large coast, which is exposed to significant dynamic change due to the increasing pressure from human activities as well as natural phenomena. There is a strong need for precise management of these sensitive areas in order to have a sustainable development. This requires the availability of effective monitoring tools covering large areas. It is clear that remote sensing has an active role as a monitoring tool for the coastal zone [1]. In the last few years the aerial surveys carried out were done irregularly and less frequently than required. The purpose of the COSAT (COastal zones monitoring using remote sensing SATellite data) project was to evaluate the capabilities of satellite data for monitoring coastal zones, from a morphological point of view, with the aim of inferring the 3D temporal variability of the breaking zone. The breaking zone is an area of great importance and very few studies have addressed this issue in the past, as there are obvious difficulties in getting data from this part of the coast. The successful development of a methodology to extract information about the coastal zones from satellite data would allow frequent updates and therefore enable us to implement an effective monitoring system. Furthermore, the information available on satellite data archives can provide historic records otherwise unavailable.

A study of the physical processes involved in the breaking zone was done. Some sediment patterns were observed in air-photos, around the breaking zone. Satellite images from SPOT HRVIR, Landsat TM and ASTER sensors were tested. A visual detection of enhanced RGB colour composites from these sensors showed that the satellites images should be able to provide the type of information required. A section of the northwest coast of Portugal, centered around Aveiro, was chosen as a test area, as this is a very instable region where the coastline changes, rapidly.

The various satellites images were calibrated, atmospherically corrected and geometrically registered.

A number of field surveys were carried out, using two types of boats and a helicopter. Simulations with recipients on the beach were also carried out.

The objective of the fieldwork was to establish a relationship between above water reflectance, measured with a spectroradiometer, and the concentration of suspend sediments.

Once this relationship is established, it should be possible to compare the Total of Suspend Matter (TSM) with the reflectance measured on the satellite images.

A classification method is being developed based in the relationship established by the fieldwork.

A geographic information system (GIS) was implemented, with all the available information of the study area, from existing cartography and geographic databases. Information about TSM was also included. Specific tools were included in GIS, in order to properly address the physical processes in the coastal zone as a function of time.

Work in currently being done in order to incorporate low spatial resolution satellite data from MERIS e MODIS in the GIS. These sensors provide images nearly daily, which could be a great advantage for monitoring purposes.

[1]- Malthus, T.J., Mumby, P.J., 2003, Remote Sensing of the Coastal Zone:an Overview and priorities for Future Research, *International Journal of Remote Sensing*, Vol. 24, No.13, 2805-2815.