Submarine water discharge detection, nearby urban areas in Greece, using Aster and Landsat images.

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INTRODUCTION

In this poster presentation we investigate the contribution of satellite image processing in submarine springs detection in certain karstic areas in Greece. Aster and Landsat images of possible or identified coastal and submarine springs in karstic areas have been processed and analyzed. The results have been compared and presented here. The regions that have been selected as research areas are Eastern Korinthia and Eastern Crete.

RESEARCH AREAS

Both regions that were chosen for this research are similar in geological and hydrogeological conditions (karstic environment) and in both there have been problems of sea water intrusion and ground water salinization, which are major problems not only for drinking water supply quality but also for the agriculture and tourism, which are the main financial resources of both areas. By identifying the ground water discharge into the sea water, the sea water intrusion areas are also identified. The lithology of both research areas area mainly composed of limestones and neogean formations. In Eastern Crete the known submarine springs that were identified are Malavara spring on the northern part and a spring near Agia Irini on the southern part of the area. In Eastern Korinthia the known springs that were identified are: Almiri, Selonda, Orea Eleni and Korfou and a new possible submarine spring was also identified and pointed with white arrow in figures 3, 4 and 5.

LANDSAT 7 ETM+

Landsat 7 is the latest satellite of the Landsat program. It was launched on April 15th, 1999. The primary goal of Landsat 7 is to replenish the global archive of satellite images, providing up-to-date and cloud-free images. Although the Landsat Program is managed by NASA, data from Landsat 7 is collected and distributed by the USGS. The NASA World Wind project provides 3D images from Landsat 7 and other remote sensing sources to be freely navigated and viewed from any angle. The different sensors on Landsat 7 have a number of different features, including: 

- Band 1 VNIR Band 1 0.520-0.600 15 metres
- Band 2 VNIR Band 2 0.630-0.690 15 metres
- Band 3 VNIR Band 3B 0.760-0.860 15 metres
- Band 4 VNIR Band 4 0.75-0.90 30 metres
- Band 5 SWIR Band 5 1.55-1.75 30 metres
- Band 6 SWIR Band 6 2.08-2.35 30 metres
- Band 7 SWIR Band 7 2.08-2.35 30 metres
- Band 8 Thermal Band 8 6.1-6.8 30 metres
- Band 9 SWIR Band 8 2.295-2.365 30 metres
- Band 10 TIR Band 10 8.125-8.475 90 metres
- Band 11 TIR Band 11 10.45-12.5 90 metres
- Band 12 TIR Band 12 10.45-12.5 90 metres
- Band 13 TIR Band 13 8.35-11.3 90 metres
- Band 14 TIR Band 14 8.35-11.3 90 metres
- Band 15 TIR Band 15 10.45-11.3 90 metres
- Band 16 TIR Band 16 10.45-11.3 90 metres

Aster images have been used because of the 5 thermal bands and the better resolution in all wavelengths. The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) is an advanced multispectral image that was launched on board NASA’s Terra spacecraft in December, 1999. ASTER covers a wide spectral region with 14 bands from the visible to the thermal infrared with high spatial, spectral and radiometric resolution. An additional backward-looking near-infrared band provides stereo coverage. The spatial resolution varies with wavelength: 15 m in the visible and near-infrared (VNIR), 30 m in the short wave infrared (SWIR), and 90 m in the thermal infrared (TIR). Each ASTER scene covers an area of 60 x 60 km. (ASTER User Handbook)

CONCLUSIONS

It is not certain that remote sensing methods and techniques can identify all existing submarine springs. That depends on the extent and the depth of the springs and the difference between the ground water and sea water temperature. Still, as it is displayed in this presentation, remote sensing is a very useful tool in locating submarine springs, combined with knowledge of the geological and hydrogeological conditions of the areas and in situ identification and research.

Both Aster and Landsat 7 ETM+ were proven successful in identifying submarine springs and fresh water discharges into the sea water.

Aster’s advantage is the five thermal bands and Landsat 7 ETM+’s advantage is the better resolution of the thermal band (90m) compared to Aster’s thermal bands resolution (60m).

REFERENCES


Rokos E., Markantonis K., Koumantakis I. (2005) “Contribution of remote sensing techniques in the detection of submarine springs in the NE Viotia-Central Evia area, Greece”.