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Integrated GRASS GIS based techniques to identify thermal anomalies on water surface. Taranto case study.

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In the last years, thermal images collected by airborne systems have made the detection of thermal anomalies possible. These images are an important tool to monitor natural inflows and legal or illegal dumping in coastal waters. By the way, the potential of these kinds of data is not well exploited by the Authorities who supervises the territory. The main reason is the processing of remote sensing data that requires very specialized operators and softwares which are usually expensive and complex.
In this study, we adopt a simple methodology that uses GRASS, a free open-source GIS software, which has allowed us to map surface water thermal anomalies and, consequently, to identify and locate coastal inflows, as well as manmade or natural watershed drains or submarine springs (in italian citri) in the Taranto Sea (South of Italy).
Taranto sea represents a coastal marine ecosystem that has been gradually modified by mankind. One of its inlet, the Mar Piccolo, is a part of the National Priority List site identified by the National Program of Environmental Remediation and Restoration because of the size and high presence of industrial activities, past and present, that have had and continue to seriously compromise the health status of the population and the environment.
In order to detect thermal anomalies, two flights have been performed respectively on March 3rd and on April 7th, 2013. A total of 13 TABI images have been acquired to map the whole Mar Piccolo with 1m of spatial resolution. TABI-320 is an airborne thermal camera by ITRES, with a continuous spectral range between 8 and 12 microns.
On July 15th, 2013, an in-situ survey was carried out along the banks to retrieve clear visible points of natural or artificial inflows, detecting up to 72 of discharges.
GRASS GIS (Geographic Resources Analysis Support System), is a free and open source Geographic Information System (GIS) software suite used for geospatial data management and analysis, image processing, graphics and maps production, spatial modeling, and visualization. In this study, we used three GRASS modules: r.clump, r.contour and v.generalize. The first module recategorizes data by grouping cells in discrete areas into a unique category preserving category distinctions in the input raster map layer. R.contour transforms an input surface raster data into an isolines vector data. The third module simplifies and smoothes the lines, reducing the complexity of vector features.
As result, we produced a map of thermal anomalies around the coast surprisingly coincident with the inflows detected during the survey.
Furthermore, the use of airborne images allowed us to identify other discharges in areas impossible to reach with the boat, due to the presence of algae, mussel-culture or forbidden military zones.
With this study we demonstrated how it is possible to use GRASS GIS modules in a new combination in order to process remote sensed data achieving the same results of the expensive and complex specialized softwares.
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