Geophysical Research Abstracts
Vol. 16, EGU2014-676, 2014
EGU General Assembly 2014

Estimation of water dam area variations by means of multitemporal remote sensing data

Hristo Nikolov (1), Vasil Vassilev (2), Denitsa Borisova (1), and Nadya Tsvetkova (2)

(1) SRTI-BAS, Remote Sensing Systems, Sofia, Bulgaria (hriston@bitex.com), (2) Remote Sensing Application Center - ReSAC, Sofia, Bulgaria

In the last decade one of the resources, which is considered to be scarce, having in mind the growing population in global scale is the fresh water. Thus the need for careful planning and use of this resource is more then evident. In order to mitigate the effects of drought and potable water needs water dams are constructed. But together with benefits they provide there is serious flooding risk they pose for the area where they reside. In this research we proposed and tested an approach for water dam area delineation based solely on remotely sensed data. We proved that processing diachronic multispectral optical data from freely available sources and additional ones, such as topographic maps, in-situ data, data from national agencies, etc. we managed to obtain relevant information concerning current and past status of water dam Topolnitsa. The proposed method includes following steps – mulspectral data processing up to reflectance; calculation of widely used water related indices, namely NDWI and MNDWI; creation of mask layer implementing linear spectral unmixing for water area; and finally estimation of the area of the water table and calculation of the volume of the water body. In our previous work testing the pertinence of each spectral band (as well as of a few band ratios) to calculate the turbidity index (results not shown here), the red band was chosen. The best fit of the red band to characterize the turbidity of Danube Delta waters is not truly surprising. Using similar technology as for processing of HR EO data combined with visual interpretation for VHR data and airborne images Remote Sensing Application Center – ReSAC has developed a database for the standing water bodies in Bulgaria. The work continues over 10 years already and as a result more than 11 000 objects are mapped. For each water body a historical record is established on its variation in size during the years based on images available. Those records are organized in GIS database and can be accessed via web-based service.
In this research the results obtained make use of data in the visible range of the EMS from satellites with regular revisit time, so we used data from TM and ETM+ instruments, but it is shown that optical data from upcoming Sentinel-2 mission (MSI instrument) can be used too. Also a methodology was created that integrates already existing data and services provided at different levels - governmental, institutional, and private company. We believe that the proposed method has potential in studying and monitoring hydrological processes in one of the areas with well developed mining industry in Bulgaria. The research was focused on this specific target (Topolnitsa dam), because very often it is considered to be the main polluter of one of the transboundary rivers of Bulgaria. During our work we faced several problems so derive some requirements for provision of a final product based on regular monitoring of the water dams by processing the data mentioned.