

Derivation of Bathymetry Data Using Worldview-2 Multispectral Images in Shallow, Turbid and Saline Lake Acıgöl

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Abstract : In this study, derivation of lake bathymetry was evaluated using the high resolution Worldview-2 multispectral images in the very shallow hypersaline Lake Acıgöl which does not have a stable water table due to the wet-dry season changes and industrial usage. Every year, a great part of the lake water budget has been consumed for the industrial salt production in the evaporation ponds, which are generally located on the south and north shores of Lake Acıgöl. Therefore, determination of the water level changes from a perspective of remote sensing-based lake water by bathymetry studies has a great importance in the sustainability-control of the lake. While the water table interval is around 1 meter between dry and wet season, dissolved ion concentration, salinity and turbidity also show clear differences during these two distinct seasonal periods. At the same time, with the satellite data acquisition (June 9, 2013), a field study was conducted to collect the salinity values, Secchi disk depths and turbidity levels. Max depth, Secchi disk depth and salinity were determined as 1,7 m, 0,9 m and 43,11 ppt, respectively. Eight-band Worldview-2 image was corrected for atmospheric effects by ATCOR technique. For each sampling point in the image, mean reflectance values in 1*1, 3*3, 5*5, 7*7, 9*9, 11*11, 13*13, 15*15, 17*17, 19*19, 21*21, 51*51 pixel reflectance neighborhoods were calculated separately. A unique image has been derivated for each matrix resolution. Spectral values and depth relation were evaluated for these distinct resolution images. Correlation coefficients were determined for the 1x1 matrix: 0,98, 0,96, 0,95 and 0,90 for the 724 nm, 831 nm, 908 nm and 659 nm, respectively. While 15x5 matrix characteristics with 0,98, 0,97 and 0,97 correlation values for the 724 nm, 908 nm and 831 nm, respectively; 51x51 matrix shows 0,98, 0,97 and 0,96 correlation values for the 724 nm, 831 nm and 659 nm, respectively. Comparison of all matrix resolutions indicates that RedEdge band (724 nm) of the Worldview-2 satellite image has the best correlation with the saline shallow lake of Acıgöl in-situ depth.

Keywords : bathymetry, Worldview-2 satellite image, ATCOR technique, Lake Acıgöl, Denizli, Turkey

Conference Title : ICESCC 2014 : International Conference on Earth Science and Climate Change

Conference Location : Cape Town, South Africa

Conference Dates : November 06-07, 2014