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Kobra Heidaryan[1]
Shahram Kaboodvandpour[2]
Jamil Amanollahi[3]

Survey of Depth Changes of the Zarivar International Wetland Using Remote Sensing and Artificial Neural Network

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Introduction

Bathymetry of water is carried out to determine the bed substance, bed morphology, utility of aquatic habitats and other environmental studies. The accurate map of depth is generated based on the ground considerations. Due to problems in the Zarivar international wetland including annual arrival of large quantities of sediment and possibility of depth decrease in the years ahead, using of remote sensing for continuous monitoring of water depth seems necessary and essential. On the other hand, according to the new bands of Landsat 8 regarding different intervals of wavelength, quantization of twelve-bit data, the failure to investigate the potential of these new bands were related to the bathymetry and the availability of these images in comparison to pictures of other satellites, The results of this research in addition to shedding light on the ability of the bands in the field of depth measurement of water resources could also allow continuous monitoring with

1- M. Sc. Department of Environment Science, Faculty of Natural Resources, University of Kordestan, Iran.
2- Department of Environment Science, Faculty of Natural Resources, University of Kordestan, Iran.
3- Department of Environment Science, Faculty of Natural Resources, University of Kordestan, Iran.

least cost and provides conditions for an informed managing of Zarivar and other wetlands of the country as well. On this basis, in this study we tried to consider the changes in the depth of international wetland using remote sensing and artificial neural network model to estimate the depth of water in the Zarivar wetland using spectral relation in the visible and infrared bands of Landsat 8 and finally comparing different bands of operational land imager of this satellite in depth estimation.

Materials and methods

Zarivar lake depth sampling was calculated simultaneously with Landsat 8 pass on wetland through hours 11:30 to 12:00 in different months during years of 1392 and 1393 in four periods including summer (August) and fall (October) of 1392 and spring (May) and summer (July) of 1393. Regarding the fact that the amount of suspended solids and soluble and phytoplankton concentration in wetland water in various time intervals is varying, and these variations influence the amount of band spectral reflection, In different seasons in the present study artificial neural network modeling was used based on various stages of sampling.

Results and discussion

Artificial neural network modeling is provided using different bands of spectral reflectance corresponding to the sampling points as a practical way to estimate the depth of wetland water. Among the present results of spectral reflectance correlation of four selected bands with water depth, red band with R^2=0.82 and RMSE= 0.0262 for estimation using general data (3 months) and with R^2=0.95 and RMSE=0.0230 for estimation using one – month data suggested better correlation with water depth. The band in 0.630 to 0.680 micrometer of wavelength is located in area of strong chlorophyll absorption and it is able to penetrate and reflect in

shallow water. Therefore it seems that red band is the best band for estimation of water depth for water below 6 meter depth. Fard et al (2013) achieved similar results and on the other hand the blue band with R^2=0.75 and RMSE= 0.0329 for estimation using general data and with R^2=0.76 and RMSE=0.0692 for estimation using one – month data suggested the weakest correlation result. The results are also consistent with that of Fard et al (2013). Among the composition used in this study, combined results (band4-band2) / (band4 + band2) with R^2=0.92 and RMSE= 0.0203 using general data and with R^2=97 and RMSE=0.0301 using one–month data suggested the higher correlation with amount of water depth. Combination of (band4-band2)/(band4+band2) is designed based on NDVI combination. In NDVI combination, high vegetation reflectance in the near-infrared band (band 5 OLI sensor of Landsat 8) is reduced from low vegetation reflectivity in red band (band 4) and the result is divided by the sum reflection of both bands.