Investigating the trend of land use changes in eastern Lake of Urmia with an emphasis on soil salinity by object-oriented method

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Introduction

Drying up of Urmia Lake has great influence on the surrounding environment. The salinity of the soil on the edge of the lake, the increase of salt particles and the reduction of the usual agriculture in this area are among the effects of this drought. With proper planning and extensive studies, it is possible to turn the created deficiencies into opportunities and take maximum advantage of them. One of the parameters that can be checked using satellite data is soil salinity. Soil salinity is the accumulation of dissolved salts in the form of electrical conductivity, and it can be measured. In this study, the changes in land use and vegetation from 2000 to 2016 have been investigated using Landsat 5 and 8 images. The analysis of the images has been done using object-oriented methods, and the soil salinity has been calculated using salinity indices and during the studied years. Soil salinity index as well as other indices such as plant indices has been used in the classification and examination of changes. Land use changes were obtained by object-oriented method in Ecognation software and calculations related to the amount of changes is done using Arc map and Idrisi software. The study was carried out on 4 periods of 2000, 2006, 2010 and 2016. The images related to each year are first classified into 9 classes of water, salt marsh, new salt, pastures and weak pastures, city, agriculture, barren land and garden by object-oriented method. After classification, the amount of changes during these years has been obtained.

Data and methods

Most of the study area is located in pass 168 and row 34, and only parts of the lake in the northwestern part of the study area are outside this image, so to get the desired result, we have to mosaic the images of passes 168 and 169 with rows 33 and 34. Processing is divided into three stages: pre-processing, processing and post-processing.

Segmentation is the first step in processing images in object-oriented methods. Segmentation is the integration of objects from small to large based on the parameters of color, shape, density, smoothness and scale. In this study for processing have used from ecognation Software. The method used to classify images is the thresholding method. In order to improve the classification method, salinity indices and vegetation indices have used in this study.

Conclusion

The amount of water in the lake has decreased drastically between 2000 and 2016, and it has decreased from 54.39% range to 29.26%. By examining the changes, it can be seen that other land uses have been reduced, and salt marshes have been added. The comparison of land uses from 2000 to 2016 shows that the amount of salt marshes has increased from 12.37% in 2000 to 13.84% in 2006, 24.7% in 2010 and 33.25% in 2016. Studies show that the intensity of changes in the amount of water and salinity between the years 2006 to 2010 and 2010 to 2016 is much more

intense than the period 2000 to 2006. It seems that before 2006, unprincipled exploitation of lake water and underground water was less than after 2006, or the environment had the ability to recover the amount of water harvested. As it can be seen from the map of 2000, the amount of new or wet salt around the lake is very small, which has increased with the decrease of the lake's water. The survey of gardens in the studied area shows that the area occupied by gardens has increased from 2000 to 2010, but the results of changes in use from 2010 to 2016 show that the area of gardens has almost halved (1099 pixels from the image in 2010 And 667 pixels in 2016) that one of the factors of this reduction can be soil salinity.
Another thing that can be seen by studying the maps is the distribution of new salt in the areas far away from the lake, which at first was only attached to the water at the edge, but over time, when the amount of this type of salt increased, due to the occurrence of salt storms, it was spread to further areas. If measures are not taken to control this amount of salt and soil salinity that has occurred after that and will increase over time, we will witness more severe problems in the region.

Key Words: Urmia Lake, Salinity, Landsat, Change detection, Object base

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