Integrated remote sensing and GIS for developed new spectral index for estimating Sandy land and its potential hazards. Case study: north-east Al-Muthanna Province area, south of Iraq

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Abstract

The sandy landscapes, such as dunes, coastal regions, or sand sheets are one of the main problems in areas of arid and semi-arid climate. Remote sensing and GIS techniques have played a significant and vital role in the investigating of sandy land and dunefields of the earth and the other planetary surfaces. The spectral indices are widely used to automatic separation landscape features such as vegetation, water, and built-up etc. This article suggests the application of the newly developed index, called the Normalized Differential Sandy Land Index (NDSLI) to extract and map sandy land. The NDSLI uses the normalized differential between the short wavelength infrared (SWIR)-1 and Red bands based on the sensitivity of the SWIR-1 to the moisture content and the ability of the Red band in the separation between different covers types of land such as vegetation, soil, and urban features. The case study, locates in the northeast part of Al-Muthanna province, the southern middle part of Iraq. In this study, three dated images (i.e., 1978, 2002, and 2017) of three different sensors (i.e., Landsat TM, ETM, and OLI sensors) of Landsat satellites level-2 (Landsat Surface Reflectance) were utilized. The obtained result showed the NDSLI has good performance to separate the sandy land from other types of land cover, especially that near to the vegetation, water areas, and other types of soils with an overall accuracy of more than 88% and a kappa of 0.75. The change detection result shows there has been an increase in sandy land about 20% to 28% during 2002 and 2017 than in 1989 respectively, most changes concentrated in the middle part of the study area.

Keywords Remote sensing . Sandy land . Moisture content . Landsat images