

The trending of normalized health environmental index based on satellite data from 2001 to 2013 and its relation with dust sources in the West Asia

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Extended Abstract

Introduction

Remote sensing has introduced new fields in monitoring and modeling environmental variables on different levels. One of the major advances of remote sensing is the use of quantitative algorithms to estimate the earth's surface variables. Therefore, it can be regarded as a research and application framework in order to forecast and counteract devastating effects of environmental crisis. Meanwhile, capabilities of MODIS sensor in terms of its various products to estimate the environmental parameters have been explored more than any other remote sensing instruments. Optical remote sensing modeling techniques are robust and strong enough for modeling the relationship between land surface variables and the quantities measured by remote sensing data.

Materials & Methods

This research focuses on developing and introducing a new spectral index for modeling the Land Surface Temperature (LST) and vegetation, simultaneously. Land surface temperature is a key parameter in the balance physical processes of the Earth's water and energy on different levels including from regional to local scales. On the other hand, studying the temporal and spatial variations of vegetation and temperature in different areas as an indicator showing the environmental conditions has the great importance for current and future behaviors of the surface. Therefore, combining these two parameters can lead to high synergies in the use of satellite data for studying the environmental status of the west Asia as the area is experiencing one of the most horrifying environmental degradations of the world. In order to evaluate the developed index, the spatial-temporal relationship of the Normalized Health Environmental Index (NHEI), in relation to the behavior of dust sources in the west Asia is investigated. The main steps of this study include the developing and introducing the remote sensing index that reflects the simultaneous behavior of environmental variables, trending the index based on its changes for the west Asia and finally applying that in studying dust sources of the studied region. The Normalized Health Environmental Index, (NHEI), is developed using MODIS products consisting of MYD11A2, MYD13A2 and MOD44W products. The developed index considers

the spatiotemporal behavior of Land Surface Temperature (LST), and vegetation cover, simultaneously. This index is useful for monitoring the environmental health situation of lands by masking the surface water bodies. NEHI is a dimensionless parameter and the range of its values is between -1 to 1. The smaller values indicate that conditions in the region in terms of land surface temperature, vegetation, water and the environmental relevant phenomena are more critical.

Results & Discussion

NHEI was used to analyze the trend changes of the most important dust sources in the West Asia during last decade. Due to the high correlation between the results obtained from NHEI and the activities of the origins of dust storms, it can be adapted as a basis for modeling the behavior of these phenomena while such relationship has not been confirmed through applying the conventional indices such as NDVI. NHEI is developed and analyzed for 2002 to 2013. The trend of changes was detected by linear trending process and its relationship with dust sources has been evaluated. Since NHEI shows the changing trend of key elements of the environment, i.e. temperature, vegetation and humidity simultaneously, the results of trending reveal the general decrease of severity and extend of the index. While the distribution of dust storm hot spots in terms of the index values is showing more scattering for the whole of the west Asia. Although NHEI is not a pure physical parameter with certain and standard unit, however, because of reflecting the combined effects of NDVI and LST as well as its simplicity and strong correlation with environmental parameters, it can be used as a reliable reference index in the environment research at local and macro-scale. Then the values of NHEI within specific land covers were determined, so it has distinct values for different land covers.

Conclusion

This study emphasizes on NHEI capabilities in monitoring and modeling environmental variables associated with dust sources, therefore, the average of NHEI in dust sources individually and totally was significantly less and more critical than the value of NHEI in other areas of the study area. Generally, the results of this study can open a new horizon in the field of land surface variables modeling and investigation by developing new remote sensing indices especially in land degradation and dust storm investigations.

Keywords: MODIS products, Normalized Criticality Environmental Index, Trending, Dust sources