

## An Effective Algorithm for Estimating the Dust Density in Iran using Remote Sensing Images

**Abstract:** One of the most important environmental issues in southern cities of Iran is Dust storm. It severely threatens the mankind society. This phenomenon may also affect the fertility of agricultural soils. Similar to all materials, dust also reflects the incident energy received from a given source. In other words, dust can affect the energy reflected toward sensors/satellites. Hence, a mass of dust directly influences the intensity of the energy. This study shows a high correlation between the dust density and the reflected energy recorded by satellites for each ground pixel. This research proposes an effective algorithm based on the linear spectral unmixing, which deploys the MODIS images. The proposed method uses changes in the reflectance of particular pixels having invariant covers during the days the satellite images are acquired. These changes help model the dust density in terms of the dust aerosols abundance. It is obvious that the abundance values demonstrate the effect of the dust density on the reflectance of each ground pixel. The first part of the results shows the contribution of dust to the pixel reflectance. A comparison with the field-measured dust densities shows an  $R^2$  of 0.90 between the measured densities and the dust reflectance abundances in each pixel (estimated from the linear unmixing). To evaluate the proposed method, it was applied to a new set of samples where an RMSE of about 1.34 (microgram / m<sup>3</sup>) between the model-predicted and the field-measured dust densities was achieved. It is expected that this model can perform better for higher values of dust densities.