Integrated Water Resources Management in the Era of nGreat Transition

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Abstract

The Chah-Nimeh reservoirs, which are a sort of natural lakes located in the border of Iran and Afghanistan, are the main drinking and agricultural water resources of Sistan arid region. Considering the occurrence of intense seasonal wind, locally known as levar wind, this study aims to explore the possibility to provide a TSM (Total Suspended Matter) monitoring model of Chah-Nimeh reservoirs using multi-temporal satellite images and in-situ wind speed data. The results show that a strong correlation between TSM concentration and wind speed are present. The developed empirical model indicated high performance in retrieving spatiotemporal distribution of the TSM concentration with $R^2=0.98$ and RMSE=0.92g/m^3. Following this observation, we also consider a machine learning-based model to predicts the average TSM using only wind speed. We connect our in-situ wind speed data to the TSM data generated from the inversion of multi-temporal satellite imagery to train a neural network based model(Wind2TSM-Net). Examining Wind2TSM-Net model indicates this model can retrieve the TSM accurately utilizing only wind speed ($R^2=0.88$ and RMSE=1.97g/m^3). Moreover, this results of this study show tha the TSM concentration can be estimated using only in situ wind speed data independent of the satellite images. Specifically, such model can supply a temporally persistent means of monitoring TSM that is not limited by the temporal resolution of imagery or the cloud cover problem in the optical remote sensing.