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Numerical simulation of dust events in the Middle East

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In this paper, the severe dust event of 3-8 July 2009 in the Middle East is simulated using the WRF-DuMo model. To improve the model capacity in dust emission estimates, the effect of soil salt on threshold friction velocity for wind erosion is taken into consideration. A soil-salt propagation map and the other input parameters are compiled based on remote sensing and a Geographic Information System. The satellite images and synoptic data are used for the validation of the model results. Synoptic analysis is done for the Middle East and the synoptic systems for the severe dust event are identified. Comparison of the model results with the observed data shows that in the Aral-Caspian Sea area, central Iran and the Dead Sea Basin, dust emission is suppressed due to the high soil-salt content. The model shows better performances when the soil-salt effect is considered.

Biography

Mehdi Hamidi has completed his PhD at the age of 32 years from K.N. Toosi University of Technology in 2013 in Hydraulic engineering. He works as an Assistant Professor in Babol Noshirvani University of Technology. He has studied more than 7 years on dust storm modeling on Middle East and Asia South-West area with cooperation of Cologne Institute of Geophysics and Meteorology in Germany and he published more than 5 papers on dust events modeling in the mentioned area in recent year.

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Synoptic analysis of dust storms in the Middle East

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Dust storm in the Middle East and south-west Asia is a natural hazard and the Tigris-Euphrates alluvial plain has been recognized as the main dust source in this area. In this study, more than 60 dust storms that occurred during the period 2003-2011 are investigated on the basis of MODIS satellite images, and 12 of the dust storms are selected for synoptic analysis using the NCEP-NCAR Reanalysis Data. The potential dust sources in the Middle East and south-west Asian region (20o E to 80o E, 5o N to 50o N) are analyzed and used in the synoptic analysis. Dust storms in the region can be grouped into two main categories, i.e., the Shamal dust storms and the frontal dust storms. Synoptic systems, associated with the two categories, are distinguished and the frequency of the patterns is identified. For 68% of the Shamal dust storms, a high pressure system is situated between 0o E to 30o E and 27o N to 45o N, and a low pressure system between 50oE to 70oE and 23oN to 43o N. For 86% of the frontal dust storms, a high is located between 51o E to 67o E and 18o N to 33o N and a low between 28o E to 48o E and 32o N to 43o N. Three main patterns for Shamal dust storms are identified, which represent about 60% of the Shamal dust storms. This analysis confirms that the Shamal is related to the anticyclones located over northern Africa to Eastern Europe and the monsoon trough over Iraq, southern Iran, Pakistan and the Indian Subcontinent. The analysis also shows that the main dust sink for the frontal dust storms in Tigris and Euphrates alluvial plain extends from center of Iraq to west and center of Iran and, in most severe cases, to northern Iran and the southern coast of the Caspian Sea.

Biography

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