

Simulation and Synoptic Investigation of a Severe Dust Storm in Urmia Lake in the Middle East

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Abstract : Deserts are the main dust sources in the world. Also, recently dried Lake beds have caused environmental problems in the surrounding areas in the world. In this study, the Urmia Lake was the source of dust from April 24 to April 25, 2017. The local dust storm was combined with another large-scale dust storm that originated from Saudi Arabia and Iraq 1-2 days earlier. Synoptic investigation revealed that the severe dust storm was made by a strong Black Sea cyclone and a low-pressure system over the Middle East and Central Iraq in conjunction with a high-pressure system and associated with a high gradient contour and a quasi-stationary long-wave trough over the east and south of the Mediterranean Sea. Based on HYSPLIT 72 hours backward and forward trajectories, the most probable dust transport routes to and from the Urmia Lake region are estimated. Using the concentration weighted trajectory (CWT) method based on 24 hours backward and 24 hours forward trajectories, the spatial distributions of potential sources of PM₁₀ observed in the Urmia Lake region on April 23-26, 2017. Also, the vertical profile of dust particles using the WRF-Chem model with two dust schemes showed dust ascending up to 5 km from the lake. Also, the dust scheme outputs show that the PM₁₀ fluctuating changes are 12 hours earlier than the measured surface PM₁₀ at five air pollution monitoring stations around the Urmia Lake in 23-26 April 2017.

Keywords : dust storm, synoptic investigation, WRF-chem model, Urmia lake, Lagrangian trajectory

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