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Study and Simulation of a Sever Dust Storm over West and South West of Iran

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Abstract : In the recent decades, frequencies of dust events have increased significantly in west and south west of Iran. First, a survey on the dust events during the period (1990-2013) is investigated using historical dust data collected at 6 weather stations scattered over west and south-west of Iran. After statistical analysis of the observational data, one of the most severe dust storm event that occurred in the region from 3rd to 6th July 2009, is selected and analyzed. WRF-Chem model is used to simulate the amount of PM10 and how to transport it to the areas. The initial and lateral boundary conditions for model obtained from GFS data with 0.5°×0.5° spatial resolution. In the simulation, two aerosol schemas (GOCART and MADE/SORGAM) with 3 options (chem_opt=106,300 and 303) were evaluated. Results of the statistical analysis of the historical data showed that south west of Iran has high frequency of dust events, so that Bushehr station has the highest frequency between stations and Urmia station has the lowest frequency. Also in the period of 1990 to 2013, the years 2009 and 1998 with the amounts of 3221 and 100 respectively had the highest and lowest dust events and according to the monthly variation, June and July had the highest frequency of dust events and December had the lowest frequency. Besides, model results showed that the MADE / SORGAM scheme has predicted values and trends of PM10 better than the other schemes and has showed the better performance in comparison with the observations. Finally, distribution of PM10 and the wind surface maps obtained from numerical modeling showed that the formation of dust plums formed in Iraq and Syria and also transportation of them to the West and Southwest of Iran. In addition, comparing the MODIS satellite image acquired on 4th July 2009 with model output at the same time showed the good ability of WRF-Chem in simulating spatial distribution of dust.

Keywords : dust storm, MADE/SORGAM scheme, PM10, WRF-Chem
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