Contribution of meteorological factors to AOD variability during the dusty season over Iran

By:

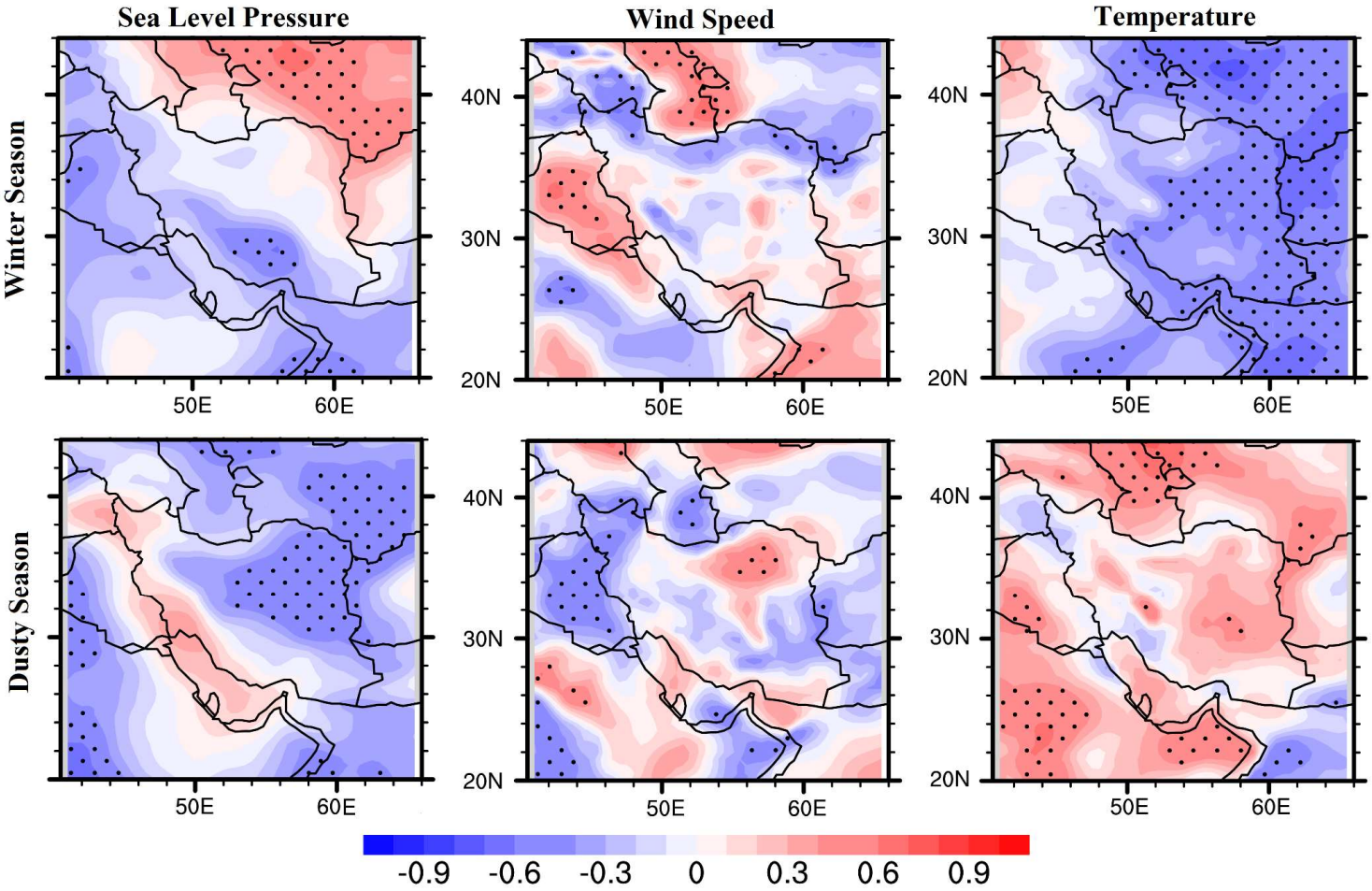
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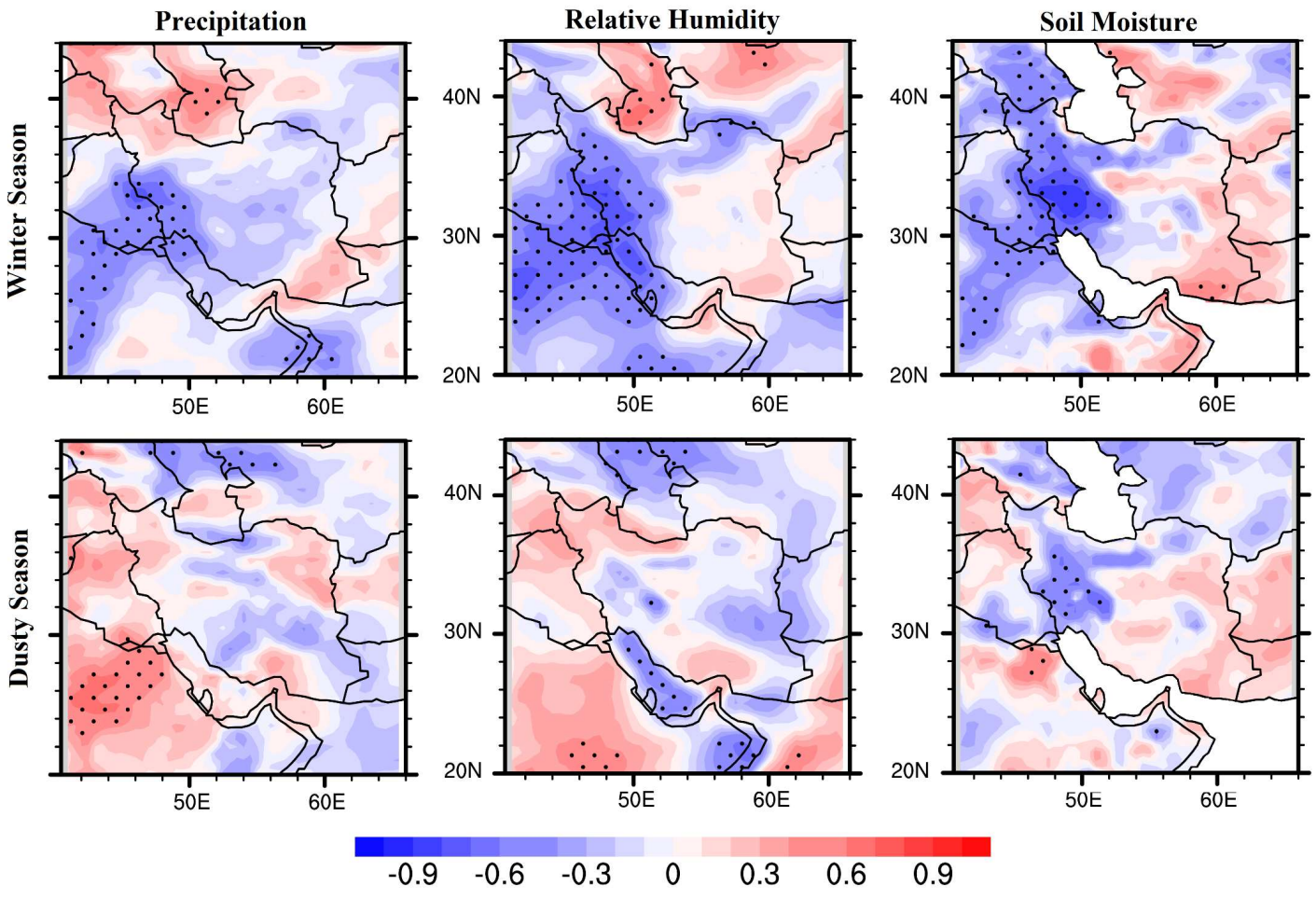
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Correlations of MERRA-2 AOD in the hot period (MJJA) and meteorological parameter from ERA5 in the cold and hot period (DJFM, MJJA) over Iran calculated from the monthly anomalies during 2000–2019:

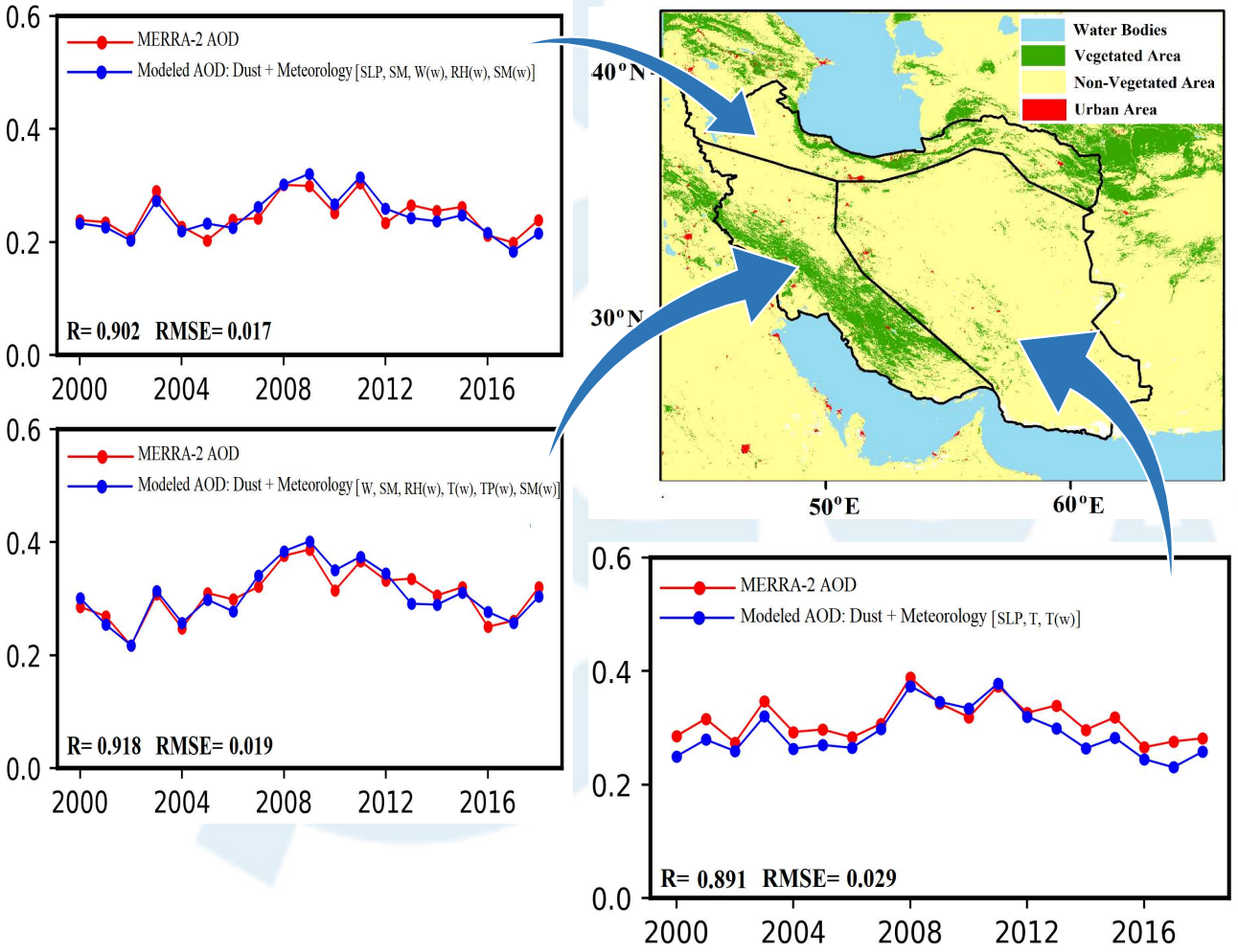


The resulting correlation analysis of aerosols and meteorological parameters revealed that soil moisture was a likely determinant in the dust changes. It should be noted that the soil moisture in the dusty spring-summer season was also strongly related to the meteorology of the preceding winter season.



Overall, during the increasing AOD period, a decrease in sea level pressure was associated with southerly winds, reduced precipitation, and relatively high temperatures that enhance surface evaporation. When relative humidity was reduced dust was more easily mobilized. In contrast, during the period when the AOD was relatively low, anomalies in meteorological parameters that contribute to soil moisture decreased dust mobilization.

Time series of mean MJJA MERRA-2 AOD and modeled mean MJJA AOD using MERRA-2 dust and ERA5 meteorological parameters from 2000 to 2019 over the three divided regions of Iran:



The multivariable regression analysis revealed that AOD trends during the dusty period can be related to meteorological variations in both the winter and dusty seasons, probably influenced by the North Atlantic Oscillation. Most humidity emanates from the west, the northern and western regions of Iran are highly influenced by synoptic patterns which lead to active changes in soil moisture. The AOD over the most important dusty region (west of Iran) appears to be relatively strongly affected by soil moisture, wind speed, and dust emissions in the spring-summer period, and temperature, relative humidity, precipitation, and soil moisture from the preceding winter season. But the central region in Iran unlike the other region where the two major mountain ranges in the north and northwest Iran prevent clouds and humidity reaching the central region of Iran which lead to less effect on soil moisture. Therefore, only MJJA sea level pressure and temperature in both seasons are more relevant predictors than other factors in linear modeling for the center region.