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Long-term AOD trend analysis and Classification of major aerosol types over Iran from 1980 to 2018

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Based on the importance of the effects of aerosols on climate pattern change, our study contributes towards a better understanding of the Aerosol Optical Depth (AOD) trends from different datasets and the contribution of each dominant aerosol over Iran. A long-term AOD dataset (1980–2018) from the reanalysis-based Modern Era Retrospective Analysis for Research and Applications (MERRA-2) and the satellite-based Moderate Resolution Imaging Spectroradiometer (MODIS) /Terra Collection 6.1(C6.1) and Level 2 (L2) in the years 2001-2018. The result of AOD trend showed some differences between MERRA-2 and MODIS in autumn and winter. But, generally, the increasing and slightly decreasing trends appeared over the southwest and north of the country, respectively. The upward trend was mainly observed in the southwest of Iran because of the proximity to the major source areas of natural mineral dust in spring and summer of both AOD datasets which was also obtained in the regional trend analysis and the city of Ahvaz experienced a strong positive trend compared with other selected cities. Also, an unforeseen downward trend was observed in the last decade. Finally, the classification of major aerosol types during 1980-2018 indicated that the mixed aerosols (43.28%) and clean marine (37.38%) were the dominate aerosols followed by the clean continental (9.78%) and desert dust (5.56%) with minor contributions of biomass burning/urban industrial (3.98%) aerosols. Later, the increase of desert dust around 2010 was another obvious result in spring and summer. Our study results indicate that the variation in dust aerosols has a key role in determining the AOD changes in Iran which are contributed in regional climate change and environmental evolutions.