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An 11-year analysis of satellite retrievals of dust aerosol over the Red Sea and the Persian Gulf

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As enclosed seas bordering two large desert regions, the Saharan and Arabian deserts, the maritime environments of the Red Sea and the Persian Gulf are heavily influenced by the presence of desert dust aerosol. The inter-annual variability of dust presence over the Red Sea is analysed and presented, with respect to the summer-time latitudinal gradient in dust loading, which is at a maximum in the far south of the Red Sea and at a minimum in the far north. Two satellite aerosol optical depth (AOD) products from the Spinning Enhanced Visible and Infrared Imager (SEVIRI) and the MODerate resolution Imaging Spectroradiometer (MODIS) instruments are used to quantify this loading over the region. Over an eleven-year period from 2005-2015 the July mean SEVIRI AODs at 630 nm vary between 0.48 and 1.45 in the southern half of the Sea, while in the north this varies between 0.22 and 0.66. Inter-retrieval offsets are observed to occur at higher dust loadings, with pronounced positive MODIS-SEVIRI AOD offsets at AODs greater than $\sim$1, indicating substantial and systematic differences between the retrievals over the Red Sea at high dust loadings. These differences appear to be influenced in part by the differences in scattering angle range of the satellite measurements, implying that assumptions of particle shape introduce more substantial biases at the highest dust loadings.