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Monitoring dust outbreaks over ocean using METEOSAT visible images

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The dust aerosols have multiple effects on climate. Insufficient knowledge of their optical properties and spatio-temporal distribution has resulted in uncertainty in their global radiative impacts (both direct and indirect). The magnitude and even the sign of their direct radiative forcing are under investigation. Every year during pre-monsoon season, major dust outbreaks are observed over the Arabian Peninsula. Few studies show that these aerosols may have direct impact on the monsoon and regional hydrological cycle. Furthermore, dust particles are transported over the polluted regions and mixed with anthropogenic aerosols, thus leading to complex aerosol-cloud-climate interactions. It is, therefore, important to monitor and quantify their sources and transport. The Infrared Difference Dust Index (IDDI) is widely used tool to pinpoint the sources and the presence of dust aerosols on land (especially desert areas) from the thermal images of MVIRI/METEOSAT. Based on the conceptual model of the IDDI, we discuss applicability of similar tool in the visible spectrum, Visible Difference Dust Index (VDDI), to monitor the dust transport over the ocean using METEOSAT visible images. Using a case study of major dust event, we show that the VDDI is very useful tool in dust monitoring at very high spatial (2.5 km) and particularly temporal resolutions (30 min). The VDDI is complementary to the IDDI and by combining both these

approaches, one can fully monitor transport of dust aerosols over both land and ocean. We also discuss possible error sources while computing the VDDI images.