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An Extensive Study on Dynamical aspects of Dust Storm over the United Arab Emirates during 18-20 March 2012

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On 18 March 2012, a super dust storm event occurred over Middle East (ME) and lasted for several hours. Following to this, another dust storm occurred on early morning of 20 March 2012 with almost higher intensity. Both these storms reduced the horizontal visibility to few hundreds of meters and represented as one of the most intense and long duration dust storms over United Arab Emirates (UAE) in recent times. These storms also reduced the air quality in most parts of the ME implying the shutdown of Airports, schools and hundreds of people were hospitalized with respirational problems. In the context of the above, we have made a detailed study on the dynamical processes leading to triggering of dust storm over UAE and neighboring regions. We have also analyzed its impact on surface, and vertical profiles of background parameters and aerosols during the dust storm period by using ground-based, space borne, dust forecasting model, and reanalysis data sets. The synoptic and dynamic conditions responsible for the occurrence of the dust storm are discussed extensively by using European Centre for Medium-Range Weather Forecasts (ECMWF) ERA interim reanalysis data sets. The Impact of dust storm on surface and upper air radiosonde measurements and aerosol optical properties are also investigated before, during and after the dust storm event. During the dust storm, surface temperature decreased by 15oC when compared to before and after the event. PM10 values significantly increased maximum of about 1600μg/m3. Spatial variation of Aerosol Optical Depth (AOD) from Moderate-resolution Imaging Spectroradiometer (MODIS) and Ozone Monitoring Instrument (OMI) aerosol index (AI) exhibited very high values during the event and source region can be identified of dust transport to our region with this figure. The total attenuated backscatter at 550nm from Cloud-Aerosol Lidar and Infrared Pathfinder Satellite shows the vertical extent of dust up to 8km. The dynamics of this event is related to coupling of subtropical jet and polar jet over the Saudi Arabia region, which leads to massive dust storm generation and dust transport through Rub-Al-Khali, and Persian Gulf over the UAE region. AOD from ground based measurements showed fourfold increase from 0.2 to 1.8 during the event implying an atmospheric forcing of $\sim$ 150 Wm-2. In addition, vertical profile of heating rate showed heating of $\sim$1.5 K/day at 3-4 km during the event. In the view of the above, the present event is discussed in the light of current understanding of dust storm aerosol optical and physical processes and associated dynamics over UAE region.