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Aerosol Properties Changes of Northeast Asia due to a Severe Dust Storm in April 2014

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This study focuses on analyzing the aerosol properties changes due to the dust storm named as “China’s Great Wall of Dust” oriented from Taklimakan desert in April, 2014. Dust identification IDDI (Infrared Difference Dust Index) images from FY-2E and true color composite images from FY-3C MERSI (Medium Resolution Spectral Imager) show the breakout and transport of the dust storm.From 4-day forward air mass trajectories, the dusty air masses were mostly transported within the lower boundary layer(<3km) over the Northwest China on April 23rd and April 24th, however they were progressively increasing in altitude to above 5km above the surface when they reached the central part of north China region (32°N-42°N; 105°E-123°E). 3-hourly data records at surface stations suggest that anticyclonic circulation occupying southern Xinjiang basin and cyclonic circulation maintaining in Mongolia formed the typical Synoptic condition which leaded to the strong dust storm. Aerosol Index (AI) results of TOU (Total Ozone Unit) aboard FY-3B are first developed and used in studying the affected areas due to the dust storm. The retrieved aerosol indexes show sensitivity to the dust particles. The dust affected areas agree with the synoptic meteorological condition analysis, which prove the synoptic meteorological condition is the main reason for the break out and transport of the dust storm. Anomalies of the average MODIS (Moderate Resolution Imaging Spectroradiometer) AOD (Aerosol Optical Depth) distributions over Northeast Asia during the dust storm to the average of that in April between 2010-2014 show high aerosol loading due to the dust storm. Compared with the 5-year average AOD in April, aerosol loading during this dust storm was much higher, with AOD values at 550nm up to 2.9 observed over the northwest China.The dust storm also brought different change in the aerosol microphysical properties between Beijing and Dalanzadgad. Aerosol Robotic Network (AERONET) retrievals demonstrate that large amount of coarse particles were transported to Dalanzadgad by the dust storm, resulting in an obvious increase in the peak of coarse mode particles volume. The coarse dust particles increased the effective radius of the aerosol mode, leading to stronger scattering at longer wavelength. However, aerosol loading was predominantly contributed by fine dust particles during the dust storm in Beijing as most coarse particles deposit during the long-range transport.