

Dust Storm Detection Using Satellite Microwave Measurements

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Abstract

Several techniques have been proposed for detecting mineral dust and volcanic ash using thermal-infrared observations [Prata, 1989; Ackerman, 1997; Legrand et al., 2001; Prata and Grant, 2001]. Detection is based on brightness temperature differences (BTD) either in two or three channels. However, the infrared radiance is primarily sensitive to the cirrus cloud, especially when the upper-layer cirrus clouds are thicker; the BTD approach is nearly useless in cirrus over dust areas. The microwave radiation is not significantly scattered or absorbed by ice clouds and can be used to detect dust storm below the ice clouds through backscattered radiation in microwave range. In this study, we develop a dust detection approach using microwave measurement and propose a multi-sensor detection index (MDI). This approach is then applied to detect the dust storm in cirrus over dust system by using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Advanced Microwave Scanning Radiometer (AMSR) on the board of Aqua satellite. The result shows that MDI is particularly useful to monitor the region of dust storm.