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PHYSICOCHEMICAL CHARACTERIZATION AND ORIGIN OF THE 20 MARCH 2002 HEAVY DUST STORM IN BEIJING

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ABSTRACT

The dust storm event on 19-21 March 2002 in North China, which was very detrimental to the atmospheric environment quality over a wide area, was one of the heaviest events during the last decade. The total mass concentration, size distribution of mass concentration and number concentration of particles were observed during this heavy dust period in Beijing. The TSP concentrations in Beijing reached peak values of 12 mg m^{-3} in dust period, which is the highest value that has ever been reported in Beijing and also is an infrequent value in dust source regions. During this dust storm, the distribution of mass concentration and number showed a characteristic increase especially in the size range of coarse particles. The mass concentration of coarse particles (>2.1μm) account for 91% of the total in the dust period and 61% in the non-dust period respectively. The number concentrations of fine particles (d <2μm) and coarse particles (d > 2μm) increased sharply in dust storm period.. The dry deposition mass flux of in dust storm period reached 17.5 g m^{-2} d^{-1} in dust period on 20 March in Beijing. During the storm, the air mass was transported directly from southern of Mongolia, central Inner Mongolia, passing through Shanxi province, and then to Beijing, which was demonstrated by backward trajectory analysis. Concentrations of Cl^-, NO_3^-, and SO_4^{2-} in TSP in dust storm period are about 10 times as that in non dust storm period, which implied that aerosols in dust period were influenced by anthropogenic sources during the transport process. Compared to the China Air Quality Standard, 20 March 2002 dust storm caused serious air pollution in Beijing.

Keywords: dust storm, size distribution, number concentration, backward trajectory analysis

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