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Mineral Dust Emission and Transport : Observation and Modeling

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As the major contributor to the global yearly aerosol production, mineral dust has the significant impact on the regional and global climate and air quality. The simulation of mineral dust lifting as well as distribution can help to improve our understanding of the role of dust in climate change as well as its contribution to the changes in the background composition of the atmosphere. A dust emission and deposition module, based on the work of Zender [2003] (Dust Entrainment and Deposition (DEAD) Models) as well as Gong [2003] (Canadian Aerosol Module (CAM)), is implemented in the Canadian Global Environmental Multiscale Air Quality [GEMAQ] model. The impacts of some key parameters affecting the dust mobilization such as the size distribution, surface roughness length as well as soil texture are quantitatively evaluated through the different specifications of those parameters under different scenarios, and their relative importance in determining the lifting process of mineral dust implies that the surface soil texture plays the most significant role in the simulation of the dust emission. Several historic dust storm events as well as inter-continental transport of dust that took place in east Asia and north Africa have been also simulated by GEMAQ with the newly embedded dust module. The extensive comparisons of the simulated dust loading in the atmosphere with both ground-based aerosol observations (AERONET and AEROCAN) and the satellite measurements proves the capability of GEMAQ in capturing both the pattern of the long range transport of dust and the magnitude of the dust loading in the atmosphere. The chemical interactions of dust with other atmospheric gas species have been described in GEMAQ dust moduel too and its impact on ozone level will also be discussed in this presentation.