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Dynamics of dust loadings in Central and East Asia and implication for assessment of dust impact on environment and climate

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The drylands of Central and East Asia are the world's largest sources of atmospheric mineral dust. Over the past century human-induced changes in land use and changes in meteorological conditions resulted in complex dynamics of dust loadings in the source regions and downwind. Reliable assessment of the emission, transport and properties of dust aerosol is needed to improve our understanding of how dust has been affecting the environment, air quality and regional climate.
To improve the modeling capability of the prediction of dust impacts, we have been building a coupled regional dust modeling system by developing an advanced dust module (DuMo) that was coupled with the NCAR Weather Research and Forecasting (WRF) model. In this presentation, we will focus on the coupling of land use changes and dust loadings with an attempt to delineate the relative role of meteorological/climate conditions and land cover/land use changes in controlling dust loadings in Central and East Asia over the past 50 years. We also address several issues that are central to the development of an integrated framework for satellite and regional model data integration in dust-laden environments. Examples will be drawn from the case studies involving the regional coupled dust modeling system WRF-DuMo and data from multi-satellite sensors (TOMS/OMI, MODIS, MISR, CALIPSO, and CloudSat).