# Assessment of dust aerosol effect on cloud properties over Northwest China using CERES SSF data

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Dust aerosols not only have direct effects on the climate through reflection and absorption of the short and long wave radiation, but also modify cloud properties such as the number concentration and size of cloud droplets (indirect effect), and contribute to diabatic heating in the atmosphere that often enhances cloud evaporation and reduces the cloud water path. In this study, indirect and semi-direct effects of dust aerosols are analyzed over eastern Asia using two years (June 2002 to June 2004) of CERES (Clouds and the Earth's Radiant Energy Budget Scanner) and MODIS (MODerate Resolution Imaging Spectroradiometer) Aqua Edition 1B SSF (Single Scanner Footprint) data sets. The statistical analysis shows evidence for both indirect and semi-direct effect of Asia dust aerosols. The dust appears to reduce the ice cloud effective particle diameter and increase high cloud amount. On average, ice cloud effective particle diameters of cirrus clouds under dust polluted conditions (dusty cloud) are 11% smaller than those derived from ice clouds in dust-free atmospheric environments. The water paths of dusty clouds are also considerably smaller than those of dust-free clouds. Dust aerosols could warm clouds, thereby increasing the evaporation of cloud droplets resulting in reduced cloud water path (semi-direct effect). The semi-direct effect may be dominated the interaction between dust aerosols and clouds over arid and semi-arid areas and partly contribute to reduced precipitation.