

Satellite Monitoring of Asian Dust Storms from SeaWiFS and MODIS: Source, Pathway, and Interannual Variability

N. CHRISTINA HSU, S.-C. TSAY, C. Bettenhausen, and A. Sayer

NASA Goddard Space Flight Center, Greenbelt, MD, USA

Among the many components that contribute to air pollution, airborne mineral dust plays an important role due to its biogeochemical impact on the ecosystem and its radiative-forcing effect on the climate system. In East Asia, dust storms frequently accompany the cold and dry air masses that occur as part of spring-time cold front systems. China's capital, Beijing, and other large cities are on the primary pathway of these dust storm plumes, and their passage over such population centers causes flight delays, pushes grit through windows and doors, and forces people indoors. Furthermore, during the spring these anthropogenic and natural air pollutants, once generated over the source regions, can be transported out of the boundary layer into the free troposphere and can travel thousands of kilometers across the Pacific into the United States and beyond.

In this paper, we will demonstrate the capability of a new satellite algorithm to retrieve aerosol optical thickness and single scattering albedo over bright-reflecting surfaces such as urban areas and deserts. Such retrievals have been difficult to perform using previously available algorithms that use wavelengths from the mid-visible to the near IR because they have trouble separating the aerosol signal from the contribution due to the bright surface reflectance. The new algorithm, called Deep Blue, utilizes blue-wavelength measurements from instruments such as SeaWiFS and MODIS to infer the properties of aerosols, since the surface reflectance over land in the blue part of the spectrum is much lower than for longer wavelength channels.

We have validated the satellite retrieved aerosol optical thickness with data from AERONET sunphotometers over desert and semi-desert regions. The comparisons show reasonable agreements between these two. These new satellite products will allow scientists to determine quantitatively the aerosol properties near sources using high spatial resolution measurements from SeaWiFS and MODIS-like instruments. The multiyear satellite measurements since 1998 from SeaWiFS will be utilized to investigate the interannual variability of source, pathway, and dust loading associated with these dust outbreaks in East Asia. The monthly averaged aerosol optical thickness during the springtime from SeaWiFS will also be compared with the MODIS Deep Blue products.