Geophysical Research Abstracts
Vol. 12, EGU2010-8365, 2010
EGU General Assembly 2010

Large-scale connection between aerosol optical depth and summer monsoon circulation, and precipitation over northeast Asia

Sang-Woo Kim, Soon-Chang Yoon, Suk-Jin Choi, and In-Jin Choi

Seoul National University, School of Earth and Environmental Sciences, Seoul, Republic Of Korea (kimsw@air.snu.ac.kr, 82 28834972)

We investigated the large-scale connection between columnar aerosol loads and summer monsoon circulation, and also the precipitation over northeast Asia using aerosol optical depth (AOD) data obtained from the 8-year MODIS, AERONET Sun/sky radiometer, and precipitation data acquired under the Global Precipitation Climatology Project (GPCP). These high-quality data revealed the large-scale link between AOD and summer monsoon circulation, precipitation in July over northeast Asian countries, and their distinct spatial and annual variabilities. Compared to the mean AOD for the entire period of 2001-2008, the increase of almost 40–50% in the AOD value in July 2005 and July 2007 was found over the downwind regions of China (Yellow Sea, Korean peninsula, and East Sea), with negative precipitation anomalies. This can be attributable to the strong westerly confluent flows, between cyclone flows by continental thermal low centered over the northern China and anti-cyclonic flows by the western North Pacific High, which transport anthropogenic pollution aerosols emitted from east China to aforementioned downwind high AOD regions along the rim of the Pacific marine airmass. In July 2002, however, the easterly flows transported anthropogenic aerosols from east China to the southwestern part of China in July 2002. As a result, the AOD off the coast of China was dramatically reduced in spite of decreasing rainfall. From the calculation of the cross-correlation coefficient between MODIS-derived AOD anomalies and GPCP precipitation anomalies over the period 2001–2008, we found negative correlations over the areas encompassed by 105–115E and 30–35N and by 120–140E and 35–40N (Yellow Sea, Korean peninsula, and East Sea). This suggests that aerosol loads over these regions are easily influenced by the Asian monsoon flow system and associated precipitation.