Geophysical Research Abstracts
Vol. 13, EGU2011-5691, 2011
EGU General Assembly 2011

Regional Climate Response to the Dust Aerosol Direct Forcing

Soohyun Park (1), Kyung-On Boo (1), Young-Hwa Byun (2), Hyun-Suk Kang (1), and ChunHo Cho (1)

(1) Climate Research Laboratory, National Institute of Meteorological Research, Republic Of Korea (shpark04@korea.kr), (2) Hadley Centre, Met Office, UK

Aerosols such as black carbon (soot) and dust warm the atmosphere by absorbing and scattering solar radiation, modifying vertical motions and horizontal circulation. The impacts on the large-scale circulation and water cycle are significant in regional scale. In order to investigate the absorbing aerosol contributions to regional climate, numerical experiments are conducted with dust emission. At first, we perform experiments with and without dust aerosols forcing. Secondly three additional simulations are carried out to assess the effect of various dust flux through modulation of dust emission amount. 20-year simulation is done from Jan. 1980 using HadGEM2-Atm developed at the Met Office Hadley Centre.

High dust AOD (aerosol optical depth) appears over Asia and the Sahara desert in the model. Simulated distribution of dust AOD is similar to the observation from MODIS TERRA. There are local discrepancies with low value of dust AOD over East Asia, compared with the observed.

Experiments including dust aerosols forcing, atmospheric warming near the surface is generated over Tibetan Plateau (TP). It accompanies rising motion over TP during the spring, leading to enhanced convection. Indian summer monsoon is strengthened over northern India, and the Bay of Bengal. During the summer, developed high pressure over the Western Pacific suppresses precipitation over the Philippine Sea and the North Western Pacific area. While the precipitation over the East Asian summer monsoon region, especially Korean Peninsula, is intensified for May and June, and dwindled for July and August since anticyclonic circulation over Western Pacific starts to extend to the north on July. These features are enhanced as dust emission flux is increased.

In addition, the elevated dust from Sahara desert, one of the dust source regions, gives impact on the Africa climate. The rainfall over Sahel area and tropical Atlantic increases and reduced rainfall is shown over the Caribbean region from June to September. The influence of Saharan dust on the local climate will be presented in the conference. Furthermore, this study will discuss the impact of dust aerosol forcing on water cycle in monsoon region and contribute the understanding between the dust aerosol forcing and water cycle.