Geophysical Research Abstracts
Vol. 16, EGU2014-7211-2, 2014
EGU General Assembly 2014

The response of Asian summer monsoon to the Tibetan plateau heating simulated by ECHAM5/MPIOM and COSMOS-CLM

Bijan Fallah, Sahar Sodoudi, and Ulrich Cubasch
Free University of Berlin, Institute of Meteorology, Berlin, Germany (bijan.fallah@met.fu-berlin.de)

The role of Tibetan plateau in driving the Asian summer monsoon system is still debating. In this study the physical climate model ECHAM5 (European Center, HAMburg) version 5.4.01 /MPIOM (Max Planck Institute Ocean Model) version 1.3.1 is used to study the potential role of Tibetan Plateau on Asian summer monsoon. The ECHAM5 model was integrated at T31 resolution with 19 levels and the MPI-OM ocean model at GR30 resolution with 40 levels for a period of 500 years (1500-2000 AD) for two experiments: a) with recent standard orography and b) with no Tibetan plateau. In the sensitivity simulation, we flattened the Tibetan plateau in 10-year time-steps to the final threshold of 500 meters. The subgrid-scale orographic drag was also considered by applying the parameterization scheme from Lott and Miller, 1996. Shallow ocean in the sensitivity simulation reached the equilibrium state after 300 years of integration. Deep ocean did not show an equilibrium state in the simulation with flattened Tibet. The large scale patterns of Asian summer monsoon are mostly unaffected by removing the Tibetan plateau, except a decrease of precipitation for the East China. Spatial pattern of summer surface temperature shows a decrease (up to -10 °C) over North Atlantic Ocean and a remarkable increase (up to 15 °C) over Tibetan plateau. Therefore, Tibet affects the atmospheric teleconnetion between the North Atlantic and the Asian monsoon system. In order to study the local orographically-induced effects on monsoon system, we have further applied the high resolution (horizontal grid spacing of 0.5) non-hydrostatic regional COSMO model in CLimate Mode (COSMO-CLM or CCLM) version 4.8_clm17 developed by the German Weather Service. The lateral boundary conditions were derived from the previous Atmosphere-Ocean General Circulation Model (AOGCM) simulations. Regional climate model simulations were started from initial conditions on 1 January 1979 for a period of 20 years.

In the next step, local thermodynamic structures of Asian monsoon will be investigated. We will also use the self-calibrated Palmer Drought Severity Index (scPDSI) as a metric to compare the hydro-climatic changes in Asian summer monsoon in the sensitivity simulations.