Geophysical Research Abstracts
Vol. 16, EGU2014-4802, 2014
EGU General Assembly 2014

Modeled precipitation response to realistic land use/cover changes from 1980 to 2000 over Eastern China

Hu Yang (1,2), Zhang Xue-Zhen (3), Gong Dao-Yi (1,2), Mao Rui (1,2)

(1) State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, Beijing, China, (2) Academy of Disaster Reduction and Emergency Management Ministry of Civil Affairs & Ministry of Education, Beijing Normal University, Beijing, China, (3) Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS), Beijing, China

Land use/cover changes are important anthropogenic factors of climate change. In this study, the precipitation response to land use/cover changes from 1980 to 2000 over Eastern China is simulated using the Weather Research and Forecasting (WRF) coupled with Noah-MP land surface model. We performed two 21-year (1980-2000) experiments using exactly the same settings except for the underlying land use/cover. One experiment used land use/cover for 1980s and the other used land use/cover for 2000s. To exclude the effects of unusual climate background, we selected 7 normal summer monsoon years. Through comparing the mean simulations of the 7 years from two experiments, we revealed out the effects of land use/cover changes.

Eastern China had undergone significant anthropogenic land cover changes such as deforestation and agricultural expansion in the last two decades of 20^{th} century. Conversions from grassland and forest to cropland increased the surface albedo and reduced surface net solar radiation. As the response, both of the surface sensible heat flux and latent heat flux decreased in the southern part of China. The local air temperature therefore has little changed. However, surface sensible heat flux decreased largely while latent heat flux decreased slightly in the northern part of China. The local air temperature therefore has decreased obviously. This cooling effect may decrease the temperature gradients between land and ocean and therefore would weaken the summer monsoon over Eastern China. As a consequence, the rainfall over lower reaches of the Yangtze River decreased while the rainfall over Southern China increased. Besides, the cooling effect enhanced the subsidence over the northern part of Eastern China and may be primarily responsible for the low pressure and cyclonic anomalies over Korean Peninsula through upstream effects. Circulation anomalies could change the moisture transport and then influence rainfall and atmospheric heating, which may enhance the cooling and form the feedback mechanism. As a result, rainfall increased over Northeastern China and Korean Peninsula.