



Impacts of Tibetan Plateau snow cover on the interannual variability of East Asian summer monsoon

Anmin Duan and Zhixiang Xiao

Institute of Atmospheric Physics, State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Beijing, China (amduan@lasg.iap.ac.cn)

The relationship between Tibetan Plateau (TP) snow cover and the East Asian summer monsoon (EASM) has long been discussed, but the underlying mechanism remains controversial. In this paper, the snow–albedo and snow–hydrology feedbacks over the TP are investigated based on multiple sources of snow data for the period 1979–2011. The results indicate that winter snow cover plays an important role in cooling local air temperature through the snow–albedo effect; the TP surface net solar radiation in years with above-normal snow cover is approximately 18 W m^{-2} less than that in below-normal snow cover years. However, data analysis demonstrates that persistent effects of winter snow cover are limited to the period from winter to spring over most parts of the central and eastern TP. Therefore, the preceding snow cover over the central and eastern TP exerts little influence over either the in situ summer atmospheric heat source or the EASM, because of its limited persistence. In contrast, the effects of winter or spring snow cover anomalies over the western TP and the Himalayas can last until summer, and these anomalies further influence the EASM by modulating moisture transport to eastern China and favoring eastward-propagating synoptic disturbances that are generated over the TP. Generally, above-normal snow cover over the western TP and the Himalayas facilitates abundant summer precipitation between the Yangtze and Yellow River basins, which is confirmed by results from a regional Weather Research and Forecasting model simulation.