The Impacts of soil moisture over the Tibetan Plateau on Summer Precipitation in China

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The Community Land Model version 4.5 (CLM4.5), driven by the atmospheric forcing dataset CRUNCEP, was used to simulate the spatial and temporal characteristics of soil moisture (SM) across the Tibetan Plateau (TP) from 1981 to 2016. This study reveals the relationship between SM on the TP in May and summer precipitation in eastern China and the physical mechanism for the impact of SM on summer precipitation. To investigate the relationship between SM on the TP in May and the summer precipitation in eastern China, this study used the monthly mean SM data from CLM4.5 and monthly precipitation data from CN05.1 for the period from 1981 to 2016. Singular value decomposition (SVD) analysis shows that the surface SM in the south-central TP was positively related to the summer precipitation in South China and negatively related to that in the middle and lower reaches of the Yangtze River and Northeast China. The SM in the western TP was the opposite of that in the south-central region. The wetter the surface SM in the south-central TP in May was, the lower the surface temperature, sensible heat flux and net longwave radiation flux, and the higher the latent heat flux and net shortwave radiation flux, leading to weaker surface heating. In contrast, lower surface SM in the western TP led to stronger surface heating. This led to a weaker western Pacific subtropical high and a more northerly rain belt. The weather in South China was controlled by large cyclonic circulations forming convergences and updrafts that led to more rainfall in South China. The precipitation in the middle and lower reaches of the Yangtze River and Northeast China was less under the control of a single summer monsoon than that in South China.