Abstract

Land--atmosphere coupling is a key process of the climate system, and various coupling mechanisms have been proposed before based on observational and numerical analyses. The impact of soil moisture (SM) on evapotranspiration (ET) and further surface temperature (ST) is an important aspect of such coupling. Using ERA-Interim data and CLM4.0 offline simulation results, this study further explores the relationships between SM/ST and ET to better understand the complex nature of the land--atmosphere coupling (i.e., spatial and seasonal variations) in eastern China, a typical monsoon area. It is found that two diagnostics of land--atmosphere coupling (i.e., SM--ET correlation and ST--ET correlation) are highly dependent on the climatology of SM and ST. By combining the SM--ET and ST--ET relationships, two “hot spots” of land--atmosphere coupling over eastern China are identified: Southwest China and North China. In Southwest China, ST is relatively high throughout the year, but SM is lowest in spring, resulting in a strong coupling in spring. However, in North China, SM is relatively low throughout the year, but ST is highest in summer, which leads to the strongest coupling in summer. Our results emphasize the dependence of land--atmosphere coupling on the seasonal evolution of climatic conditions and have implications for future studies related to land surface feedbacks.