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Detecting evapotranspiration biases in reanalyses and regional climate modeling

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As the highest plateau in the world, the Tibetan Plateau (TP) exerts great impacts on regional and global climate and water cycle through interactions between land and free atmosphere. Terrestrial evapotranspiration is a critical component of the Earth's water cycle. To better understand the heterogeneity of the evapotranspiration over the Tibetan Plateau and its influences, we conducted a whole year dynamical downscale modelling (DDM) with the horizontal resolution at 28km and a convection permitting modelling (CPM) at 4km for 2014. DDM and CPM simulation results are compared with an satellite retrieving dataset, which is referred as OBS in the following, the global land surface data assimilation system (GLDAS) and two commonly used reanalyses ERA-Interim and ERA5, as well. The annual and seasonal means and seasonal variabilities are inter-compared. The evapotranspiration over ten dominant land use types are investigated based on six datasets. Differences with the satellite dataset are illustrated and relationships with soil moisture and temperature, precipitation and radiation are explored. The followings are obtained. GLDAS generally reproduces magnitude and pattern of the OBS; reanalyses overestimate, DDM and CPM underestimate compared to the OBS and GLDAS.

The overestimations in reanalyses occur in the monsoon season and the underestimations in DDM and CPM occur in the non-monsoon season. Large evapotranspiration biases exist over the vegetated ground which exert large impacts on the TP-average biases for growing season.