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Modeling the impact of lakes over the Tibetan Plateau on the local climate

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In this study, we investigated the impact of lake processes on local and regional climate using the Weather Research and Forecasting (WRF) model, which is coupled with a one-dimensional physically based lake model. We conducted WRF simulations for the TP over the 2000-2010 period, and the model showed a good performance in simulating near-surface temperature and precipitation when compared to observations. The observed lake surface temperature was also well reproduced by the WRF model. The second simulation was carried out with the same model settings as in the first simulation but replacing all the TP lakes with the nearest land-use types. The differences between those two simulations were analyzed to characterize the effects of the TP lakes on local and regional climate. The results indicated that the TP lakes favored a cooling effect during the daytime and a warming effect at night. The strongest lake-induced cooling occurred in the spring due to the largest reduction in absorbed surface solar radiation, while the most significant warming occurred in the fall due to the greatest heat transfer from the lower part of the lakes to the surface. Daily precipitation over the lakes occurred six-eight hour later than over the land caused by the effects of the TP lakes on the atmospheric processes. Thus, the TP lakes played a significant role in affecting local and reginal weather and climate at diurnal and seasonal scales.