Geophysical Research Abstracts
Vol. 18, EGU2016-8811, 2016
EGU General Assembly 2016

Improved Simulation of Lake Effect of Erhai Lake

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Lake effect of Erhai in complex valley and basin area was simulated using the WRF_CLM model which includes a lake module. Observational stations over cropland and lake were used to verify the model results. By reducing the water thermal diffusivity to 5% of the value calculated with the Henderson–Sellers parameterization and increasing the light extinction coefficient to 5 times, the model was able to reproduce the observed diurnal variations in water surface temperature and in sensible and latent heat fluxes. We have analyzed the lake effect of Erhai on local circulation and boundary layer structure during monsoon and non-monsoon period with the model. The Erhai lake has a great impact on the local circulation and boundary layer structure. Affected by overlapping of the valley breeze with lake breeze, valley breeze reach up to 2600m during the day, while lake-land circulation is weakened by mountain breeze of Cangshan at dusk. Valley breeze only reaches up to 200m without the lake breeze. There is no mountain-valley breeze circulation in the nolake experiment. In the evening, the strong synergism of mountain breeze of Cangshan and Yuanshan makes the circulation height reaches up to 600m. There is a cyclonic circulation maintained by the combination of mountain breeze and land breeze in the south of the basin at night. Affected by precipitation system, local circulation can't develop well during monsoon period. Divergence flow during daytime and cyclonic circulation during nighttime are weaker in monsoon period than that in non-monsoon period. Compared with land surface, lake surface transfers less turbulent flux, and the development of turbulence is weaker in the daytime, which leads to lower boundary height. In the evening, difference of water vapor pressure between lake surface and air may be large, which results to the great value of latent heat flux. At the same time, turbulance developes, and boundary layer height may get higher than that in the daytime.