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Three years of carbon and energy fluxes over a highland lake in southwest of China

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Lakes play an important role in impacting local and regional carbon and water exchange process. Based on continuous measurements of turbulent fluxes using eddy covariance method over a highland lake in China from May 2012 to April 2015, the characteristics of carbon and energy fluxes in different time scales were investigated. The eddy covariance tower was established over Erhai lake which was located in the southeast margin of the Qinghai-Tibet Plateau. Our analysis showed that the lake temperature became higher than air temperature since July and the temperature difference kept positive until January in the next year. The temperature difference between the lake and the surface ranged from -4.70 to 4.77° over the whole study period. There are large difference for the diurnal and seasonal variation of turbulent fluxes between wet season (May-October) and dry season (November-April). Sensible heat flux (Hs) had a larger diurnal variation in dry season compared to wet season. Negative sensible fluxes majorly occurred during dry season Seasonal variation of sensible flux was similar the temperature difference between the lake and the atmosphere, and the daily maximum sensible flux was observed during November. The latent heat flux (LE) has a larger magnitude than sensible heat flux and reached the maximum during July. The CO_2 flux was observed at a higher rate during mid-summer (August-September). Daily average Hs was better correlated with the product of wind speed and temperature difference between the water surface and air in wet season than dry season. The latent flux was mainly controlled by the product of wind speed and vapor pressure deficit in dry season, while it was mainly controlled by wind speed in wet season. The evaporation in wet season comprised of 63% of the annual total evaporation. The average annual sum evaporation was about 1104 mm. The daily CO_2 flux in wet season was 12% higher in wet season compared to dry season. The lake majorly acted as a carbon source with an annual total CO_2 flux ranging from 207 to 267 g C m^{-2} $year^{-1}$.