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# Environmental Controls on the Surface Energy Fluxes over a Southern Open Water Surface in USA: An Annual Analysis

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We measured the surface energy fluxes using an eddy covariance system on a tower that was located in the middle of a large southern open water surface of the Ross Barnett Reservoir (the Reservoir hereafter) in Mississippi, USA, for a 1-year period in 2008. The Reservoir was ice-free over a course of year. We analyze diurnal, monthly, and seasonal variations in radiative balance and turbulent fluxes and sensible and latent heat. Our objective is to quantify environmental controls on turbulent exchanges of surface energy fluxes and their variation patterns over a course of year in 2008.

On a basis of monthly average, the water surface was always warmer than the overlying atmospheric surface layer (ASL), leading to thermally convective conditions. Vapor pressure in the water-air interface was higher than the overlying ASL, generating a consistently positive water pressure gradient. Mean winds were considerably large to maintain adequate turbulent mixing mechanically. Consequently, consistently positive H and LE were generated as a result of the combined effect of thermally and mechanically generated turbulent mixing. In 2008, the monthly averaged Rn ranged from 26 to 196 W $m^{-2}$, H from 10 to 23 W $m^{-2}$, and LE from 50 to 134 W $m^{-2}$. The Bowen ratio was low for this open water surface (i.e., about 0.2 for the annual mean), suggesting that most of the energy released from the water fueled evaporation more than sensible heating of the atmosphere. Nighttime evaporative water losses were substantial, contributing to 48% of the total evaporative water loss annually.

Our results indicate that changes in the surface energy fluxes were primarily associated with changes in the surface temperature and thermal and moisture properties of over-water air masses. Extra-tropical cyclone activities played important roles in modulating exchanges of the surface fluxes over the open water.