Surface energy budget over the Pantanal wetland during the dry season

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Abstract

In this work, the diurnal cycle of components of the surface energy budget (SEB) are computed to the Brazilian Pantanal wetland during the dry season (September 1999). The analyzed data were collected during the Interdisciplinary Pantanal Experiment (IPE-2) realized by INPE and UFMS. A very defined diurnal cycle is observed, suggesting that the available energy at surface is mainly employed in the evapotranspiration even during the dry season.

Resumo

Neste trabalho os componentes do balanço de radiação e energia à superfície são investigados para o Pantanal Sul Mato-Grossense. Os dados experimentais foram coletados por uma torre meteorológica durante a Campanha Interdisciplinar do Pantanal (IPE-2) em setembro de 1999 realizada pelo INPE e UFMS.

1. Introduction

The Pantanal is one of the largest freshwater wetland ecosystems in the world. Though Pantanal is a very important ecosystem, a small number of meteorological investigations were realized in this region up to now. Marques Filho et al. (2008) analyzed the Surface Energy Budget (SEB) and the validity of flux-gradient relationships defined by the Monin-Obukhov Similarity Theory over the Pantanal region, during the transition between the rainy season (summer) and the dry season (winter), over a

patchiness surface composed by shallow water layers and mixed vegetated land cover, with grass and trees.

The objective of the present work is to describe the Pantanal's SEB during the dry season.

2. Experimental data and procedures

The data employed in this work was measured along 22 days (Sept. 1999), with a 21m-height micrometeorological tower installed on a almost flat terrain (80-m above the sea surface level), localized in southern part of Pantanal wetland (19°34'S, 57°01'W), near to Corumbá-MS, in Brazil. All the surface radiance balance components were measured in the experimental campaign, as described by Silva (2002). The SEB is given by (Oke, 1986):

$$R_n = H + \mathrm{LE} + G \qquad (1)$$

being R_n the net radiation, H the sensible heat flux, LE the latent heat flux, and G the soil heat flux measured at 1cm into the soil. Since H and LE was not measured in the experimental campaign, the Bowen Ratio Energy Balance (BREB) method (Oke, 1986) was employed here.

3. Results

The hourly evolution of the average radiation and SEB components are presented in Figures 1 and 2. The radiation balance during the dry season (September) is characterized by a net irradiance density flux of 550 (W m^{-2}) at noon (Fig. 1a). The SEB (Fig. 1b) shows that a large amount of the net irradiance is converted in the latent heat flux by the surface, even in the dry season of Pantanal wetland. The value of the Bowen ratio during the dry season is 0.45 ± 0.03 (Fig. 2b), that may be compared with the value of 0.36 previously obtained by Marques Filho et al. (2008) for the wet period analysis. Therefore, the evapotranspiration is very important to the Pantanal region, even during the dry season. As a next step, the comparisons with results from fast response method will permit to assure the consistence of the present analysis.

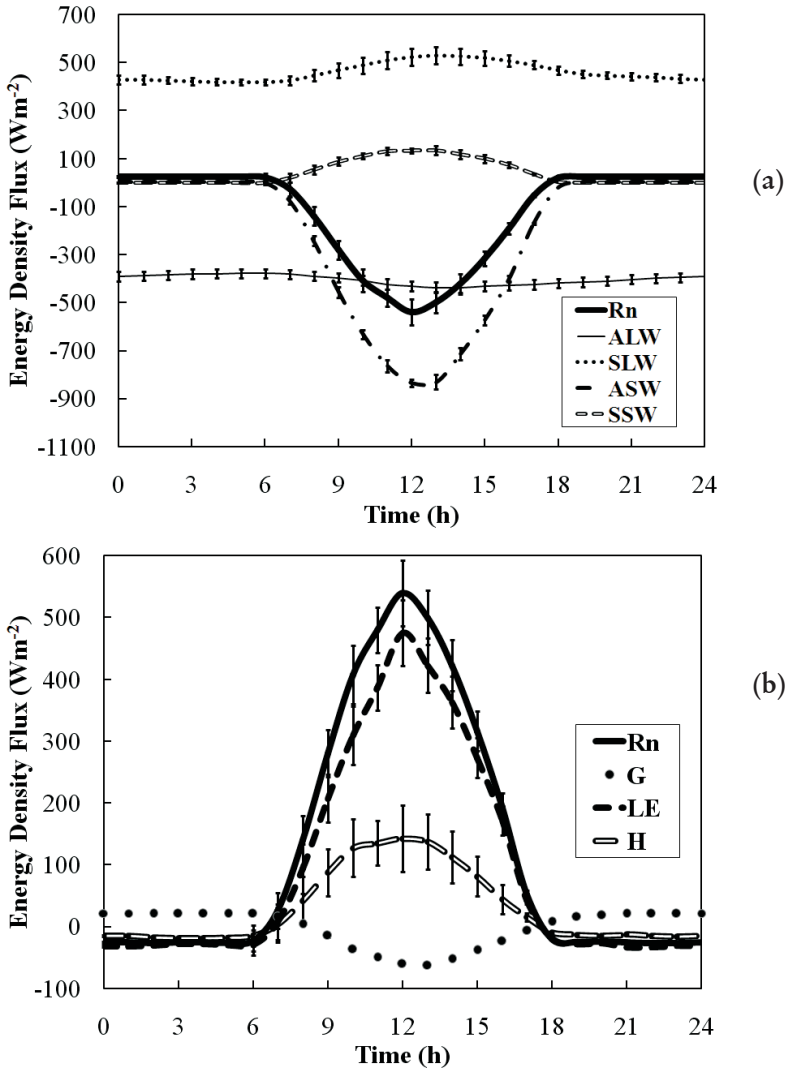

Figure 1. Average hourly evolution of the SEB for the Pantanal-MS region in Brazil. In (a) the radiation components, where ALW and SLW, are respectively, the atmospheric and surface longwave; ASW and SSW, are respectively, atmospheric and surface shortwave; and in (b) the energy components. The bars indicate the standard deviations. Rn is the net irradiance, G is the heat flux in the soil, and H is the sensible heat flux, and LE is latent heat flux.

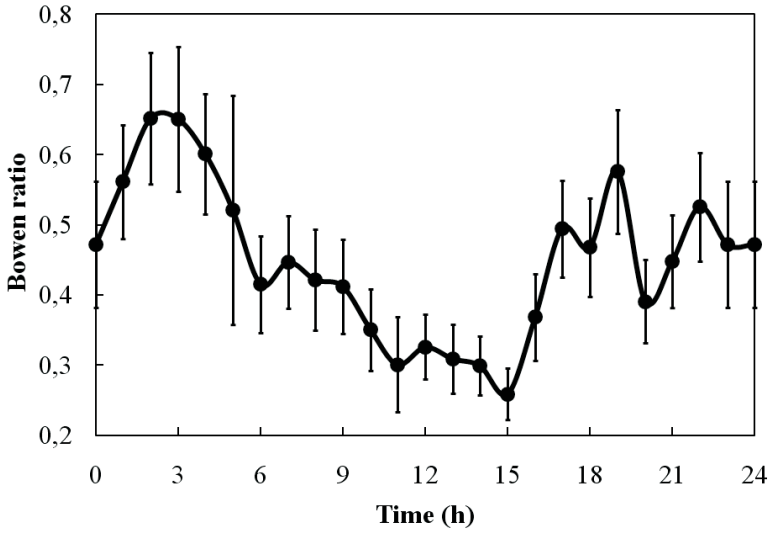

Figure 2. Hourly evolution of the average Bowen Ratio during the dry season in the Pantanal-MS, Brazil.

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