

Interest Using the Bowen-Ratio Method to Study the Actual Evapotranspiration of the Savannah in the Climate Change Context (the Kouilou Basin, Congo-Brazzaville)

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Keywords

Climate change - Canopy resistance - Bowen-ratio - Monteith equation - Evapotranspiration

Abstract

The aim of this work is to study the actual evapotranspiration and surface resistance of the savannah using the Bowen-ratio method for two contrasted periods, dry and rainy season in the climate change context.

The reliability of this method has been assessed by comparison with the Monteith equation and the soil-water balance method in a 90% *Loudetia arundinacea* dominated savannah (Pointe Noire, Congo).

Our results relate to the period from 18 September to 11 October 1998 (24 days): (a) from 18 to 29 September ("dry season"), the soil-water content was less than 70% of the soil-water content at field capacity (63–70% of R_{FC} ; large soil-water stress; T/E_p from 0.2 to 0.4); (b) from 30 September to 11 October ("rainy season") soil-water content close to 90–92% of R_{FC} ; no soil-water stress; T/E_p from 0.73 to 0.77).

The mean daily surface resistance resulting from the Bowen-ratio method was 317 s m^{-1} , 355 s m^{-1} during the "dry season" and 279 s m^{-1} during the "rainy season". The total actual evapotranspiration (E_a) resulting from the Bowen-ratio method, Penman-Monteith equation and soil-water balance method were, respectively of 58.6–57.8 and 56.2 mm, with the mean daily E_a of 2.4–2.4 and 2.3 mm day^{-1} (2.4–1.5 and 2.2 mm day^{-1} in "dry season" and of 2.5–3.4 and 2.5 mm day^{-1} in "rainy season").

The Bowen-ratio method was used for the assessment of the actual evapotranspiration from the temperature and specific humidity differences, net radiation and the soil heat flux measurement: its advantages are a rapidity of installation, a temporal resolution of measurement in less than one hour and a good integration of the heterogeneousness of the savannah's latent flux of vaporization.

This method is adapted to eco-physiological studies in tropical conditions with reduced teams.

Nizinski Georges, Galat Gérard, Galat-Luong Ahn. (2010).

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In : Endlicher W. (ed.), Gerstengarbe F.W. (ed.) Continents under climate change : conference on the occasion of the 200th anniversary of the Humboldt-Universität zu Berlin : abstracts of lectures and posters of the conference.

Potsdam : PIK, (115), 76. (PIK Report ; 115). Conference on the Occasion of the 200th Anniversary of the Humboldt-Universität zu Berlin, Berlin (DEU), 2010/04/21-23. ISSN 1436-0179