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Hydrology and Earth System Sciences Discussions

Interactive comment on "Variability in riparian zone potential and actual evapotranspiration in a 1st order agricultural catchment in Southern Ontario, Canada" *by* R. M. Petrone et al.

Anonymous Referee #3

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General comments

This paper describes an interesting set of hydrometeorological data for a riparian area in Southern Ontario. The objectives of the paper are set out clearly, and estimating the spatial variability in actual evapotranspiration of this riparian area seems a worthwhile exercise.

However, the use of the Priestley-Taylor formula rather than the Penman-Monteith equation leads to a relatively inadequate analysis of the data, as the effects of wind-speed and roughness length (through aerodynamic resistance, ra), relative humidity and surface resistance can not be explored. This needs to be addressed to improve the analyses and conclusions of the paper. I therefore recommend a major revision.

Specific comments

* Abstract

- please remove ‘in a multiple land-use agricultural watershed in Southern Ontario (page 266, lines 7/8) as this is obvious from the information given in line 3 - line 12: it is unclear (also throughout the remainder of the text) what these hydrological and energy balance components are. With energy balance component I think you mean available energy (Q*-Qg)

* Introduction

- The introduction is too long and often repetitive, please shorten. - The section on factors that influence the rates of AET and PET (page 267, lines 28/29 & most of page 268) needs to be rewritten. At the moment the reader is presented with a confusing mixture of surface (e.g. albedo) and driving variables (e.g. wind, air temperature). - This section needs to start with the statements given in lines 10-13 on page 268 (The rate of evaporation is controlled byĚ.. Brutsaert, 1984). It then needs to carry on with stating that the combined effect of these variables can be expressed through the Penman-Monteith equation. Give the equation, explain the variables and the role that e.g. wind speed (effect on aerodynamic resistance) and air temperature (determines saturated vapour pressure and has an effect on most constants in the equation) play in it. Discuss the effect of water availability on surface resistance, rs. - It would be best to give the equation in the form given by e.g. Raupach or McNaughton where total AE is the sum of an equilibrium term (i.e. your Eq. 2) and an advective term. Raupach, M.R., 1991. Vegetation-atmosphere interaction in homogeneous and heterogeneous terrain: some implications of mixed-layer dynamics. Vegetatio 91: 105-120; McNaughton, K.G., 1976. Evaporation and advection. II. Evaporation downwind of a boundary separating regions having different surface resistances and available energies. Q.J.R. Meteorol. Soc. 102: 193-202.; McNaughton, K.G., and Jarvis, P.G., 1983. Predicting effects of vegetation changes on transpiration and evaporation. In: Water deficits and Plant

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Growth, Vol. VII, Academic Press, London, p. 1-42. - You will need to think about surface resistance rs: will you take rs = 0, because of the fact that we are dealing with riparian vegetation? - Remove lines 24-28 on page 268, these are superfluous - Page 269, line 1: what kind of coefficients?

* Study site

This section is concise and needs no changes

* Methodology

- Page 270, line 18: put the word 'vapour' between 'water' and 'across' - Page 270, lines 21-24: Give some references when discussing the two types of lysimeters - Page 270, line 250: The reader will need to know the size of the container, nut just the total volume. - Page 271, line 6: place the word 'riparian' in front of 'vegetation' - Page 271, line 11: more detail is required on the lysimeters. How often was each lysimeter weighed? What was the resolution (in mm) of the system? - How is the TDR instrument operated? Is this a roving sensor, or are continuous data available? - The explanation below Equation 1 is confusing. At the moment it seems you have accounted for drainage loss twice. What is the time interval used in this equation (daily?). - More details need to be given about the micrometeorological measurements: how was soil heat flux measured, at what depths was soil temperature measured? Do you have half-hourly values? - The bit on the Priestley-Taylor equation can be removed (see discussion above on PM-equation), but Equation 3 can be kept, as values of alpha $>$ 1.0 can be used to describe advection

* Results

The results need to be presented in a different order

- Section 4.2 & 4.3 can be combined and need to be discussed first to give the reader an idea of the driving variables for the PM-equation. Not sure whether we need to know about the discharge. One graph could give P and soil moisture, another one

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could give driving variables Q*, Qg, Vapour pressure deficit, Ta and wind speed for both sites - Next, the evapotranspiration results can be given. - I would compare measured AET with modelled (PM) AET for both sites. Can the differences between the sites be explained by differences in wind speed and possibly in rs, that is by differences in the advective term? The differences in advective term can indeed be expressed by differences in alpha (Figure 3), so this figure can be kept and discussed - What do you mean with total PET? The total for the whole period? How many days did this include?

* Figures

- When giving dates (e.g. 22 August) in Figure captions, also give Day of Year (DOY) between brackets. Change the titles of the x-axes from Date to Day of Year (DOY). - In Figure 2: what is FR? Do you mean the lower site? - Figure 3: it is hard to see the differences between the column patterns.

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 265, 2005.