Biogeosciences Discuss., 8, C1345–C1347, 2011
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Biogeosciences Discussions

Interactive comment on "Characterizing the multi-scale spatial structure of land-atmosphere interactions with information theory" *by* N. A. Brunsell and M. C. Anderson

Anonymous Referee #1

Received and published: 31 May 2011

Main comments: - This paper retrieves the scaling properties of evapotranspiration computed from remotely sensed data (NDVI and radiative surface temperature) based on 3 different sensors and thus three pixel resolutions: Landsat, MODIS and GOES. Using a wavelet analysis, the different components of the flux variability at each spatial scale are assessed. An interesting feature is that large scale behaviors compare well between the different sensors (Fig 4), thus confirming work by, say, McCabe and Wood (2006). - The reader misses greatly important pieces of information to interpret the results: first, nothing is said about the type of landscape variability that one can observe in the region: is it mainly composed of natural vegetation ? agricultural fields ? of what size ? irrigated/rainfed agriculture? hilly, gently undulating or flat terrain ? The size

of the region under study is not specified either: is it a LANDSAT image ? Second, little is said about the meteorological input data necessary for ALEXI estimates, nor its variability. Third, nothing is said about the hydrological conditions that prevail for the three selected dates (time span between the acquisition date and the last precipitation date etc). Please add a description of the study area and datasets after the model section. - Related to that, the discussion section of the paper is not going far enough beyond the mere description of the main scaling tendencies. Linking the observed variability to the main landscape and meteorological attributes is a requirement for a journal such as BGD. - State of the art (introduction) section should be expanded: similar work has been done by the same lead author (Brunsell et al., 2003, 2008) for other regions/ecosystems (grass prairie, SGP97 agricultural area...). The references are cited, but their findings are not really summarized. Actually, it's not clear whether the current work brings any new insight (both in terms of methodological advances or retrieved scaling relationships) into the different controls of latent heat flux at various scales. It seems to me that the peak scaling component length scales depend both on the objective and the typical scales of variability of the landscape, which, as in (Brunsell et al., 2003, 2008), often correspond to typical field scales or DEM scales. This analysis is not carried out in this paper and is missing. - The description of the wavelet analysis should be rewritten: simplify P3440 (paragraph 3.1) and the top half of P3441 and expand it into an appendix; in its present form, this paragraph doesn't really help the reader unfamiliar with wavelet analysis. - The title is not explicit enough: "land-atmosphere interaction" is too broad. Replace it with something like "remotely sensed evapotranspiration" ? Detailed comments: P3437 L11: "is not be a function": suppress "be" P3441 L17-18: missing reference for symbols W(m,n) and t0; in your case study how do you define lambda0 and t0 ? P3442 L8: how do you define the scaling function ? P3442 L10: What's the (,) operator ? P3443 L9: what's "bin i" ? P3444 L21: "near surface moisture ET/PET": this is a strange shortcut; replace with something like "ET/PET seen as a relative soil moisture proxy" (ET/PET can be low in cloudy conditions even with low soil moisture levels; of course in cloudy conditions no

image is acquired). P3445 L7: “beak” > “peak” P3446 L10: “arbitrarily” > the choice is not that arbitrary, it corresponds to a length scale with a max. information content. P3446 L13: how do you have within pixel variability ? Do you perform oversampling ? Is it an artifact of the wavelet reconstruction ? P3448 L28: do you have data on rainfall variability that supports this ? P3449 L12: I’m not sure to understand this sentence. What do you mean by “overall field” ? You mean “larger scale variations” ? How do you interpret the increase of entropy for GOES on DOY 181 ? P3449 L15: Which figure supports this finding ? It seems to me that entropy values at 50km are of the same order of magnitude for Landsat than the other sensors. Please point the “51 km” scale with an arrow to identify it on the log axis. P3449 L24: missing verb P3450 L3-5: indicate the main figure (7d ?) that supports this affirmation. I can’t find an explanation for the flat density function for MODIS at 51 km (Figure 4b middle panel). Can you comment on it ? P3451 L10: “with respect to temporal variations”: I don’t see anything in the paper that supports this finding, esp. given the fact that the analysis is based on three dates in the summer. P3451 L20-21: “the length scale of variability . . . Landsat”: isn’t it trivial given that the MODIS pixel resolution is often larger than the length scale of the main landscape attributes (average field size for instance) ? P3455: suppress the digital number for fluxes (keep integer values), and only one digit for the temperature (thermoradiometer accuracy can’t be lower than 0.1°C) P3459: what is the meaning of the numbers in the colorbar ? (pdf around mean ET in W/m2 ?)

Important suggested reference: McCabe, M.F. and Wood, E.F., 2006. Scale influences on the remote estimation of evapotranspiration using multiple satellite sensors. Remote Sensing of Environment, 105(4): 271-285.

Interactive comment on Biogeosciences Discuss., 8, 3435, 2011.