Hydrol. Earth Syst. Sci. Discuss., 11, C307–C308, 2014
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Hydrology and Earth System Sciences Discussions
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HESSD
11, C307–C308, 2014

Interactive Comment

Interactive comment on "Estimates of the climatological land surface energy and water balance derived from maximum convective power" *by* A. Kleidon et al.

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Received and published: 5 March 2014

The authors use the concept of maximum power in the context of thermodynamics to derive the partioning of absorbed shortwave radiation into surface energy loss by longwave emission and turbulent heat exchange. From this they are able to calculate the global surface energy and water balance based on global datasets of Precipitation, absorbed shortwave radiation and surface temperature.

I generally like the paper: it is well written and the method, albeit simple, works well, supporting again the assumption that the turbulent exchange between land and atmosphere at large spatial and temporal scales occurs at maximum power given the energy input.

I have three issues that I like to discuss:

1) To make the system work, the Bowen ratio in the form of Eq. 4 is introduced as a deus ex machina. However, looking at the the form of the equation it turns out that it is consistent with the Priestley-Taylor equation for evpotranspiration. So, the question is: how physical is Equation (4), necessary for the further derivations, or is it an assumed parameterization that is not mentioned in the paper. If this is the case, the results are not as much derived from first principles as stated. Please explain where the assumed form of the Bowen ratio comes from?

2) There are quit a number of simple reference evaporation equations that are driven by radiation (incoming radiation that is), and temperature only (e.g. Makkink, Hargreaves: see e.g. http://folk.uio.no/chongyux/papers_SCI/HYP_4.pdf). It would be good to take one of those simple equations and use it as a benchmark and drive it with the same surface temprature and precipitation and a radiation dataset for incoming ration (see e.g. http://wui.cmsaf.eu/safira/action/viewDoiDetails?acronym=RAD_MVIRI_V001). The authors could then compare their method to the following primitive model: if Eref < P -> E = Eref and Q = P-Eref ; else if Eref > P -> E = P and Q=0. There method should ate least do as good or better than this primitive model that follows the outer lines of Budyko.

3) A downside of open review like this is that I just noticed the review of Han Dolman which draw my attention to the same question about deriving the maximum power limit in appendix A: when looking at the energy input (Jin) to the atmosphere, only the turbulent heat exchange is considered and not the net longwave radiation exchange (L_up-L_down) which also depends on (Ts-Ta). Is this term small compared to LE+H? Please elaborate on this.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 265, 2014.