

Interactive comment on “A general framework for understanding the response of the water cycle to global warming over land and ocean” by M. L. Roderick et al.

Anonymous Referee #3

Received and published: 13 February 2014

Overall comments: This is a well written and clear article, which addresses an important research topic in climate science (why changes in precipitation under enhanced greenhouse gas concentrations are not changing at the Clausius-Clapeyron rate). It also highlights some potential pitfalls when applying rules derived (and valid) for latitude bands including both land and ocean areas (proportionality of changes in P-E to background P-E) to changes in land-only areas or to local changes over the oceans. Furthermore, it highlights an important misconception, i.e. that it is evapotranspiration that drives temperature changes under enhanced greenhouse gas forcing rather than the opposite, because most of the enhanced incoming longwave radiation is used for

C7876

enhanced outgoing radiation at the surface. I have only minor comments on the article (see below) and thus recommend it being accepted subject to minor revisions.

Detailed comments: 1) P. 15264, lines 17-20: The construction of this sentence is a little convoluted and confusing. The three terms that are referred to should be more clearly highlighted and recognizable upon first reading. In addition, the sentence should note that most of the evapotranspiration changes occur over the oceans rather than land areas. Here is a suggested revision of this sentence: "In terms of global averages, we find [that] the climate model projections are dominated by changes in only three terms of the surface energy balance: 1) an increase in the incoming longwave irradiance, and the respective responses in 2) outgoing longwave irradiance and 3) evaporative flux (the latter being much smaller than the other two terms and mostly restricted to the oceans).

2) P. 15274, line 11: The following paragraph is mostly based on the numbers in Table 2, but I found Fig. 5 more straightforward to interpret upon first reading. I would suggest to add in the parenthesis "(Table 2)" also a reference to Fig. 5, e.g. "(Table 2; see also Fig. 5 for a summary of the changes between the two periods)".

3) P. 15275, line 6: Add "over the oceans" after "in the latent heat flux" (same comment as 1): most of the changes in evaporation occur over the oceans)

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 15263, 2013.

C7877