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Interactive comment on "Observed nighttime conductance alters modeled global hydrology and carbon budgets" *by* D. L. Lombardozzi et al.

Anonymous Referee #2

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This is a well written manuscript that makes a valuable scientific contribution highlighting the sensitivity of terrestrial ecosystem simulations to the parameterization of stomatal conductance. The authors use a novel dataset of nighttime stomatal conductance to inform simulations in a global land surface model showing that in some simulations global evapotranspiration is increased and runoff reduced. My main criticism is that the attribution of the effects in the simulations to nighttime conductance and transpiration is not entirely accurate. Figures 4 & 5 show that the modified model structures make by far the largest impact on daytime transpiration and not nighttime. And that the g0 and gmin simulations tend to over-predict daytime transpiration in July, the time when these simulations diverge the most from the control and the gnight simulations. This should be discussed in depth. Figure 5 also shows that the modified model structures

only very slightly improve simulations of nighttime transpiration. In these simulations of modified stomatal conductance, the main effects result from changes in daytime stomatal conductance, not nighttime stomatal conductance. Though this result is touched on in the manuscript it is not well emphasised. The effects on daytime stomatal conductance and fluxes should be more prominently discussed as it is the major finding from this work and it implies that future efforts should focus on better characterising minimum stomatal conductance during the day. Given this, the title is somewhat misleading as it implies that realistic nighttime conductance leads to changed nighttime transpiration which affects global fluxes, the title should reflect the fact that it is really the change to minimum conductance that is affecting the global fluxes.

Minor comments:

p8 ln16 – I think you mean lower daytime gs than night-time.

p9 ln25 – this should also be described in the methods.

P10 ln2-4 – this statement is not true. Water loss is not just a function of stomatal conductance. In the Penmen-Monteith formulation of evapotranspiration insolation, vpd, and wind speed are the drivers of water loss. Insolation is zero at night and vpd and wind speeds are generally lower so it is unlikely that higher night-time gs leads to higher water loss during the night compared with the day.

Figure 5 – why isn't the whole 24 hr period shown for May?

Interactive comment on Geosci. Model Dev. Discuss., 8, 10339, 2015.