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Interactive comment on "Examining the evidence for sustained transpiration during heat extremes" *by* Martin G. De Kauwe et al.

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Recent findings on a leaf and tree level indicated that during heatwaves the photosynthesis (A) may decouple from the stomatal conductance (gs). In line with gs, transpiration (E) may increase while A does not which impacts instantaneous water use efficiency (WUE). De Kauwe's et al paper aims to extend this evidence on the ecosystem level analyzing eddy covariance data from mostly Australian forested ecosystems. Because the topic is novel and because the correlation between A and gs became central to many models the topic may be in a scope of a large audience.

Generally, the paper reads well. Data are demonstrated on figures which are mostly clear to understand. But I do not think that the research questions stated in the last

paragraph of the introduction section fit the rest of the paper. That means, the paper focuses more on changes in instantaneous WUE (A/E) that on a decoupling of the gs from A. Of course, both may be described in the same paper but the reasoning in the introduction and in a discussion as well as the structure of results should be adjusted accordingly.

Further, I suggest a few points to work on: 1. Is it E or gs which decouples from A during heatwaves? Both are interlinked but for the modeling purposes, I believe that A/gs (i.e. intrinsic WUE) is more important than A/E (i.e. instantaneous WUE). On the other hand, increase in E while A does not change or decline during the heatwave is the important issue, too. Many papers were published on E/gs which assumed stomatal regulation to maximize the A for a fixed amount of water transpired over the long time period. This idea was recently challenged (i.e. Wolf et al. 2016, PNAS; Sperry et al. 2017, PCE) and De Kauwe et al. may want to work with this evidence, should they decide to aim their paper this way. Furthermore, I do not believe that trees should keep a fixed A/E ratio in a short time (i.e. a few days of a heatwave). That said, imagine the temperature is fixed to a specific value (i.e. 25 oC) and vapor pressure deficit (VPD) increases from near zero to a couple thousand Pa (scenario unlikely to happen in nature but good to demonstrate the change in WUE). Photosynthesis would decline due to stomatal closure as a response to the increase in VPD, but the transpiration would increase. 2. Should authors want to focus more on A/gs relationship, I believe the analysis which clearly demonstrates the change in (or lack of) the response should be presented. While I do not challenge the approach of GPPxDˆ0.5 here, I do not think it is enough illustrative. Many readers, including me, are not familiar with this approach. It would be much better to demonstrate directly how A changes with a change in gs (or canopy conductance, gc). There are approaches to calculate gc from sap flow measurements (which I use). I do not know how reliable are approaches to calculate gc from eddy covariance data but if gc can be somehow derived I would be in favor of using it. 3. The timescale of the temperature vs. GPP data. Why did the authors decide to use the maximal daily temperature and compare it to the daily sum of the

GPP? Would not it be more appropriate to work with half an hour (or hour) resolution in both temperature and GPP? 4. What is the temperature optimum of photosynthesis for the plants in studied ecosystems? The temperature of 37oC for a part of the day may not be high enough to visibly affect the daily GPP. 5. Is there any information available how much trees and understory (grasses) contribute to the LAI and to the GPP?

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