

## ***Interactive comment on “Improving the complementary methods to estimate evapotranspiration under diverse climatic and physical conditions” by F. M. Anayah and J. J. Kaluarachchi***

### **Anonymous Referee #1**

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This paper proposed a complementary relationship model without calibration through the inter-comparison of CRAE, AA and GG model, as well as variations of them. The work is valuable because large number of FLUXNET sites were used for validation of CR model.

Major comments: 1. “This study aims to develop a calibration-free universal model using the complementary relationships to compute regional ET in contrasting climatic and physical conditions with meteorological data only”. This purpose is very interesting.

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However, I doubt that the proposed GG18 model may be not a “universal model”. There are two methods on complementary relationship model. The first one is trying to give suitable estimates of ET<sub>p</sub> or ET<sub>w</sub> but keep the original complementary relationship (Eq. 1 or 8). This paper looks like the first one. The authors proposed several combinations of the equations, variables of the complementary relationship models. But there is little physical consideration about the definitions of ET<sub>p</sub> (or ET<sub>w</sub>) and the complementary relationship during the study. The results may be limited since there would be many other variations. For example, there may be other relationship except Eq. (1) or (8). It is only proved that GG 18 is the best between the 33 models used in this study. Please give more discussions about that GG18 is a “universal model” or not? Why?

2. Other studies were trying to propose a better model and calibrate the parameters. According to the Granger and Gray’s work, equation (8) is not comparable to equation (1), because equation (8) is just a rearrangement of the energy balance. The key of the GG model would be the function describing ET/ET<sub>p</sub> (equation 11 or 12). Is it possible that there are other parameters of Eq. 11 or 12, or other relationships describing ET/ET<sub>p</sub>? And the GG model performs better than GG18 with these relationships? I suggest more calibration work on the relationship (Eq. 11), or proposing a more universal relationship. The model with calibrated Eq. 11 may perform better than GG18.

3. AA and GG models are usually used at daily timescale, while the CRAE model is designed at monthly timescale. Since daily data is included in the datasets used in this study, I suggest that the AA and GG model should be calculated at daily timescales. If the AA and GG model is used using monthly data, the parameters may be changed. Please give some explanation or discussion.

Specific comments to the authors: 1. There is no need to give Fig. 7. It would be more clearer if GG18 is given as  $E/ET_{PT}=?$

2. It is better to list the mean value of ET<sub>pen</sub>, ET<sub>PT</sub> of the 34 sites in Table 1.

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