

# ***Interactive comment on “Regional evapotranspiration from image-based implementation of the Surface Temperature Initiated Closure (STIC1.2) model and its validation across an aridity gradient in the conterminous United States” by Nishan Bhattarai et al.***

**Anonymous Referee #1**

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This paper has enlightened ET remote sensing community about the importance of aerodynamic conductance/resistance. Currently, most of the ET algorithms do not take into account the diurnal variation in this resistance. The authors have implemented STIC model at regional scale. STIC model integrates remote sensed surface temperature into Penman-Monteith equation to derive an analytical solution for the resistance and use the resolved resistance to calculate surface heat fluxes/ET. They also compare its performance with other two ET algorithms, SEBS and MOD16. SEBS model

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provide direct solution for surface and boundary layer conductance/resistance from momentum/heat roughness and stability. However, MOD16 uses a kind of constant resistance in its ET calculation, which explains its worst performance among the three methods. STIC use an energy balance and meteorological information to inversely retrieve the surface and boundary layer conductance. The results are sufficient to support their conclusions. The paper address very relevant scientific questions within the scope of HESS. Thus I suggest an acceptance for publication.

Figure 5 shows that SEBS has a similar performance as STIC, and MOD16 for CRO, DBF, and ENF, but worse result at WSA and GRA. Please check if this is due to in-accuracy of satellite input data.

Fig. 8, 9 10 shows that SEBS ET maps have higher ET than STIC and MOD16, this is due to sensible heat flux is low-estimated, because of high  $kB_1$ . Please check the reference of Chen et al. 2013.

Which method or model is used to calculate  $kB_1$  and  $z0m$  in figure 13? Or  $kB_1$  and  $z0m$  is derived from flux tower measurement?

Figure. 12, please have more discussion about the higher SEBS annual ET, is this due to the method in annual accumulation or SEBS model. Fig. 4 and 5 does not show SEBS ET has different performance over different land covers, at least does not always show high ET estimation.

Special report to the authors: Sorry for the late report due to other heavy dateline.

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