

Comments on Comparison of 6 algorithms to determine the soil thermal diffusivity ... Gao et al.

The paper aims at comparing different already existing algorithms to determine soil diffusivity. All these algorithms lies on the temperature variations at different depths. The comparison was done with a single experiment performed on the Tibet Plateau over 8 days period.

General comments

The main problem of this paper is the lack of reference measured values which would allow a hierarchy between the methods. In the paper we can just conclude that the methods led to different results, which is not really a new result. Moreover, harmonic methods are stressed out as being the best methods. Since these methods are more flexible, offering a higher degree of freedom, they are expected to reproduce the temperature more precisely. This not proves that HM offers better results to estimate the soil thermal diffusivity. Finally, there is no error assessment on the retrieved thermal diffusivity.

So in its present form, the paper is not conclusive enough to be published in HESSD. I recommend the author to resubmit a paper when the analysis includes reference values, measured using adequate sensors as thermal chamber or method based on artificial heating, or taken from literature. An error assessment on the thermal diffusivity should be added (temperature accuracy, exact location of temperature sensors ...).

Specific comments

In page 2250 vapor convection should be added as a potential contribution to heat flows. Water vaporization is energy consuming

P2251 : it is not clear what is expected to be found in supplement table 1.

Eq 3 is not consistant with 2 (remove C_g on Eq3 left term)

$-C_w/C_g W_{\theta}$ is not a clear notation for water flux

P2256 L 7 : I don't understand where the first term of W comes from

Soil granulometric fractions are missing.

For the need of the paper, the description of the site climate is not necessary for the paper understanding

P2257 L25 This not shown from Figures

P2258 : the soil moisture diurnal patterns are not physically consistant, the soil moisture being the highest at noon. This is a typical illustration of the temperature influence on the dielectric constant.

P2261 take care : a good temperature representation does not necessarily show that the thermal diffusivity is better estimated

Axis labels and legends are too small