

Response to Interactive comment on “Influence of wave phase difference between surface soil heat flux and soil surface temperature on land surface energy balance closure”

Dear Anonymous Referee #1

We greatly appreciate your efforts and your helpful comments in reviewing our article. We have incorporated all of your comments in the revised manuscript.

We respond below in blue to your comments item-by-item.

General comments:

The understanding of the factors that mainly affect the closure of surface energy balance has strong implications on the interpretation of energy flux measurements. This paper concluded that the phase difference of soil surface heat flux from those of net radiation, sensible heat and latent heat fluxes was an inherent source to surface energy balance closure failure by theoretical analysis and experimental evaluation. However, the analysis is not comprehensive and systematic. This paper needs substantial improvement before its publication.

We substantially revised our article by incorporating the comments into our article.

Major comments:

(1) In introduction, this paper does not include recent research advancements on the energy balance closure problem, such as Foken et al.(2006,2008), Cava et al.(2008), etc.

We now refer to these references together with Wilson et al. (2002).

(2) “Experimental evaluation” may need a reconstruction. This paper evaluated the theoretical analysis only using one day data, it’s questionable. The imbalance was prevalent not only on an half-hour basis, but also on a daily or an annual basis (Wilson et al. 2002). So several days or months data are needed to validate if “the phase difference of soil surface heat flux from those of net radiation, sensible heat and latent heat fluxes” is closed related to surface energy balance closure failure”.

To address this issue, we added a short paragraph in the Discussion section to explain why we only selected one day’s data for experimental validation.

(3) In summary, this paper stated that $H+LE$ was always less than R_n-G_0 even if all energy components were accurately measured, their footprints were strictly matched and all corrections were made, but it is inadequate. Firstly, their source areas can not be matched. Because the horizontal scale for R_n is 10m(1-2m,height), for H and LE are 100m(2-10m,height), while only 0.1m for G_0 (Foken,2008). Secondly, except for measurement errors and storage terms, long wave eddies or organized turbulence structures is also one of the main reasons of the closure problem. But the authors didn’t show any analysis.

This article only addresses the influence of wave phase differences between surface soil heat and soil surface temperature on land surface energy balance closure for ideal conditions. We did not analyze other potential sources for surface energy imbalance.