

Response to Referee's Comments:

We would like to thank the editor, the topical editor, and the referee Prof. Massimo Menenti for the time and efforts handling and reviewing our manuscript. The constructive comments and suggestions are very helpful to improve our manuscript.

The referee's original comments are formatted in black, while our point-by-point responses are formatted in **blue** font. All the corresponding revisions in the revised manuscript are indicated in **red**.

general suggestions

In the description of the method it should be made clear that the approach described assumes that only the liquid - vapour phase transition occur and that the energy balance equation is written accordingly, i.e. it is affected by the same limitations. This limitation impacts the interpretation of observed land surface temperature.

The sentence has been added in the revised manuscript to state that only liquid to vapour phase transition has been considered: *".....This equation is not applicable to any condition where a phase change of water occurs, except the liquid to vapour phase change....."*

In the description of the data, potential users should be informed that the data are likely to be less reliable under conditions where other water phase transitions than liquid - vapour may occur. On the TP this is the case at high elevation, in winter and in general anywhere temperatures are below zero.

A sentence has been added to mention the limitation of the dataset in the "Summary and conclusions" section that is *"Note that the energy consumption related to freeze-thaw processes and sublimation is neglected. Thus, the dataset is likely to be less reliable over the glacier, permafrost, and in winter season."*

specific suggestions

L174: the sentence "Thus this equation is applicable without considering the phase change of water" is ambiguous / unclear and should actually read "This equation is not applicable to any condition where a phase change of water occurs, except the liquid to vapour phase change".

The sentence has been changed in the revised manuscript.

L236: here it should be discussed how far the dry – wet limit concept is applicable to conditions, as in the TP, where all water phase transitions occur.

The sentence “.....*Note that the dry-wet limit assumption did not apply to frozen soil, water, snow, and ice surfaces. The latent heat flux was obtained as the residual of the surface energy balance equation (1) after calculating net radiation, sensible heat flux, and ground heat flux when the dry-wet limit assumption is not applicable.....*” Has been added to describe the limitation of the dry-wet limit assumption.