

Interactive comment on “Cloud Tolerance of Remote Sensing Technologies to Measure Land Surface Temperature” by T. R. H. Holmes et al.

Anonymous Referee #2

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The manuscript by Holmes et al. investigated the cloud tolerance of the microwave remote sensed land surface temperature (LST). They found that the clouds have no direct impact on the accuracy and bias of microwave-based LST. Since the thermal infrared based LST is highly restricted by clouds, the microwave based LST would provide complementary LST over cloudy conditions. The estimation of land surface heat fluxes and soil moisture would benefit a lot from the availability of LST over full sky conditions. Therefore, the current study is of great interest and worth for publication. In general, the manuscript is well organized and written. I only have a few comments that are listed below.

General comments:

1. Since there are other recent published studies on estimating LST with microwave

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observations such as André et al., (2015), Prigent et al., (2016), I suggest the authors integrate these studies in the introduction section.

2. The study tested the hypothesis that microwave based LST is not sensitive to clouds over the FLUXNET tower scale. From the manuscript, it seems that the global scale microwave LST is already available. I suggest the authors to conduct a further study in the future on global analysis such as inter-comparison with other available LST products. Nevertheless, it would be nice if the authors could show the spatial pattern of the microwave LST and thermal LST. In addition, the current study focuses on the time period 2009-2011. For hydrological applications, this period is very limited. Does the developed microwave LST cover longer period? If not, do you have plans to extend it to long time period? I did not find detailed description on the global microwave product.

3. The diurnal temperature cycle (DTC) of microwave LST is scaled to match that of thermal LST. Therefore, the diurnal microwave LST depends on the thermal LST to some extent. I am wondering how much influence would this scaling bring to the diurnal microwave LST. In other words, I suggest the authors show the results before scaling the DTC to match thermal LST.

Specific comments:

1. Page 2 Line2: specify the name of the radiometer that deliver 2 km spatial resolution.
2. Page 4 Line3: List the names of the 6 staellites/sensors.
3. Page 5 Line7: It would be nice if the used FLUXNET towers are shown in a global map.
4. The statistic metric R (correlation coefficient) should also be calculated except for ubRMS and BIAS.

References: André, C., et al. "Land surface temperature retrieval over circumpolar Arctic using SSM/I–SSMIS and MODIS data." *Remote Sensing of Environment* 162 (2015): 1-10.

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Prigent, C., C. Jimenez, and F. Aires. "Towards "all weather", long record, and real-time land surface temperature retrievals from microwave satellite observations." *Journal of Geophysical Research: Atmospheres* (2016).

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