Hydrology and
Earth System
Sciences
Discussions

Open Access

Interactive comment on "Spatial patterns in timing of the diurnal temperature cycle" *by* T. R. H. Holmes et al.

T. R. H. Holmes et al.

thomas.holmes@ars.usda.gov

Received and published: 23 May 2013

In the following we clarify the points as commented on by referee 1.

1) Regarding the summary of results. We propose to change the wording in the abstract to clarify that these numbers refer to the Africa/Europe domain, chosen so that they can be compared in relative terms. In addition the mean value of Ka-band is included: Page 6020, line 13: "(both averaged over the MSG Africa and Europe domain)" Page 6020, line 15. "The equivalent number for Ka-band is 13:44, which is influenced by the effect of increased sensing depth over desert areas. For non-desert areas, the Ka-band observations have only a small delay of about 15 min with the TIR observations which is in agreement with their respective theoretical sensing depth."

There is no conflict in reported numbers for the difference in timing between Ka-band and TIR: -For Europe it is given as 14 min ($\pm$12 min) (page 6033, line 14) - In the conclusion the number for Africa/Europe outside of deserts is given as on average 15 min (page 6035, line 16) - In the abstract this is summarized as "about 15 min" (page 6020, line 16)

2) Definition of terms on pages 6022 and 6024 will be corrected as suggested

3) Regarding MSG earth incidence angle (EIA). The EIA is the same as the view zenith angle, both refer for a given location to the angle between the zenith and the line from the satellite to that location. The LSA SAF LST products are now provided up to EIA of around 78 degrees, previously they were indeed limited to 55 degrees.

4) Regarding the clear-sky bias of thermal infrared (TIR) data. The TIR data are cloud-screened according by LSA SAF, therefore they will definitely favor clear-sky days. Since the objective of the paper is to determine the timing of the temperature products relative to solar noon, analyzing clear-sky days where the maximum insolation is at solar noon is preferred. For the MERRA and Ka-band data sets, we applied conditions 2 an 3 as listed in Section 4 (page 6030) to preferentially select clear-sky days in the samples, and this should minimize the effect that clear-sky bias may have on the relative value of the timing. However, this selection of clear-sky days might not be robust enough in the tropics, where cloud cover is persistent. We speculate that a diurnal pattern in cloudiness is in fact what causes the half hour delay in timing over the tropics (Page 6032, line 14-16). To answer the reviewers question, we intend each set to have a clear-sky bias before computing the timing so that the effect of sampling preference is minimized. The overall effect of cloudy days on the measured average annual timing depends on the strength of a diurnal pattern in the clouds.

5) Following the reviewers suggestion, Figure 2 will be amended to add an arrow indicating 'half of the total afternoon cooling', defined to calculate ts, see Fig 1 attached.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 6019, 2013.
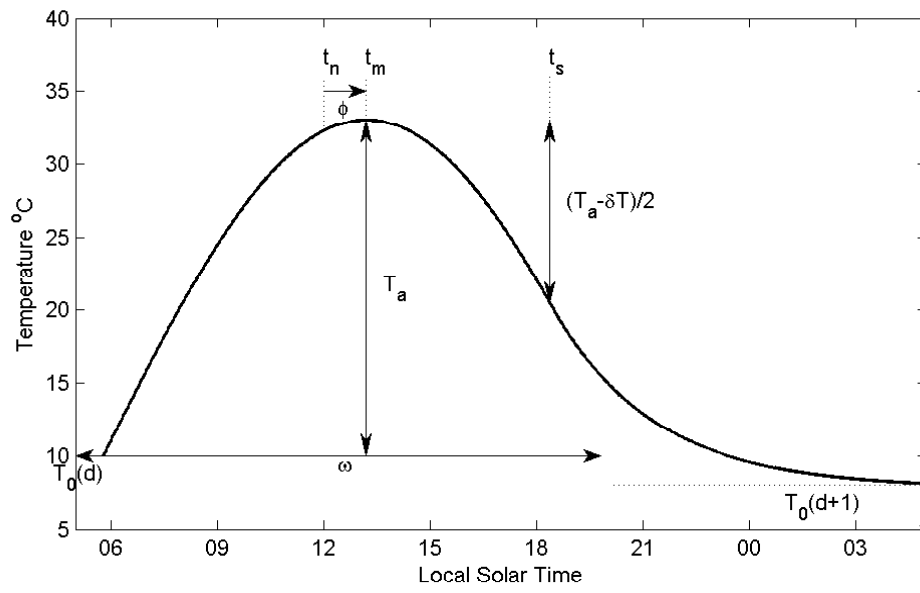
Fig. 1. Amended Fig. 2. to add an arrow indicating 'half of the total afternoon cooling', defined to calculate ts.

C1900