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Interactive comment on "Role of vegetation in representing land surface temperature in the CHTESSEL (CY45R1) and SURFEX-ISBA (v8.1) land surface models: a case study over Iberia" *by* Miguel Nogueira et al.

Anonymous Referee #2

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This paper investigates the impact of the vegetation parameters in the modeling of the land surface temperature (LST) in the CHTESSEL land surface model. It is based on simulations in Iberia during summer, compared to satellite infrared LST estimates and to results from another model (SURFEX). It is triggered by a previous analysis that showed a systematic underestimation of the daily maximum LST by CHTESSEL during summer in Iberia. Different aspects of the vegetation parameterizations are considered and tested (cover fraction, low and high vegetation, LAI). Changes in the vegetation inputs are suggested, with a clumping approach and the addition of seasonality in the

fractional cover. These modifications successfully reduce the LST cold bias, when done in a consistent way among the different vegetation parameters.

The analysis is, for most aspects, carefully conducted, with relevant references to previous works. The paper is well structured and written. It will be an interesting contribution to the field, once the following points are considered.

1) The effects of the vegetation parameter modifications are carefully tested for the daily maximum in summer in Iberia, against IR satellite LST estimates. Different model options are compared for the rest of the year, but are not compared to the satellite LST, on the basis that the cloud cover is too large for the other seasons. The reviewer is fully aware of the difficulty to compare IR LSTs with other estimates, because of possible cloud contamination. However, it is just not legitimate to pretend that the comparisons are impossible outside summer (line 445 and following). Several authors of this paper are directly producing IR LST estimates on a daily basis and the community (including the reviewer) sincerely expects that these estimates are not valid only in summer (especially in Iberia that is not the cloudiest region under the SEVIRI disk). That would cast significant doubts on the usefulness of IR LST to produce CCI records... With increasing cloudiness outside summer, larger uncertainties could be expected, but at the monthly time scale of the analysis, they should not jeopardize the comparison. The authors have to prove that the vegetation modification they propose for the summer period is still valid for the other seasons, in agreement with the observations. It is likely that the results for the rest of the year will be encouraging and it will strengthen the demonstration. It will actually be interesting to discuss the differences in behavior between the clear and cloudy scenes in terms of vegetation impact on the model and their comparisons with the clear sky LST.

2) There seems to be a shift in the diurnal cycle of the summer LST, between the IR LST and SURFEX on one side and the CHTESSEL model on the other side, regardless of the vegetation parameters (Figure 7). The peak in the maximum LST is delayed with the CHTESSEL simulations. Any reasons for that? Any way to correct for it? This

should be commented in the text, even if not corrected.

3) The differences in vegetation parameters from the selected sources are very large (Figures 4-5). Additional comments on the reliability of these datasets, depending on their bases, despite their very 'official' nature? Advices on their applicability for other studies? Some datasets to avoid?

4) Minor points: - Line 56. 8-13 microns, not millimeters. - Lines 72-72. The authors tend to underestimate the uncertainty of the microwave LST estimates and maximize the uncertainty of the IR LST estimates. To be fair, the comparisons have to be done under the same conditions. See Jimenez et al, JGR, 2017 for instance, where comparisons are performed for the same time and same stations: an RMSD of 2.4K is found for the IR (MODIS) and 4.0K for the microwaves (AMSR-E). See also comparisons in Ermida et al., JGR, 2017 between IR estimates and MW estimates. Even between IR estimates the differences can be very large, seriously questioning an uncertainty below 2K for each individual IR product.