

## ***Interactive comment on “Using MODIS land surface temperatures and the Crocus snow model to understand the warm bias of ERA-Interim reanalyses at the surface in Antarctica” by H. Fréville et al.***

**Anonymous Referee #1**

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This paper presents a validation of the MODIS based surface temperature data set and uses this new product to find a bias in the ERA-Interim reanalysis with the help of the CROCUS snow model. The use of this new MODIS based product is novel as well as the aim of this paper. It fits well with TC and for these reasons, it should be published. I hope that the conclusions of this paper will be taken into account in the next developments of the ECMWF reanalysis. However, there are several shortcomings that need to be addressed before the paper can be published.

1. pg 61, line 26. The raw resolution of ERA-Interim is not  $0.5^\circ$  but  $0.75^\circ$ . How do the

C248

authors deal with the topography when they interpolate the ERA-Interim temperature at 25 km of resolution? Is the temperature corrected (with a constant lapse rate) for taking into account the sub-grid topography? If it is not the case, what is the difference between the  $0.75 \times 0.75$  interpolated topography with the 25 km MODIS topography? Idem with the forcing fields (T2m, Q2m, WS10m, ...) of CROCUS?

2. pg 62, line 27: CROCUS is forced by T2m from ERA-Interim which is impacted by the "warm bias" in surface as explained in the paper. But, in respect to in-situ observations, what is the bias of T2m from ERA-Interim in respect to ERA-Interim based TS vs in-situ TS. I guess that the authors have also the observed T2m from the compared weather stations. Due to errors compensations, TS could be biased but not T2m in some models.

3. Even if CROCUS is forced by a too high T2m, CROCUS is able to correct in part the warm bias. This could be strange and could be due to some errors compensations. To prove that CROCUS work well with unbiased inputs (and I am sure that it is the case), CROCUS needs to be forced by in-situ measurements as validation and the resulting modelled TS needs to be compared to the observed one.

4. Is the biases identified in ERA-Interim also present in the new product ERA-Interim/LAND data set?

Balsamo, G., Albergel, C., Beljaars, A., Boussetta, S., Cloke, H., Dee, D., Dutra, E., Muñoz-Sabater, J., Pappenberger, F., de Rosnay, P., Stockdale, T., and Vitart, F.: ERA-Interim/Land: a global land water resources dataset, Hydrol. Earth Syst. Sci. Discuss., 10, 14705–14745, doi:10.5194/hessd-10-14705-2013, 2013.

Interactive comment on The Cryosphere Discuss., 8, 55, 2014.