Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-37

Anonymous Referee #2

Referee comment on "Multi-sensor analyses of the skin temperature for the assimilation of satellite radiances in the European Centre for Medium-Range Weather Forecasts (ECMWF) Integrated Forecasting System (IFS, cycle 47R1)" by Sebastien Massart et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-37-RC2, 2021

General comments:

This manuscript presents a new approach to add the skin temperature to the control variable in the ECMWF data assimilation system. The idea on the two-dimensional skin temperature field considering temporal and spatial consistency is interesting. Although NCEP utilizes surface temperature analysis together with atmospheric data assimilation in their operation, the author's approach seems to be novel because the authors introduced additional fields to explain the different sensitivity on the depth from the surface between microwave and infrared. The methodology and formulations in the manuscript are well described. However, radiance observation used for the skin temperature is the data set used for atmospheric analysis and surface sensitive channels are not sufficiently used. Therefore, it is unclear whether the consideration of spatial and temporal consistency in SKTACV is better than TOVSCV under the limited surface sensitive radiance data use.

Specific comments:

Line 52: "In the absence of snow, land emissivity varies very little, temporally or spatially"

This is true for infrared case. However, for microwave range, land surface emissivity

varies depending on surface vegetation and soil conditions. Add some words to specify this sentence is valid for infrared case only.

Line 74: “Because of this lack of constraint by other surrounding measurements, the skin temperature adjustment likely compensate for other errors in the background state,”

Line 509: “other errors”

What kind of errors had been compensated in TOVSCV? The errors were IFS’s systematic bias error? Please clarify what kind of error had been compensated in TOVSCV and justify the new approach SKTACV could use the observation information appropriately.

Table 1:

Add channel numbers which are used in the data assimilation.

Figure 2:

Over land, generally, microwave standard deviation is larger than infrared one. Is the reason insufficient microwave cloud-screening over land? Add some descriptions from the point of view in the text.

Line 515, and Figure 7 (c):

Larger temperature difference at 850 hPa in Antarctica would be below the surface.

Which depth are represented as red colored area?

Line 582:

The title of section 5 should be "Summary and Conclusions" instead of "Conclusions" because many sentences and their contents in section 5 are just a repeat of the previous section.

Technical corrections:

Line 149:$\mathbf{R}_i^{-1}$ should be $\mathbf{R}_i$

Line 188:"," should be inserted.

Line 224:"Tab 1" should be written as "Table 1" in the text.

Line 518:“Figs. 7(a) and (b)” should be “Figs. 7(a) and (c)”

Line 530:“Figs. 7(c) and (d)” should be “Figs. 7(b) and (d)”

Line 677:Add URL of this reference.