Geoscientific

Model Development

Discussions

GMDD

Interactive
comment

Interactive comment on "Assimilation of SCATSAR Soil Wetness Index in SURFEX 8.0 to improve weather forecasts" *by* Stefan Schneider and Bernhard Bauer-Marschallinger

Anonymous Referee #1

Received and published: 24 January 2019

Comments by Reviewer

on

Manuscript https://doi.org/10.5194/gmd-2018-273

Assimilation of SCATSAR Soil Wetness Index in SURFEX 8.0 to improve weather forecasts

by

Stefan Schneider, Bernhard Bauer-Marschallinger

General comments: ————————————————— This Paper is concerned with the assimilation of a satellite based based soil moisture product in a numerical weather prediction modelling system containing a SURFEX surface model using the ISBA 14 layer diffusion scheme. The satellite-based soil moisture product is based on two different kind of sensors, on-board different satellites and a Kalmanfiler-based data surface data-assimilation technique is used. Results point at benefit fo NWP forecast quality from using the satellite product in surface data assimilation.

The Paper points at an important point, which is how to initialize the deeper soil layers in the model. The general idea of the study is very interesting but unfortunately, in my opinion, the investigation is not extensive enough and suffers from some limitations. In addition the Paper is too short and technical. I therefore recommend that the Paper is subject to major modifications. After that these modifications have been carried out I consider the Paper ready for a another evaluation, prior to future potential publication. My main general concerns regarding the Paper are:

1. The Paper in is current form is too short. In particular a more detailed description on the procedure for merging the satellite data from different satellites and instruments and the procedure for that is needed. Now there is only a short description with a reference to Papers in review without providing doi or link. I think more information in the Paper itself is needed.

2. In several places I consider the description in the Paper too technical. For example you do not need to provide the surfex version in the title. Furthermore, in the title the acronym SCATSAR does not need to be mentioned,. It can be replaced with Scatterometer-Synthetic Aperture Radar or you reformulate the title. Other examples when I consider text to technical 'as implemented in Python's SciPy' and 'One possible approach would be the use of both SCATSAR-SWI and some temperature information for assimilation or at least use model ground temperature (TG) as additional control variable.' I think no need to mention 'as implemented in Python's SciPy' and that grounf temperature is called 'TG0' in the model used.

3. I think some more details of sEKF and its limiations and similarities as compared with other assimialtion methods suchs as optimal interpolation and EnKF should be provided. Is it for example appropriate with a linear assumption to use a series of 24 h perturbed to calculated the Jacobians? I think not. I think the dependence of Jacobians and thus results on length of perturbed forecast when calculating Jacobians shoud be caaried out and presented. Perhaps possible to apply 24 h cycle but calculating Jacobians for shorter period, please elaborate and extend experiments I suggest. Are other assimialtion methods like EnKF more appropriate and is a long spin-up period needed also for data assimilation? If Jacobians where larger when calculating based on for example 3 h forecats then experiment 3 would perhaps be more competative with experiment 4? Then Jacobians in combination with information from top soil moisture layer only would be sufficient possibly, or not? Very interesting question and you are really trying to answer in paper but please consider the importance of Jacobian calculation.

4. Please add some more Figures. I suggest an overview Figure of the data assimilation procedure. It is good to have mean accumulated soil moisture increments as in Figures 5 and 6. However to look at magnitudes also perhaps absoulute values of increments would be useful? In addition mean and absolute Jacobian or gain matrix values should be added. I propose as well a number of smaller modifications of already existing Figures.

More specific comments: ——————-

1. Page 1, line 1-2. I suuggest removing version number and acronym SCATSAR

2. Page 1, lines 4-5 I think abreviations ZAMG and TU should be instead written out both here and then first time mentioned in text.

3. line 15, and many cases like this. Change '0.5m' to '0.5 m'

4. Page 3, lines 1-2 Can you please provide some more details on why the temporal

resolution is higher for METOP/ASCAT as compared to resolution of Sentinel-1 SAR? Perhaps provide some more details on spatial resolution and footprint as well and discussion of difference as compared to model horizontal resolution?

5. Page 3, lines 9-11 Please provide link to report on methodology and include substantial part of it in this paper to strengthen the Paper.

6. Page 4., lines 15-25 Please provide a lot of more details on assimilation methodology. What is meant by 'slightly' perturbed? I think an overview schematic Figure would be good.

7. Page 7, lines 5-15 Please make clear what is meant by 'spin-up phase' in the sence of how model is configured. I think the 4 experiments could more clear be presented in bullet form.

8. Page 12 The two reports in review by Bauer-Marschallinger is not cleary accesable yet. Please provide link and include relevant part in this paper as well.

9. Page 18, Figures 3-4 Please provide units on vertical axes (K and %) as well as in Figure texts. In addition I think it would be preferable to calculate and present standard deviation rather than rmse.

10. Page 18, Figures 5-6 Please provide units in Figure texts.