

Interactive comment on “Variational Assimilation of Land Surface Temperature within the ORCHIDEE Land Surface Model Version 1.2.6” by H. S. Benavides Pinjosovsky et al.

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Dear Authors,

I have appreciated the global work and I find the topic really interesting especially the use of the variational method in a double goal : the sensitivity analysis and the parameter estimation. I think that some minor corrections should be performed before being published and here are my corrections and my comments on this work.

C1

1 Minor corrections

- Abstract
 1. The sentence corresponding to page 1, lines 16 to 18 is too long and should be shortened or divided in two sentences.
- Section 2 : Models and Data
 1. Page 3, line 16 change “22th” to “22nd”.
 2. Page 4, line 10 the unit is not clear for the spectral band “ μm ”.
- Section 3 : The Methodology
 - Subsection 3.1: Variational Assimilation
 1. Page 6, line 3 : you should replace the “ f ” at the end of equation (5) by “ J ”
 2. In the page 6, lines 6 and 7 you explained that y is described by equation 2. I can't see the relationship between equation 2 describing the empirical formulation of the brightness temperature and the surface radiation and the description of the observation term “ y ”. Are you making reference to the equation described in page 5 at line 23 ?
 - Subsection 3.4: Development of SECHIBA-YAO
 1. Page 8, line 11 : change “ANNEX A” to “Appendix A”
- Data assimilation experiments
 - Subsection 4.3: Experiment Definition
 1. Page 11, line 27 : change as follows : “sensible (H) and latent (LE) heat”.

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- Subsection 4.4: Experiment Definition
 1. Page 12, line 25 : correct 'retrieved' to 'retrieve'.

2 Questions and Comments

- General comments

1. I think that you should write the corresponding DOI and pages numbers for the different references used.
2. Figures are not clear when printed in A4 format and legends are almost not visible I think you should use larger size for the legends and make your figures in a vectorial (.ps, .eps, .pdf, etc.) format so that the zoom could be possible without degrading the figures quality.

- Specific comments

1. In the variational assimilation can you please specify what do you exactly mean by observations and first guess : what are you exactly assimilating **Pnoise** (referred as 'first guess' and 'perturbed' in figures 5 and 6 (a and b)) or **Ptrue** (referred as 'observations' and 'initial value' in figures 5 and 6 (a and b)) ?
 - (a) In the case you are assimilation observations then how could you perform your validation using the same observations?
 - (b) In the case you are assimilation your **Pnoise** then can you explain more how did you perturbed the 'Truth' using your uniform random noise (precise the respective variation ranges of the different assimilated variables so that we can see how much 50% of the nominal value is consistent) ?

C3

2. In the experiment 3 the gal was to show how could the number of variables included in the assimilation affects the performances of the method. In this case Experiment 3 must have the same conditions than Experiment 2 except the number of assimilated variables. Surprisingly you have changed the assimilation period starting the 8th of August 1996 rather than the 3rd of March. My questions are the following :
 - (a) Why did you change the starting date of the assimilation?
 - (b) How could you know that the decrease in the performances is only related to the number of parameters knowing that you have taken a different assimilation period and knowing the fact that the sensitivity of parameters toward LST is - as you have already mentioned- dependent on the seasons, period of the day etc. ?

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