

## ***Interactive comment on “The effect of assimilating satellite derived soil moisture in SiBCASA on simulated carbon fluxes in Boreal Eurasia” by M. K. van der Molen et al.***

**Anonymous Referee #2**

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This study's objectives are to assimilate satellite-derived soil moisture observations into a land surface model and quantify its effect on modelled carbon fluxes. The author's find that assimilations has an effect on simulated carbon fluxes, but the quality of satellite-derived soil moisture observations are highly questionable since these data do not capture major drought events.

In a close to ideal world, we have a good but imperfect model, high-quality observations and after assimilating such observations into the model, resulting simulated key fluxes agree better with independent observations. After reading this manuscript, it is clear that this study is not close to an 'ideal world' situation. I still feel that after some

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revisions (see below) it does provide a worthwhile contribution simply because it highlights a number of issues in regards to assimilation of a key parameter (soil moisture) in the northern high latitudes from both a modelling and observational perspective.

Major comments:

It is somewhat surprising that in this study NO comparison of simulated and observed carbon fluxes are shown. It is perhaps trivial to expect a change after assimilation but did assimilation improve the carbon fluxes (at least for specific seasons) would be the question to explore??

Specific comments:

Page 3, line 22 (first sentence start): I wonder if a publication has its own 'interest;? Perhaps better to start with some context and then state the goals of the study.

Page 4, line 6: 'Permafrost' is mentioned, but it would be good to explain somewhere how this process is modelled in SiBCASA.

Page 4, line 6-9: References needed

Page 5, line 6: Sentence starting with 'Respiration... ' is not clear. Suggest revision.

Page 6, line 15: Are these 4 site soil moisture measurements really representative of a larger area? A brief discussion at appropriate location about the mismatch in spatial scale between direct observation of soil moisture and the model footprint/resolution would be good.

Page 9, line 5: Sentence starting with 'Therefore... ' . What are the implications for the boreal study area? Can it be considered sparsely vegetated?

Page 9, line 9: Paragraph starting with 'Complementary... '. Add info on layer penetration depth of soil moisture retrieval (as done for passive) and add reasons why this product is less accurate for bare grounds (which is a bit counterintuitive)

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Page 10, line 18: a link is provided to Section 2.2 in regards to soil data, but I could see anything along these lines in Section 2.2???

Page 11, line 19: Instead of 'in Siberia' you probably mean 'across boreal Eurasia'?

Page 12, line 10: 'Reliability' in the subsection headline: Is this the right word? As this would imply a comparison to in-situ data which comes later!

Page 13, line 1: check figure designation!

Page 13, line 6: If you state results with no figure/table, you should at least include '(data not shown)'.

Page 14, line 6: Not clear about correlations: Is the correlation based on 7 points (e.g. monthly mean August) or truly daily (30dx7year)?

Page 14, line 14: Sentence starting with 'This pattern...'. Again you should add at least '(data not shown)', or show it in the supplement. Otherwise we have to believe what you say and science should not be based on a 'belief' system.

Page 14, line 26: Sentence starting with 'This shows...': Sentence is again difficult to understand. Suggest revising.

Page 15, line 3: Add 'temporal' prior correlation coefficients.

Page 15, line 12: Sentence start with 'Over the years...', perhaps add here after this sentence: 'whereby the ASCAT data are also more consistent with the in-situ data'.

Page 17, line 23: After sentence starting with 'As a result...' more detail should be provided in regards to explanations why ASCAT does not capture the spatial footprint of the drought.

Page 17, line 26-29: Without reference to any figures or tables, this becomes just story telling.

Page 22, line 27: By 'value' did you perhaps mean 'accuracy'?

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Page 23, line 26: Sentence starting with the 'The low soil...': among possibly many other factors? Right? Or is there evidence that this IS the key factor?

Page 25, line 12-15: Sentence very hard to understand. Suggest revising.

Page 25, line 23: Sentence starting with 'Furthermore' needs reference.

Page 26, line 1: What do you mean by 'reality'? Field evidence?

Page 26, line 19-20: Very awkward English.

Figure 12, caption: How is the temporal correlation coefficient calculated here???

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