Hydrology and Earth System Sciences Discussions

Interactive comment on "A dynamic approach for evaluating coarse scale satellite soil moisture products" *by* A. Loew and F. Schlenz

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This is a very nice paper that makes at least two important contributions to satellite soil moisture validation activities: 1) it's the first paper (to my knowledge) to look at time stability and triple collocation validation approaches simultaneously and 2) it makes novel points about our ability to apply both approaches over variable time periods.

Some comments for the authors to consider upon revision:

1) Introduction: I think a reference to Scipal et al. (2009) would be appropriate in the second paragraph. They were the first to apply to triple collocation to soil moisture. However the particular triplet they used (i.e. passive microwave soil moisture /active

microwave soil moisture /model-based soil moisture) is different than the triplet used in Miralles and Crow (2010) and here (i.e. passive microwave soil moisture/sparse ground-based observations/model-based soil moisture). This could be clarified.

2) Line 10, P. 7271. Clarify which of the three data sets is assumed to provide the unbiased reference here.

3) Line 20, P. 7271. I could not follow the sentence "However, the estimation of the errors in independent of the chosen model parameters as can be seen from Eq. (9)." "Beta" variables do appear in Eq. (9)…so it seems like the choice of a reference data set DOES impact the recovered errors. I'm probably missing something…considered clarifying.

4) Lines 20 to 25, P. 7275. This is a very good point. The "stable" nature of time stability approach is only relative and will break down as it is evaluated at progressively longer time scales. The same thing is likely true as you increase the spatial extent of the time stability analysis.

5) I'd recommend an explicit equation somewhere to define how the benchmark "e_station" error is estimated. Also, make sure to clarify the difference between "e_station" and "e_stat" whenever the two are compared (in e.g. the caption for Table 3).

6) Figure 9 – My understanding is that the points plotted in the "2008" and "2009" graphs represent a mixture of stations and monthly temporal periods. So that it is difficult to establish whether the observed correlation is due to TC capturing temporal or spatial patterns in spatial representativeness errors. Given that a key point in the analysis is that the proposal dynamic approach can capture monthly temporal trends in errors, the authors should consider coloring each particular station individually so the reader can see whether temporal variations at a given site accurately track real variations (i.e. are relative periods of high and low representativeness error actually reproduced in the TC analysis?...or is the observed correlation due to just capturing

station-to-station differences?). It is difficult to answer this question using the current plot.

7) Along these same lines, it might be interesting to explicitly compare the degradation in TC estimation of representativeness error as a function of dt. . .how much more scatter is introduced as you proceed to short temporal averaging windows (i.e. dt = 1 year to dt = 60 days to dt = 30 days)?

8) The comparisons to Miralles and Crow (2010) are interesting. However, there are at least three differences between the two approaches that should be discussed:

a) Miralles and Crow's analysis was based on errors in soil moisture ANOMALIES calculated relative to a soil moisture climatology based on applying a 31-day moving average window to multi-year data while this analysis is based on errors after only a long-term mean has been removed from the data. In this sense, this analysis is more ambitious than Miralles and Crow (Miralles and Crow show that TC is actually more difficult if you do not remove a seasonal cycle).

b) As already discussed in the paper, Miralles and Crow attempt to recover only long-term errors while this analysis attempts retrievals over a shorter time period.

c) On the other hand, Miralles and Crow's analysis did not filter out periods of low cross-correlation between observations (as was done here) and applied TC to the entire time series of available data. In this sense, Miralles and Crow are attempting a more ambitious retrieval.

So this analysis is more ambitious (i.e. attempting a more difficult estimation problem) on two counts while Miralles and Crow is more ambitious on a single count. Direct comparisons between the two approaches all still meaningful but should briefly discuss all three differences.

9) The updated citation for "Miralles and Crow, 2010" is: Miralles, D.G., W.T. Crow and M.H. Cosh, "A technique for estimating spatial sampling errors in coarse-scale soil

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moisture estimates derived from point-scale observations," Journal of Hydrometeorology, in press, 2010.

Some minor points regarding figures and tables:

Table 1 – Why does the experiment numbering start with 16? It might be clearer just to refer to each experiment based on the location name used to represent the "single station" soil moisture observation (i.e. Engersdorf, Locheim, etc, ...).

Figures 5 to 7 - In the figure captions, clarify what the difference is between plotted results presented in the left and right columns of the figures.

Figure 8, second column - Add axis labels to the scatterplots.

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