**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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General comments

This paper deals with the comparison of in situ soil moisture samples and satellite-derived soil moisture estimates at coarse resolution. This study is a timely contribution, particularly for the validation of SMOS and upcoming SMAP soil moisture products. It compares the time stability and the triple collocation (TC) methods, and proposes the use of the TC method at a shorter timescale so as to adapt to temporally stable soil moisture patterns.

The authors are presenting a nice work; the approach is original and interesting. Nev-

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ertheless, I would recommend them to complete the study with a detailed comparison to the TC method in Miralles and Crow, 2010, and to include an analysis of how to choose the most suitable timescale, given a specific case study. I would also suggest them to introduce the different sections in the introduction and be more concise in the conclusions. I believe these changes are needed to strengthen the paper and help its readability. Hence, I suggest the authors to address the comments hereafter before publication.

Specific comments

1) Line 2, page 7265. You should clarify that SMAP will also provide a soil moisture product at 10 km spatial resolution.

2) Lines 15 to 17, 7265. Since Scipal et al. 2009 were the first ones to apply the TC method to soil moisture, it would be appropriate to cite them in the Introduction.

3) Lines 22 to 28, page 7265. It is not clear from this paragraph how this paper will "contrast the potential" of the two validation methods introduced in the previous paragraph (Cosh et al. 2004, 2006 and Miralles and Crow 2010). Differences with respect to these two approaches should be outlined to better understand the novelty of the method proposed.

4) Line 29, page 7265. "rather short timescales" is a vague expression, would it be possible to indicate an approximate value?

5) Line 8, page 7266. I would recommend a change of notation: Root Mean Square Error (RMSE) instead of Root Mean Square Deviation (RMSD). RMSE is more frequently used within the soil moisture remote sensing community. Also, note that the D in RMSD stands for deviation and not for difference.

6) Lines 24 to 25, page 7266. I would suggest to add the following reference for the Australian Airborne Cal/Val Experiment for SMOS (AACES) dedicated campaign:

Peischl, S., Walker, J.P., Allahmoradi, M., Barrett, D., Gurney, R., Kerr, Y., Kim, E.

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LeMarshall, J., Rüdiger, C., Ryu D., and Ye N., 2009. Towards Validation of SMOS Using Airborne and Ground Data Over the Murrumbidgee Catchment. In Anderssen, R.S., R.D. Braddock and L.T.H. Newham (eds) 18th World IMACS Congress and MODSIM09 International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand and International Association for Mathematics and Computers in Simulation, July 2009, pp. 3733-3739.

7) Lines 1 to 4, page 7267. To complete the list of regular soil moisture networks I would suggest to include a reference to OZnet (www.oznet.org.au)

8) Lines 13 to to 15, page 7267. You should make clear in the beginning of the sentence you are addressing soil moisture spatial variability, i.e. "…soil moisture spatial variability within the footprint of a satellite sensor…".

9) Lines 18 to 19, page 7267. It would be helpful if you could indicate in what specific sections you are introducing every approach and their potential. The same way, it would greatly increase readability if you could include a short summary of what each section of the paper is devoted to at the end of the introduction.

10) Lines 22 to 25, page 7269. Please, clarify differences between the approach in Scipal et al. 2009 and the one in Miralles and Crow, 2010. What soil moisture data is used in Miralles and Crow, 2010?

11) Lines 6, page 7271. My understanding is that the final expression for var (ez) should be $<(z^*)2 - <x^*z^*> (beta2/beta0)>$. Please, check.

12) Lines 15 to 20, page 7271. This paragraph is confusing; could you please detail (i) why rescaling is typically performed over satellite and modeled soil moisture retrievals, and (ii) why the estimation of the errors is independent of the chosen model parameters?

13) Line 17, page 7272. The ISEA4H9 has an inter-cell distance of 14.989 km. Please correct.

14) Line 9, page 7275. From Fig. 2, I would say that the dynamical range of soil moisture is from 0.02 to 0.5 [m3/m3].

15) Line 20, page 7275. I would recommend adding an explicit equation showing how e_station is estimated.

16) Lines 20 to 21, page 7277. You should indicate both in Table 3 and in the text what the subscripts x, y, and z stands for in the correlation notation. I assume x stands for station, y for model and z for satellite.

The correlations in year 2009 are significantly lower than in 2008, and there are six cases wit r < 0.3. Is this correlation still significant? Consider revising.

17) Figure 6. Do you have a hypothesis of what's causing the high gain value observed in some of the days/runs?

18) Lines 9 to 10, page 7279. Figure 8 is showing results for year 2009, and the text is referring to year 2008. I guess there is some inconsistency here, consider revising.

19) Lines 1 to 6, page 7281. Here, also more information on the Miralles and Crow approach are needed to assess the results obtained with the two approaches, their advantages and disadvantages (see comment 10 above).

20) Line 16, page 7280. It might be interesting to show the degradation in TC estimation of representativeness error as a function of dt. In your analysis you used dt = 30 days, 60 days and 1 year, do you think it would be advantageous to include a shorter timescale? is it feasible to find an optimum dt for the case studied?

21) Figure 9. I would recommend coloring each station differently in this plot. Also, the caption should indicate that significant correlation stands for 95% confidence or r2 > 0.3.

22) Line 8, page 7281. I would recommend mentioning the approaches you are comparing in this first sentence of the conclusions. Also, it should be clearly stated in

the conclusions that you propose to combine the static TC method and the dynamic TC method at a shorter timescale, and that for your particular study the time stability approach is not applicable. Please, consider adding a short paragraph to clarify.

Technical corrections

1) Lines 19 to 21, page 7266. My understanding is that "of" should be replaced by "or", as you are citing two examples, is that it?

2) Line 15, page 7275. It should be "least squares"

3) Table 2. The table caption should detail the specific parameters calculated and its notation: gain, offset, correlation, e_station.

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