

Interactive comment on “A soil moisture and temperature network for SMOS validation in Western Denmark” by S. Bircher et al.

Anonymous Referee #2

Received and published: 13 December 2011

Overview

The study describes the set up of a soil moisture and soil temperature network in the Skjern River Catchment, Denmark. The network is mainly addressed to the validation of the soil moisture product obtained by SMOS. Additionally, a first comparison between in situ observations and the SMOS soil moisture product for the year 2010 is carried out.

General Comments

As already underlined by Referee 1, the paper is well written and structured and ad-
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dresses an important topic, i.e., the optimization and establishment of a soil moisture network to be used as benchmark for the validation of coarse-resolution satellite soil moisture products. I also agree with Referee 1 that the paper is mostly a technical descriptive document. However, some interesting points are investigated in the paper as, for instance, the optimization of station locations according to land use and soil features. Therefore, it may deserve to be published. However, I have several concerns that should be addressed before the publication.

Reading the paper it is not clear the reason why the approach described in the paper would provide an enhanced in situ soil moisture observation. Obviously, this is theoretically expected but some information to demonstrate that the employed procedure provides a more reliable soil moisture estimate at SMOS pixel scale should be given. For instance, I suggest showing some analysis that highlights that the average of the whole soil moisture network data provides a significantly different soil moisture time series than using a more limited number of observations. Moreover, some analysis dealing with the spatial and temporal variability of the in situ collected data could give to the reader a more clear picture of the soil moisture behaviour in the study area.

I was also surprised to see that the agreement between the initial guess soil moisture (derived by the ECMWF model) and in situ observations is higher than the one retrieved by SMOS. This means that the soil moisture product derived by the ECMWF model (the first guess) is better than the SMOS one, at least in the investigated area. I think this aspect should be analyzed and discussed.

Finally, in a paper dealing with remote sensing of coarse-resolution soil moisture product, I believe that the other satellite sensors, besides SMOS, providing a soil moisture product at global scale could be at least mentioned: ASCAT, AMSR-E and Windsat. Moreover, a comparison of the results with the ones obtained with the other sensors, for instance in Europe (e.g. *Brocca et al., 2011*), might be given.

In the specific comments, I report a number of further changes and clarifications that

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should be required.

On these bases, in my opinion, I find that the paper may become worthy of publication on HESS after a moderate revision.

Specific Comments/ Technical Corrections (P: page, L: line or lines)

P9962, L4: For sake of clarity, please specify that soil temperature data are measured by the network. At a first reading, I believed that air temperature data are collected.

P9962, L22: Actually, soil temperature data is a product derived by the ECMWF model, it is not retrieved by the SMOS radiometer. I believe it should be specified better in the abstract because it seems that also these data are retrieved by SMOS. Moreover, it is not clear in the abstract what the initial/retrieved products represent.

P9964, L21-25: Also *Brocca et al. (2010)* applied temporal stability and random analysis for the optimization of the number of soil moisture sensor within an area of 60 km². Additionally, *Famiglietti et al. (2008)* analyzed also the number of soil moisture samples as a function of spatial scale; this aspect could be discussed in the Introduction.

P9965, L13-15: At this point of the paper this sentence is not clear, please revise.

P9966, L13-14: It is not clear to me what is "the shelter correction factor". Moreover, as rainfall observations are only used for data visualization it is not needed to give too much details for them.

P9968, L7-10: In my opinion, more details regarding the soil moisture and soil temperature products provided by the ECMWF model should be provided. Which products are used? The operational product or the reanalysis one. Please specify.

P9970, L22: The sentence seems truncated, something is missing, please check.

P9977-9978: In my opinion, this description of the profile soil moisture and soil temperature data is too long and could be summarized. It seems more appropriate for a

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technical document.

P9979, L18-27: I am surprised to see that the determination coefficient between soil moisture time series ($R^2=0.57$) is lower than the one between rainfall time series ($R^2=0.86$). Usually, soil moisture time series are more smooth than rainfall ones thus showing higher correlation values. I suggest analyzing more in-depth this interesting aspect also considering other soil moisture stations.

P9980, L3-4: It is not clear to me why these results highlight that the variability between the two areas is in the same order as within them. I suggest specifying better.

Figure 2: A topographic map of the area should be provided.

Additional Reference

Brocca, L., Hasenauer, S., Lacava, T., Melone, F., Moramarco, T., Wagner, W., Dorigo, W., Matgen, P., Martínez-Fernández, J., Llorens, P., Latron, J., Martin, C., Bittelli, M. (2011). Soil moisture estimation through ASCAT and AMSR-E sensors: an intercomparison and validation study across Europe. *Remote Sensing of Environment*, 115, 3390-3408, doi:10.1016/j.rse.2011.08.003.

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