**Hydrology and
Earth System
Sciences
Discussions**

Interactive comment on "Modelling soil moisture at SMOS scale by use of a SVAT model over the Valencia Anchor Station" *by* S. Juglea et al.

Anonymous Referee #2

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This paper addresses the validation of soil moisture products from satellite measurements, on the Valencia Anchor Station (VAS). This site is an important validation site for the SMOS satellite. First the ISBA Soil Vegetation Atmosphere Transfer Scheme is calibrated and validated using the Melbex I and Melbex II campaigns. Second simulations are conducted over a 10 x 10 km2 grid and soil moisture outputs are averaged to compare with AMSR-E soil moisture and polarization ratio and with ERS/SCAT soil moisture product. This subject is relevant to the HESS journal and several related papers have already been published in the past few years in HESS and in others journals (Wagner et al., 2007, , Albergel et al., 2008, Rüdiger et al., 2009, Draper et al., 2009, Gruhier et al., 2010). Only the study from Rüdiger et al., 2009 is mentioned in the paper. Please cite these papers since they are highly relevant and very close to this study (list of reference at the end of this review). I believe this paper

is acceptable for publication, but with major modifications.

General Comments

The abstract is well written and it provides a good overview of the paper, including the calibration and validation of the ISBA model, and the comparison with AMSR-E and ERS/SCAT data. However in the introduction the objective of the paper is reduced to the calibration/validation of the ISBA model. The comparison with satellite data is indicated to be used to test "the accuracy of the approach". The introduction should be re-written to clarify the objective of the paper. Previous studies related to the same topic (list indicated above) should be discussed in order to emphasize the contribution of this paper.

Section 2 needs to be re-organized. It is supposed to describe the study area and the data, but it also contains the ISBA model description and calibration. This section should be more focused on material and methods with a separate domain and data (VAS) sub-section and a Model subsection. The model description is too long as indicated in my specific comments below. Since the objective of the paper is not to develop ISBA, the description should be reduced. In contrast it would help the reader to have a sub-subsection that provides a clear description of the numerical experiments (resolution, dates, spin-up, area, forcing, etc...). Experiments description should also focus on the objectives of each experiment for calibration, validation or comparison with satellite data.

The conclusion section does not provide any discussion/analysis of the study. It should clarify the interest of the two main parts of the paper:
- What is the interest of the calibration/validaton of ISBA on VAS ?
- What do we learn from the AMSR-E and ERS/SCAT comparison? What is the additional value (spartialized SVAT model) compared to the five previous studies

referenced at the end of this review?

The conclusion should also show how this study will be useful for the preparation of the SMOS cal-val activities.

Specific comments

P 652 line 20: The objective of the paper is "to generate a spatialized surface soil moisture over a 50 x 50 km^2 area" with the ISBA model forced by ground stations measurements. This is a technical objective. Please indicate scientific objectives of the paper (see general comments).

P 653, lines 11 and 14-15: Figure 1 shows ECOCLIMAP land cover. This is not in relation with the text, which provides a general description of the study area. ECOCLIMAP land cover figure should be shown later in the paper. In this part of the paper (P 653) a map of the study area would be useful in this paragraph.

P 654 line 10 and Figure 2: This figure is not nice and not useful as it is. In the text 4 fully equipped stations and 18 rain gauges are indicated. The reader would like to be able to tell apart different types of stations on the map. Replacing Figure 2 by a map of the study area, with stations types, Melbex I and Melbex II locations and names of the sites listed P 653 (e.g. Caudete de las Fuentes) would be very useful. In addition, Figures 1 and Figures 2 should be swapped in order to have first the figure related to VAS description and second land cover types.

P 664 lines 5 and 26: The ISBA simulations of this paper are forced by data from the Caudete de las Fuentes meteorological station, "located close to the campaign site". . How far is the meteorological station from the campaign site? Can this distance affect the RMSE ? Please comments on this in the text. And again according to the previous comments it would be useful to have stations and campaign sites shown on a map.

P 669 line 15: The description of ISBA is far too long and too detailed. As indicated by reviewer 1 ISBA is a well established model and there is no need to give such a detailed description of the soil water dynamics equations which are described in the ISBA papers from Boone et al.

P 662-663: The way this spatialization method is used in this study is not very well exposed in the paper. It would greatly improve the clarity of the paper to include a sub-section dedicated to the description of the numerical experiments, including scale, forcing, objective (calibration, validation, comparison with satellite data).

P 664 line 21: So does your numerical experiments include 1.5 year of spin-up? What initial conditions did you use? Did the model reach equilibrium on 14 July 2005? Spin-up length depends on initial conditions (longer spin-up in dry conditions). You should shortly discuss this issue in the text.

Technical corrections

P 650, line 23: Add "from the ERS Scat sensor" after "soil moisture data".
P 652, line 5: Move "a day" before the parenthesis
P 654, line 21: The Figure with ECOCLIMAP mand cover should be cited here.
P 655 lines 1-16: Indicate the location of the Melbex campaigns on the study area map, and in the text as you indicated in your replys to L. Brocca's comments.
P 656, line 4: Define RFI. It would be interesting to add some comments on SMOS RFI in this area.
P 656, line 14: Replace "leave" by "leaves"
P 657, line 26: Replace "MODIS" by "MODIS data" to be consistent with previous bullets
P 658, line 1: Remove "(Leaf Area Index)" since it is already defined in page 654
P 658, line 2: Replace "They are" by "It is"

P 658, line 5: "METOSAT data" (consistence previous bullets)
P 658, line 13: The ISBA Model description has nothing to do do in the ERS-SCAT part (see general comments). Please use consistent notation for ERS Scat, ERS-SCAT in the paper.
P 658 line 16: Remove "called"
P 658 line 23: Replace "Soil-Vegetation-Atmosphere transfer (SVAT)" by "SVAT" since it is already defined.
P 661 line 15: Replace "is to enable" by "that enables"
P 662 line 14: Replace "Sect. 4" by "Sect. 3
P 664 line 26: Even though it is well known define RMSE when used for the first time.
P 665 line 13: Replace "equation" by "value"
P 665 line 19: Replace " behaviour" by "evolution"
P673, Lopez-Baeza et al.: The 4 references all concern the VAS. Since two of them are conference presentations, I would suggest to keep the two references that are possibble to find in written (second and fourth).
P 674: Complete the Rüdiger et al reference (Journal of Hydrometeorology, 10(2),)
Table 1: Also put this information on a map
Table 4: Unit of Ksat
Table 5: Define units
Figure 1: Caption should indicate "land cover" instead of "characteristics"
Figure 2: Replace this figure by a proper map with stations and sites locations.

References to update and to add

Albergel, C., C. Rüdiger, T. Pellarin, J.-C. Calvet, N. Fritz, F. Froissard, D. Suquia, A. Petitpa, B. Piguet, and E. Martin, "From near-surface to root-zone soil moisture using an exponential filter: an assessment of the method based on in-situ observations and model simulations" Hydrol. Earth Syst. Sci., 12, 1323-1337, 2008

Draper, C., Walker, J., Steinle, P., de Jeu, R. and Holmes, T., 2009. An evaluation of AMSR-E derived soil moisture over Australia. Remote Sensing of Environment, 113 (4), 703-710.

Gruhier C., P. de Rosnay, S. Hasenauer, T. Holmes, R. de Jeu, Y. Kerr, E. Mougin, E. Njoku, F. Timouk, W. Wagner, and M. Zribi, " Soil moisture active and passive microwave products: intercomparison and evaluation over a Sahelian site ", Hydrology and Earth System Sciences, 14, 141-156, 2010

Rüdiger C., J.-C. Calvet, C. Gruhier, T. Holmes, R. de Jeu and W. Wagner, " An Intercomparison of ERS-Scat and AMSR- E Soil Moisture Observations with Model Simulations over France ", Journal of Hydrometeorology, 10(2), 431-447, doi:10.1175/2008JHM997.1, 2009

Wagner, W., V. Naeimi, K. Scipal, R. de Jeu, J. Martidnez-Fernadndez (2006) Soil moisture from operational meteorological satellites, Hydrogeology Journal, DOI 10.1007/s10040-006-0104-6.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 649, 2010.