

## **Interactive comment on “Hourly soil moisture mapping over West Africa using AMSR-E observations and a satellite-based rainfall product” by T. Pellarin et al.**

This article provides an original and simple method to map hourly soil moisture on a large scale with observations and satellite-based rainfall data. The method is interesting and useful. However, the presentation is far away from clear. The English language is too poor to understand in many places. I suggest publishing it with major revision. Besides the comments from Referee #1, the authors should pay attention to the following issues:

(1). The English language is rather difficult to understand. The authors have to ask help from a native English speaker to polish the language.

*The paper has been corrected by a native English speaker.*

(2). The abstract is too long. It has to be substantially shortened.

*The abstract has been shortened from 20 to 14 lines.*

(3). Two resolutions are mentioned in the article:  $10 * 10 \text{ km}^2$  and 30 min. 30 min is equivalent to  $50 * 50 \text{ km}^2$ . It is not clear whether the authors use both the resolutions or you only use one. Please clarify this. In addition, "30 min" is not professional at all. "30 arc-minutes" should be used.

*30 min is related to the temporal resolution and not the spatial resolution. In the new version of the paper, this has been better explained (e.g. “soil moisture map at the  $10 \times 10 \text{ km}^2$  and 30 minutes resolution” has been replaced by “soil moisture maps at a spatial resolution of  $10 \times 10 \text{ km}^2$  and a temporal resolution of 30 minutes” in the abstract)*

(4). P4036 Line26: SHOWN→ showed

*The sentence has been changed by the native English speaker:*

*“A large part of these studies concern West Africa where Koster et al. (2004) shown that there is a strong coupling between soil moisture and precipitation in climate models” has been replaced by “Many of these studies concern West Africa, a region with a strong coupling mechanism between soil moisture and precipitation in climate models, as shown by Koster et al. (2004)”*

(5). P4037 Line 26:  $10 * 10 \text{ km}^2$ , 30 min. what’s your meaning? do you think they are the same resolution?

*Same answer as in (3)*

(6). P4038 LINE 10-12: this sentence is not clear at all. Pls polish it!

*The sentence “Then, the assimilation technique consists on modulating the satellite-based rainfall accumulation estimates in order to match the simulated TB and the observed AMSR-E TB.” has been replaced by “Then, an assimilation technique is used to modulate the satellite-based rainfall estimates in order to minimize the difference between simulated TBs and the observed AMSR-E TBs”*

(7). P4039 Line 1-4: explain the reasons for the differences. Line 18: Pj (subscript!!)

*The following sentence has been added to the new version of the paper to explain the reason for differences between the total number of rain events detected at ground level and by the satellite-based algorithm: “The overestimation of the number of rainy days is frequently observed in satellite-based rainfall products based on statistical relationships between the top-cloud temperature value and precipitation rate measured at ground level. This is particularly true in the Sahel where strong evaporation of the rain can occur between the clouds and the ground”.*

(8). P4042 Line 11 "This yields to modify..." I do not understand this sentence.

*This paragraph has been corrected by the native English speaker.*

(9). P4043 Line 3 "locale" is not correct. locale→local. This word is used incorrectly many times in the paper. Correct all! Line 12: June 1st to 30 September: both the dates do not share the same format. IINE 20: "Untrue" is not a correct word here.

*All these mistakes have been corrected in the new version of the paper*

(10) P4045 Line 5-7: this sentence is not clear at all. Polish the language.

*This sentence has been removed and replaced in the new version by: "In the assimilation technique used in this study, the EPSAT-SG rainfall rate estimates between two successive AMSR-E brightness temperature (TB) measurements are adjusted by multiplying them by a factor between 0 to 7 that minimizes the difference between simulated and observed TBs".*

(11) P4046 Line 1-3: not clear at all. Line 8-9: not clear at all. Line 22-24: not clear at all. Line 29: R2 coefficient → R2. This suggestion applies to other places.

*All these mistakes have been corrected in the new version of the paper*

(12) Line 17: based on the use of a rainfall.. →based on a rainfall ....

*Done...*

(13) P4049 Page 7: "essentially" is not a suitable word here. Page 10: Calibration/Validation – > calibration/validation

*"Essentially" has been replaced by mainly and Calibration/Validation by calibration/validation*

Interactive comment on "Hourly soil moisture mapping over West Africa using AMSR-E observations and a satellite-based rainfall product" by T. Pellarin et al.

Anonymous Referee #1

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Reviewer's comments to "Hourly soil moisture mapping over West Africa using AMSRE observations and a satellite-based rainfall product" by Pellarin et al.

Satellite microwave remote sensing observation is one of the most important technologies for regional soil moisture mapping, but the most current onboard satellite sensors for soil moisture research had designed 1-3 days local revisit period, this is challengeable for monitoring soil moisture dynamical range. The objective of this research is to provide an original and simple methodology for mapping surface soil moisture with a fine temporal and spatial resolution over large areas based on the rainfall accumulation product and soil microwave emission at C-band. This is a first research I read on temporal scale conversion issues of soil moisture mapping, it is also successfully applied in deriving high temporal resolution soil moisture product. Therefore, I recommend accept it for publishing after making a minor technical corrections. The specific comments

1)in API model, only an simple relationship between API and soil moisture has been deployed, the detail discussions about this relationship and error analyses are necessary;

*The following sentences have been added to the text to provide information and references concerning the API model: "A simple model is used to simulate soil water dynamics. It is based on the concept of the so-called API. As the API needs only precipitation data as model input, it has been widely used in rainfall–runoff applications to parameterize the soil moisture conditions in hydrological catchments (Sittner et al., 1969; Descroix et al., 2002)".*

*The error analysis is found in part 3.1 when comparing reference soil moisture (measured at the ground) and API derived soil moisture (API model at the local scale)*

2)in P4039-4040,the introductions on how to estimate the delta parameter are not enough;

*The estimation of the delta parameter is not discussed on P4039-4040 but is explained on P4043 (part 3.1). It is said that a calibration procedure was used to find the best decreasing time parameter (delta) for the three sites of Wankama (Niger), Agoufou (Mali) and Nalohou (Benin). Comparisons were made using the mean value of all soil moisture measurements (-5 cm) at the three sites.*

3)the references on soil moisture retrieval from microwave remote sensing are not sufficient, please add more such as the one in “Journal of Geophysics Research, 108(D2), 4038, doi: 10.1029/2002JD002176, 2003” et al.;

*This reference has been added to the new version of the paper (p.2 line 18-20)*

4)the format of the reference list is not standard, capital letters and lowercase letters are missed somewhere, such as the ones in P4051L32-33, P4052L2-3, P4052L23-25;

*Done...*

5)The digit number in Figure4, Figure7, Figure8, Figure9 and Figure10 are not clear, they are not readable.

*I am not convinced that the digit numbers of these figures are too small. I think they will be easy to read with the final quality of these figures. However, if the editor agrees with reviewer#1, I can redo them.*

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 4035, 2009.