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Hydrology and Earth System Sciences Discussions

Interactive comment on "A global analysis of satellite derived and DGVM surface soil moisture products" *by* K. T. Rebel et al.

Anonymous Referee #2

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Manuscript is well written and structured. Authors perform a global evaluation of the LPRM derived AMSR-E product against a modeled soil moisture output generated using the ORCHIDEE vegetation model. However, there are several issues that need to be addressed, including the fact that ORCHIDEE is a root-zone "single-layer" model and AMSR-E provides an estimated of the top few cm, the impact of the 5-days smoothing filter that was applied to the AMSR-E data and value of the in situ observations used here.

What does the "DGVW" abbreviation in the title mean? It is not a common abbreviation. Please either define it or re-word the title.

AMSR-E is available since 2002 until present and section 2.2. explains that the model

was run between 2000 and 2008. Why the analyses focus on only two years and why were exactly these two years selected (2003 and 2004)?

pp. 4283, last paragraph: authors explained that the LPRM model provides a "global soil moisture product" where the retrieval is based on the radiative transfer equation, which is true; however, all of the available passive microwave techniques are based on this same equation. It will be more useful if the statement reflects on what makes the LPRM retrieval different than the rest of the existing approaches.

pp. 4285, last paragraph – the supreme performance of descending C-band data set used here, is it relative to the ascending C-band retrieval, to X-band, to the alternative global soil moisture data sets? Is this the justification for choosing LPMR over the rest of the available global products? Please, clarify.

pp. 4286, line 13: "These satellite . . . products" – assume the sentence describes the C-band LPRM product as not other products have been mentioned previously. Please, re-word.

Justification for the 5-days moving average filter should be provided, i.e. AMSR-E re-visit time is 16 days, why a 5-days moving window was selected? More importantly, given that the analysis are based on "the dynamics of the soil moisture depletion processes after rainfall events" (pp. 4284, lines 10-15), the filter will actually dampened down the AMSR-E response to rainfall events and possibly remove spikes caused by small events. Can you please elaborate a little bit on the implications of the smoothing step, i.e. were any analyses performed to assess how this moving filter impacts the AMSR-E response to rainfall events?

How exactly does the ORCHIDEE model do the water transfer through the soil medium? Is it a simple bucket model? There is no info on the actual depths of the model soil layers. Description if the ORCHIDEE should be improved.

Can you please elaborate on the fact that the top layer disappears during dry periods.

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Why?

Why was not the model soil moisture recalculated into m3/m3 – 20 mm of water within 5 cm deep layer is different than 20 mm within 1 m or 2 m layer!

What is the difference between deep (DEEP_SM), total (TOT_SM) and root zone (ROOT_SM) layers? Please, explain.

Authors explained that the modeled soil moisture is a daily product; if the precip data are available on an hourly time step why the model was archived on a daily basis? AMSR-E is an instantaneous observation in time. Since AMSR-E estimates are representative of only a very shallow soil depth – the response to a rainfall event that was let's say 8 hours before the overpass will be rather small or not evident at all depending on the rainfall amount, but will be present in the model's response. Furthermore, it is expected that the satellite product will correlated better with the top layer model estimate; however, this is not the case here. Authors' explanation for this is the fact that the shallow layer "disappears" under dry conditions and the results from the AMSRE-SHALLOW_SM comparisons are omitted in the end. If the shallow model layer is so unstable, it may be less confusing if the satellite comparisons against the shallow soil moisture layer are not included.

At what depth do the in situ stations measure soil moisture? Better/more detailed description of the soil moisture instruments at the Fluxnet sites should be provided. Why were the Fluxnet sites selected considering that there are alternative, well instrumented watersheds that provide more than one observation per footprint? 15 stations out of 300(?) available seem like a very small subset! Also, given the multiple reasons provided by the authors, why the in situ data are expected to behave differently than the other two products (i.e. scale, not representative footprint average, etc.), not convinced that the analyses against the station data really provide additional info on the performance of the model/satellite or help "learn more about the inter-annual differences". Is 0.8 optical depth indicative of low vegetation density?

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Authors use correlation coefficient, lag correlation coefficient, rank coefficient – do the authors compute and discuss diff. statistical parameter or the three are used interchangeably? Please, clarify.

pp. 4290, line 7-8 – The modeled, satellite and in situ may differ in terms of absolute value, but should agree in terms temporal dynamics.

pp. 4291, line 9 – "the significant ($p < 0.05$) correlation coefficients" – it appears that the corr. values shown in Fig. 1 are not all significant.

pp. 4291, line 13-14 – not clear: "since the precipitation input in these years was different in each region";

pp. 4292, line 11-12 – certainly precipitation is the dominant input when it comes to calculating the soil moisture state; however, the more significant issue here is the simplicity of the hydrologic component of the vegetation model;

Not clear why 1/e was selected as a threshold.

Table 2 is not needed – authors can add a color bar with the percentages next to each category next to Fig. 3c and

Figure 5: What are the numbers shown in the plot? Station number (corresponding to the numbers listed in Table 1)?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 4281, 2011.