Hydrol. Earth Syst. Sci. Discuss., 10, C989–C992, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C989/2013/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Potential and limitations of multidecadal satellite soil moisture observations for climate model evaluation studies" *by* A. Loew et al.

Anonymous Referee #1

Received and published: 22 April 2013

Overview

The study performs a global-scale intercomparison of the new multi-decadal satellite-based soil moisture dataset (ECVSM) with the ERA-Interim reanalysis dataset and modelled data from the JSBACH land-surface model. Moreover, the different datasets are compared with precipitation data. Finally, a preliminary trend and correlation analysis in the Sahelian region is carried out to highlight the possible use of the ECVSM dataset for climatic studies.

General Comments

I found the paper by Loew et al. well written, well structured and clear; the language is fluent and precise. It addresses an innovative and important topic as the evaluation of the newly delivered (Sep-2012) ECVSM soil moisture dataset at global scale clearly represents the first step to be done before the use of this dataset for climatic applications (and others, e.g., hydrological). The authors firstly made a significant effort to build and co-locate (in time and space) the different soil moisture and precipitation datasets employed in the analysis and, secondly, performed a detailed intercomparison between the datasets.

Therefore, I recommend publication in HESS, after the authors have addressed the reviewers' comments.

1) The paper is quite long and it contains many figures (17+3) and analyses. The intercomparison between the soil moisture and rainfall datasets is carried out in space and time, considering absolute and anomaly values. The reader can be lost to exactly catch the paper message and the main results. I suggest making an attempt to summarize the analyses made in the paper, For instance, a table listing them might be beneficial. Moreover, a clear distinction between the spatial and temporal analyses should be made.

2) In the paper, the datasets are compared in space and time by using, mainly, a correlation and partial correlation analysis. While I believe that the temporal analysis is appropriate and give insights on the behaviour of the ECVSM dataset, I have some doubts about the spatial analysis (shown in Figures 6, 9 and 10). As underlined by the authors (page 3545, lines 8-10 and page 3563, lines 4-13), the current version of the ECVSM dataset (likely to be changed in the near future) uses the GLDAS as a common scaling reference. Therefore, the global maps of the mean, median or percentiles values simply reflect the corresponding values of the GLDAS. Therefore, their intercomparison with the reanalysis and modelled data might be not correct as it

does not reflect the spatial behaviour of the ECVSM dataset. I suggest clarifying this aspect and, possibly, to reduce the space given to this analysis.

Alternatively, it could be interesting to investigate the evolution in time of the spatial correlation between the different datasets, e.g. at a global scale and subdivided by continents or climatic regions. In my opinion, this analysis could give the correct representation of the capability of the ECVSM dataset to reproduce the spatial variability of soil moisture at large scale.

3) One of the main outcomes of the paper is that the agreement between the ECVSM dataset and the JSBACH modelled data is better than the one with the ERA-Interim dataset. This is likely due to some inconsistencies in the ERA-Interim soil moisture data that sometimes show different range of variability in the different years. For this issue, the ECMWF has delivered a new soil moisture dataset, called ERA-Land, to be employed for long-term analysis (as the one in this paper) that avoids the inconsistencies found in the ERA-Interim dataset. I suggest mentioning this aspect as (possible) additional explanation of the obtained results.

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

P3542, L7-8: Actually, in the paper a detailed comparison of the ECVSM dataset with modelled data from the ERA-Interim re-analysis dataset and the JSBACH land-surface model is shown. The potentials and limitations of the ECVSM dataset for climate modelling applications is not the main content of the paper. Please rephrase the abstract, even simply changing the order of the sentences.

P3542, L9: Only the land-surface model JSBACH is used in this study, not the climate model. I suggest correcting, also later in the text, to avoid misunderstanding.

P3546, L12: (Hagemann and Stacke, 2013) is missing in the references list.

P3546, L14: I guess that the first soil layer is used in the subsequent analyses but it

should be clearly specified. The same should be done for the ERA-Interim soil moisture data.

P3550, L14-16: The rationale for removing the trend of the timeseries (explained later in the text) should be specified also here.

P3551, L17: In the analysis of percentiles, only the spatial analysis is carried out. Please remove "temporal".

P3557, L10-11: The employed precipitation datasets represent rainfall plus snowfall or only rainfall? Please specify.

P3562, L23-24: As specified in the General Comments, I am not sure that the spatial analysis with the percentiles represents a useful approach to evaluate the ECVSM dataset.

P3563, L1-3: The results of the correlation and partial correlation analyses between the ECVSM, JSBACH and ERA-Interim soil moisture anomalies show very similar results. The mean correlation values are equal to 0.36 (0.41) and 0.15 (0.23) for the correlation and partial correlation analyses, respectively, in the comparison of ECVSM and ERA-Interim (JSBACH) datasets. Please rephrase this part.

P3575, Fig.1: Please change "WFD" with "WFDEI" as in the text WFD refers to ERA40 reanalysis data.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 3541, 2013.