Hydrology and Earth System Sciences

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Discussions

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Interactive comment

Interactive comment on "Evaluation of soil moisture from CCAM-CABLE simulation, satellite based models estimates and satellite observations: Skukuza and Malopeni flux towers regional case study" *by* Floyd Vukosi Khosa et al.

Anonymous Referee #2

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The manuscript tries to compare soil moisture estimates from a coupled GCM-dynamic land surface model, and from 3 variants of passive/active remote sensing product (25km resolution) against small scale in-situ measurements (2/4 profiles a 4 depths) from two South African flux tower sites. Measurements and Estimated were compared on aggregated monthly time steps, for 2 depths (0-10, 10-100cm) looking at the correlation between monthly time series, phase lags analysed by wavelet analysis and representing the on and offset of a wetting period. In general, I belief the topic and analysis presented is of interest to the readership of HESS and could therefore be

considered for publications. However, I have some general as well as some specific comments that would need to be considered and require major revisions before possible publication.

General Comments

1. As a hydrologist, I am interested in the daily (sometime even hourly) dynamics of the individual components of the water cycle. As a water manager, we have to provide runoff predictions on hourly to daily timescales to hydropower producers or to release warnings on flood and low flow conditions. The question for me is, to what extend is a soil moisture estimate relevant that compares on a monthly level with an R2 of 0.5? What is the performance on daily estimates?

2. It seems that all products use different sources of precipitation input. How does the precipitation input differs and compares to the measurements of the two flux tower sites. I assume that at least some of the deviations in the soil moisture dynamics stem from differences and deviation in the precipitation dynamics.

3. The same hold for temperature, humidity and other inputs used for ET-calculation.

4. How representative are the averaged soil moisture data for the 25*25km2 pixels. My experience is that soil moisture data largely vary in space with short correlation lengths. What is the variation in soil texture over the 25*25km2 domain? I still see a large gap in scale that at least has to be discussed.

5. How do temporal difference in soil moisture behave of different time scales (days, weeks, months)? Perhaps that is an information, which is more similar covered by all products/estimates.

Specific Comments

P2l49ff It should be mentioned that soil moisture itself is not the driving force for water transport and evapotranspiration, rather it is the soil matric potential. Often difference in soil moisture only reflect differences in soil texture.

P3l96: Could you explain data constrains more precisely. My experience is, that there are hundreds of FLUXNET locations available, some of them also providing soil moisture data. So I do not see that you are limited or constrained by available data!

P5l179ff: As you are using a product combining active and passive microwave data, I would be more specific here. Passive microwave by the way is not dependent on radiation, it emits dependent on it temperature and emissivity. Also, active sensors per se are not necesseraily able to penetrate through vegetation – this will be largely dependent on the wavelength (x-,C-,L-band). Please be more precise on that topics.

P8l293: Why is the focus more on the phase agreement rather than on the magnitude? Because the results are better!? Or because it is more important!?

P9l317: Why are only detrended data analysed? If there are trends that are different, this would be interesting as well!

P12L390ff: I feel that large parts of the discussion would benefit from some short introduction of how the different products are generated (e.g. GLEAM, built on Priestley & Taylor, Stress-function bsed on VOD derived from mircrowave products ...). In its current form some of the discussions remain relatively week.

P20/21 Why is cov used in Fig. 10 and 11. As I do not know the Standard deviation the correlation coefficient would be more intuitive for me!?

P22l688: Should readers really be surprised by the conclusion that all products/estimates are at least able to reproduce the seasonality in the soil moisture signal! I am sure taking some mean monthly precipitation information, Temperature as a proxy for ETp and some simple bucket model would provide some similar performance. I know this is provocative, but my impression is you should at least demonstrate that all the effort you are doing is significantly better than such a Null-model!

Minor comments

P1l3: should be "... satellite based model estimates"

P1l20: should be ". . . turn out"

P7l263: semicolon should be removed

P8l283: should be "inter-compares"

P12l408ff: which figure is this text referring to?

P11l378: how are "wet periods" defined?

P18l581: structure of the sentence

P20l728: What you mean by soil moisture memory!