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Hydrology and Earth System Sciences Discussions

Interactive comment on "A comparison of ASCAT and modelled soil moisture over South Africa, using TOPKAPI in land surface mode" *by* S. Sinclair and G. G. S. Pegram

Anonymous Referee #3

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This interesting work is an attempt to use several satellite products in the TOPKAPI platform to monitor hydrological processes in South Africa. The EUMETSAT ASCAT soil moisture product is used, together with the EUMETSAT LSA-SAF shortwave radiation product. Additionally, TRMM rainfall products are used. While an assessment of the incident shortwave radiation product of the EUMETSAT LSA-SAF product is performed, the ASCAT soil moisture product is not verified. Could in situ observations of soil moisture be used ? What is the accuracy of the TRMM precipitation estimates over this region ? The methods used to model soil moisture needs more justification. How are the TOPKAPI parameters (e.g. soil depth or vegetation characteristics) mapped ?

Recommendation: Minor revisions.

Particular comments:

- P. 7440, L. 27: "of this region"?

- P. 7441, L.25: "by the SA" ?

- P. 7443, L. 1: "Reasearch" ?

- P. 7445, L. 10-11: The authors have chosen an extremely simplified method (Penman-Monteith) as a basis to simulate the water fluxes and soil moisture. They claim that they made this choice based on the lack of forcing variables, but it seems that all the variables needed to run a complete land surface model are available. Regarding incident radiation, the LSA-SAF provides shortwave and longwave radiation fluxes. A better justification of the methods used is needed.

- P. 7446, Eq. 2: How are G and Rn calculated ?

- P. 7447, L. 22-23: replace "co-efficient" by "coefficient"

- P. 7448, title of section 3: in general, LSM means "land surface model" and refers to more complex algorithms. In particular, a LSM solves the energy budget, simulates a surface temperature, and may simulate many quantities like carbon fluxes and vegetation biomass. The term "TOPKAPI-LSM" is misleading. Please remove or rename "LSM".

- PP. 7447-7448: it is not clear how spatial information about vegetation types (land cover types, fractional coverage of vegetation, etc.) and soil characteristics is included in Eqs. 3-4.

- P. 7449, L. 15. What is the soil depth and/or the maximum soil water content available for plant transpiration in TOPKAPI ? Does it vary from one region to another or from a vegetation type to another ? This should be explained in this section.

- P. 7450, last paragraph: the ASCAT SSM product corresponds to the soil moisture content of a very thin top soil layer (0.5-2cm). What is the soil depth considered by TOPKAPI ? The “low-pass filtering” performed by the authors is similar to the exponential technique frequently used to derive a root-zone soil moisture index from SSM.

- P. 7451, Eq. 6: this equation is an oversimplified formulation of the recursive expression of the exponential filtering technique. Why not using the exact equation (see Albergel et al., Hydrol. Earth Syst. Sci., 12, 1323–1337, 2008) ? Why using T=20d ? Albergel et al. 2009 found T=14d for retrieving soil moisture at a depth of 30cm. Is it consistent with the soil depth considered in TOPKAPI ?

- P. 7452, L. 18-19: with T=20d ?

- P. 7455: this section 5 is confusing. What do the authors want to demonstrate ? Differences in correlation with local soil moisture estimates, between ascending and descending passes, have been reported by e.g. Albergel et al. 2009. They show that morning orbits provide better results. Why not considering morning orbits, only ? Fig. 20 is very difficult to interpret and should be removed.

- Figures: too many. Fig. 2 is not essential nor directly related to the scope of this study and could be removed. Caption of Fig. 20 is not complete for understanding. Some figures could be merged (several subfigures): 5-6, 8-9, 11-12-13-14, 18-19.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 7439, 2009.