

Interactive comment on “On the utility of land surface models for agricultural drought monitoring” by W. T. Crow et al.

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Evaluation: The paper is very well written and I think the validation of global land surface models (LSM) is of utmost importance. In this study, it is assumed that the cross-correlation between modelled soil moisture and satellite NDVI anomalies can be used to test the ability of such models to predict the occurrence of droughts. Although this method was already applied for the European continent, it is not the most straightforward way to test the ability of LSM models for simulating global soil moisture dynamics since it is an indirect method and largely depends on the accuracy of the NDVI data. In my opinion, existing soil moisture products from recent satellite missions are far more adequate to validate global applications of LSM models. These soil moisture

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products can also be used to check, whether the NDVI anomalies are actually indicating drought situations. Therefore, I recommend a revision of the paper in which also soil moisture data are included.

General comments: 1. The method chosen to validate global land surface models (LSM) was already applied to the European continent and is for the first time applied globally. However there is also no verification that this method is valid for the global scale. This could be accomplished using global soil moisture products from satellite missions (e.g. SMOS, ASCAT). 2. The reason for choosing this indirect method is the supposed lack of large scale soil moisture measurements. However, recently several soil moisture data products from satellite missions are available, which already have been used to evaluate modelled soil moisture products (e.g. Albergel et al., 2012). Such data sets have sufficient time (e.g. 3-5 days) and spatial resolution (e.g. ~50 km) for the validation of global LSM. 3. Three different LSM have been chosen for this study, but no specific reason for this selection has been made. Also, not the latest versions have been used. For instance, the CLM 2.0 version instead of the actual 4.0 version was used. This unnecessarily decreases the significance of the results. 4. The study showed that the oversimplified API-approach led to better drought forecast than using LSMs. However, since the API-approach uses a spatially constant parameter it should yield highly unreliable soil moisture predictions depending on the local rainfall amounts. Therefore this result could also hint to the fact that the validation approach is not reliable. Again, satellite soil moisture products would be needed to disprove this suspicion.

Specific comments: P1 L5 I think you mean “formulations” P2 L56 The CLM version 4.0 is now standard P3 L86 The formulation “diagnosed from the...” is unclear P3 L87 What is the start value of theta? I would have expected that a spatially constant parameter will lead to large over and underestimations of soil moisture depending on the local rainfall amounts. Did you check whether the modeled soil moisture values are realistic at all? P4 L106 How did you disaggregate the SMAP data. P4 L121 “uses”

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instead of "input" P4 L127 Delete "assumed" P5 L154 "issues" instead of "things" P6 L174 What might be the reason for the higher auto-correlation of Noah and why is this a problem for the later analysis? P6 L182 Delete "in the" P6 L192 "product" P7 L2 Why did you include API in the ensemble? I think it would better to exclude API since in the z-score analysis the ensemble is compared with API. P8 L1-237 this belongs to the methodology section. P8 L259 The quality of model results largely depends on the quality of the input data ("rubbish in, rubbish out"). This is particularly true for physically based models. Therefore, also the quality of the input data should be taken into consideration (e.g. soil data). P9 L276 Since rainfall quality will increase LSM as well as API model output. If the data quality of other input sources would be increased (e.g. soil information) the performance of the LSM is likely to be improved relatively to API. P9 L293 Figure 5b

References Albergel, C., P. de Rosnay, C. Gruhier, J. Muñoz-Sabater, S. Hasenauer, L. Isaksen, Y. Kerr, W. Wagner, "Evaluation of remotely sensed and modelled soil moisture products using global ground-based in situ observations" *Remote Sens. Environ.* Vol 118, pp. 215-226, 2012.

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