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

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We thank Reviewer #2 for their helpful review of our manuscript.

**p5173.l5: Since long-term AVHRR data with lack of inter-annual variability are used for vegetation parameterization, my impression is that capabilities of LSMs are not exploited to the fullest extent. Can you please describe into more detail how the vegetation parameterization is performed, and whether improvements in rank cross-correlations between soil moisture and NDVI could be expected when improved vegetation products would be used in the LSMs?**

Response: We agree that this is a valid point. In response, we have repeated our en-

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tire Noah LSM analysis using AVHRR NDVI data containing full inter-annual variability. These results actually demonstrate slightly lower cross-correlation versus both independent MODIS-based NDVI and independent satellite-based surface soil moisture retrievals than results based on forcing Noah using only climatological NDVI values. The exact reason for this degradation is unknown. However, these results clearly counter the (reasonable) concern of the reviewer that our earlier use of climatological NDVI values under exploits the full potential value of modern LSM's. A full discussion of these results will be added to the revised manuscript.

In addition, the revised manuscript will include more information on how each LSM utilizes satellite-based NDVI and LAI retrievals to estimate model vegetation parameters (i.e., LAI and fractional vegetation cover).

**p5173.l24: It would be interesting to evaluate the quality of the root-zone soil moisture products, in particular, to show the agreement between the API and LSMs moisture values.**

Response: Evaluating the quality of various model-derived root-zone soil moisture estimates is precisely the goal of this analysis. However, the most objective way to perform this evaluation is via comparisons between various model-based soil moisture products and independent remote sensing variables (i.e., NDVI and satellite-based surface soil moisture retrievals). We feel that cross-comparisons between various model-based soil moisture products (as suggested by the reviewer) are less interesting because evaluating such comparisons requires that you make a priori assumptions about which models are best. Our basic point here is that, when you don't make the assumption that soil moisture predictions from complex LSMs are superior, it is difficult to identify significant added skill in them.

**p5175.l6: I do not completely understand why the soil moisture rank autocorrelations need to be standardized. In my opinion, the autocorrelation is a model quality that needs to be preserved when evaluating its skill for drought monitor-**

**ing. Furthermore, standardization by simply adjusting the layer depth of Noah to 40 cm is somewhat arbitrary. Also, in case standardization is performed, then all models (also CLM and/or CLSM) should be standardized.**

Response: The revised manuscript will contain new text better motivating the standardization of rank auto-correlation functions priori to our rank cross-correlation analysis. See response to comment "P6 L174" of Reviewer #1 for details.

The standardization of Noah by adjusting the layer depth to 40-cm is not arbitrary rather is implemented because it leads to a soil moisture rank auto-correlation function that matches functions associated with CLM and CLSM soil moisture predictions. Likewise, CLM and CLSM are not modified since they already produce almost identical auto-correlation functions. Text in Section 3.2 of the revised manuscript will be rewritten to clarify these points.

**Technical corrections:**

**Page5175.l20: In the in the**

Response: Agreed. Typo will be corrected.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 5167, 2012.