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Geoscientific Model Development Discussions

Interactive comment on "TerrSysMP-PDAF (version 1.0): a modular high-performance data assimilation framework for an integrated land surface–subsurface model" *by* W. Kurtz et al.

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General Comments

The paper of the "TerrSysMP-PDAF (version 1.0): a modular high-performance data assimilation framework for an integrated land surface–subsurface model" by W. Kurtz et al. present the work of coupling the model to the assimilation system. The manuscript focuses on the introductions of the technical implementation, computational efficiency of the parallel framework, and also examines the performance of the data assimilation. Overall, the manuscript provides proper information and description of the new system, and could be a important reference for upcoming studies in the future.

In the introduction, it would be nice to mention other similar system such as "The Canadian Land Data Assimilation System (CaLDAS)". In addition, authors may want to point out the uniqueness of their compared to others.

Once authors revise the manuscript based on the comments/suggestions here, I believe that the paper is worth to publish.

Specific Comments

P9642, line 27-28: "Assimilation of soil moisture data leads to a reduction of . . .." In Fig. 9, you show the soil water content for each member compared to the reference value. This only demonstrates the reduction of the ensemble spread after data assimilation. However, we do not see the reduction of the bias. In data assimilation, it is common to show the root mean square error (RMSE) and the bias of the control variable(s). I suggest authors examine the performance of DA/without DA in this way.

P9643, line 6-7: "This can again be related to the lower observation density at the model borders." I agree with authors' explanation. However, why it does not occur in other boundaries?

The results present in Fig 9 are based on four points from north to south at x=2000m. Based on my previous comments and suggestions, it would be nice if you can select different points other than x=2000m and examine the results. This could also verify your explanation of the boundary issue.

In section 5.4, you performed the results of higher resolution. Are there any different setups of the EnKF between 25-m and 5-m resolutions? In addition, P9627, line 24, authors state that there is no need for localization by global filter algorithms like EnKF. Please clarify this statement. As my understanding, as long as you have limited members for ensemble, localization is necessary and could perform better result.

Fig. 10 a) There is a discontinuity at y=1500 m, and the values of the AAE is also Discontinuous. Is this caused by MPI? b) How to explain the values of AAE in the

south boundary (x=1000-2000, y=0) is larger in the EnKF (with DA) than in the open-loop (no DA)?

Technical Corrections

P9624, Line 10: “i.e. the is no lateral” should be “i.e. there is no lateral”

The captions in Fig. 5 are not complete. Only sub-figure in the left is traduced.

The captions in Fig. 9 are not complete. What is red line and what is grey line?

Fig. 11 versus Fig. 12: For inter-comparison of these two figures, please use the same maximum and minimum for the color bar.

Interactive comment on Geosci. Model Dev. Discuss., 8, 9617, 2015.