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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Landslides Data Assimilation Using TRIGRS Based on Particle Filtering" *by* Changhu Xue et al.

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Thanks for your comments. The following is my reply.

Specific comments: 1. The particle filter and its improved algorithm are introduced in detail in another article (Xue, et al., 2018), and this part of the content was added to this manuscript (Part 2). The specific steps of the algorithm can be found in the supplement. The acquisition of hydrological parameters was supplemented in the fourth part of the article. The description of some details in the article was revised, such as landslide blocks and InSAR data. 2. We can't know the true value of the state in the experiment. In fact, the observed data is more credible, and our goal is to use the previously observed data to correct the model's operation. This is to make the model

results not have too much deviation in the future operation. Root mean square error (RMSE) or root mean square difference (RMSD) was used as an indicator to evaluate assimilation results in many studies, such as these articles (Healy and âĂŘN., 2006, Xie and Zhang, 2010, Zhang, et al., 2013, Bi, et al., 2014). The RMSE/RMSD calculation requires a state true value, or a sample mean instead. With the sample mean calculation, only the fluctuation of the assimilation result itself can be obtained, and the difference between it and the actual value cannot be evaluated. Therefore, it is more appropriate to use the observations for calculation. The data of the groundwater pressure head is not obtained in real time, and the data volume is lacking. As an indirect comparison, we analyzed the correlation between the pressure head and the rainfall sequence of the experimental output in the end of Part 4. 3. The error sequence of GPS observations is displayed separately (Figure 6). In the InSAR observation, we can only know that the overall accuracy of the observation data is better than 1 cm, and cannot obtain the specific value of the observation error of each day. Particle filtering itself is an algorithm that is difficult to perform specific error analysis, usually using RMSE/RMSD as an indicator of the quality of the evaluation results. Therefore, the error bars of the resulting sequence are difficult to draw, and the RMSD sequence (Figure 12) can be used as its quality evaluation. 4. The relevant expression details in the manuscript are modified. The expression of the article has been simplified. The terminology such as "sequential" and "Bayesian theory" has been removed, and the algorithm description of particle filtering has been added in the second part. The use of acronyms has also been revised. Thanks for your suggestion.

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Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-16/nhess-2019-16-AC3-supplement.zip

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