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Comment on hess-2022-350

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Referee comment on "A genetic particle filter scheme for univariate snow cover assimilation into Noah-MP model across snow climates" by Yuanhong You et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-350-RC3, 2022

Summary: The study is focused on the simulation of snow depth with a simple energy balance model with assimilation with observations. The data assimilation scheme is based on a genetic particle filter algorithm. The main conclusion is that this algorithm performs well for snow depth simulations.

Recommendation: the manuscript is in general terms poorly written. The English needs would need extensive copy-editing, and this deficiency often hinders the understanding of technical and scientific aspects of the study. In addition, the manuscript does not include important information that is critical to understand what has been done. One is that there is no description of the genetic particle filter algorithm itself, which is surprising. Unfortunately, I cannot recommend the publication of the manuscript. A revision would entail rewriting the manuscript almost completely.

Main points

1) The presentation is poor. The English needs very extensive revisions; acronyms are not defined (for instance SD, which I interpret to be snow depth!. SWE and GPF are not defined either) . The discussion is restricted to the own results and does not place the results in the framework of previous studies (what has been learned , what is the novelty?)

2) The destitution of important technical aspects is missing. The genetic algorithm is essentially not described - the paragraph starting in line 218 is so obscure that essentially nothing can be understood. The reader is not informed of many technical aspects. What are the 'particles' ? how are they genetically generated? what are the crossover and mutation operators ? why the genetic algorithm would improve on the deficiencies of other particle filters ?

3) I kept wondering of the utility and meaning of some of the mathematical assumptions. For instance, equation 9 seems to be unnecessary complicated. The distribution of the random noise w is just uniform in (-2,2), so there is no need for the additional complexity of equation 9. Also, why would the temperature errors be uniformly distributed ? why between -2 and 2 and which units represent those numbers (I guess C ?). This is an example of a problem that goes through the whole manuscript.