



EGUsphere, referee comment RC1
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Comment on egusphere-2022-766

Anonymous Referee #1

Referee comment on "On parameter bias in earthquake sequence models using data assimilation" by Arundhuti Banerjee et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-766-RC1>, 2022

The study by Banerjee et al. illustrates the implications of parameter bias in data assimilation applications for seismic-cycle modelling. One of the prominent features is that they adopted a particle filter. This is an interesting work. Characterizing the slip rate and shear stress in presence parameter bias is important to earthquake sequence estimation. The manuscript is logically organized and well written. Hence, my recommendation is minor revision before acceptance.

My main comment is about the data of this study. Synthetic observations are produced by sampling from the synthetic truth and adding an observational error from a Gaussian distribution with standard deviation. However, the real observations could be affected by instrumental noise, missing data, spikes, etc, and a short time step of four time units may no longer be applicable. I understand that the authors lack real observations. But they should at least discuss this limitation in Section 5.

Other minor comments are as follows.

Comment 1

In introduction, please review some previous studies where either the frictional parameters have been estimated as part of the data assimilation or assumed to be perfectly known.

Comment 2

Section 2.1: Please specify how to quantitatively determine the observation noise error. Please review some data assimilation frameworks and explain the reason why this framework is selected.

Comment 3

Equation 4: What does j mean? Is it a typo?

Comment 4

Line 89: In the presence of filter degeneracy, how to guarantee that one or few particles with high weight are sufficiently representative as the input?

Comment 5

Line 96: The sequential importance resampling process duplicates particles with high weight. Please explain its physical meaning in data assimilation.

Comment 6

Section 2.2: The model of forwarding simulation is important to data assimilation. In this study, a zero-dimensional (0D) model is considered. However, 1D, 2/3D models are also available. Please specify the reason why 0D model is selected. More details of its pros and cons are expected.

Comment 7

Line 149: What if in the region $a-b > 0$?

Comment 8

Section 3.2: The assimilation step may have an important effect on the results. In this study a very short time step is adopted. Please provide more discussions on its effect. If a longer time step is used, can a small parameter bias still be compensated?

Comment 9

Discussion: I appreciate the authors' efforts in stating the limitations of this study, but here I expect more discussion on their results and comparison with previous studies (without data assimilation).