

Dear Editor, we would like first to thank you for the careful reading of the revised version of our manuscript and for your comments. We will consider all of them in a revised version of the manuscript, as detailed here below. You can find the comments in *italics* and our answers in blue. In **bold**, you can find the modifications that will be made to the manuscript.

Dear authors,

Thank you for submitting a revised version of your manuscript.

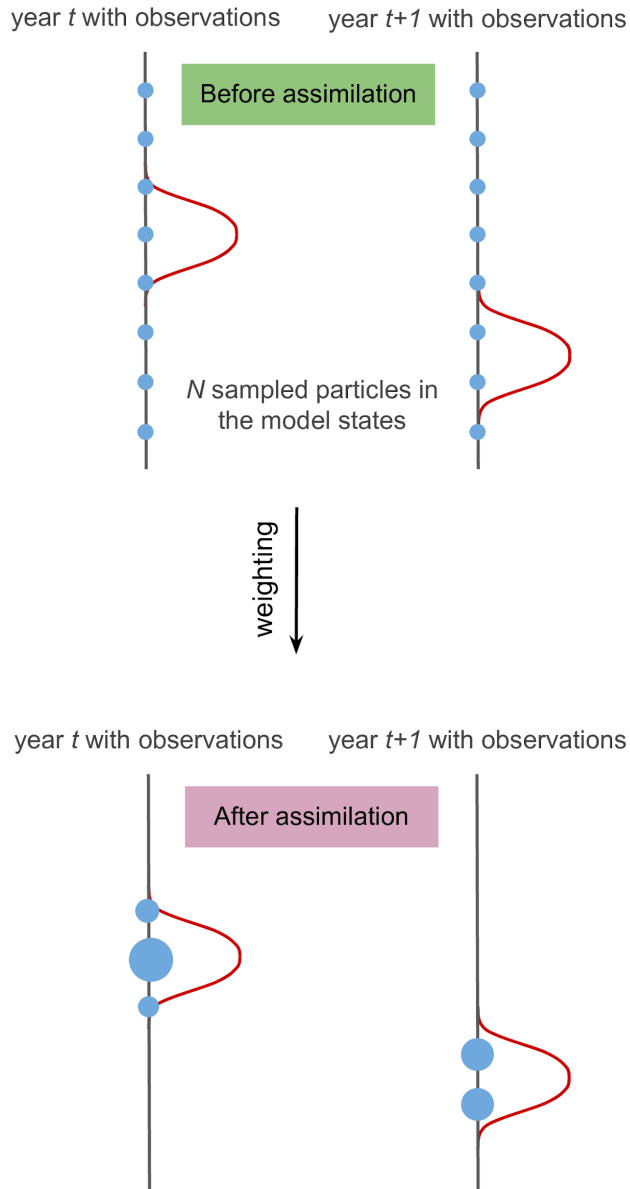
*I consider that it is broadly ready for final publication in *Climate of the Past*. However, there are a number of instances where you have provided information in the response to the referees that you have not incorporated into the manuscript. Some of this information would be of benefit to the reader, and so I kindly ask you to consider the following comments.*

Referee #1, Section 2.1:

In the response to the referees, you provide extensive information on the implementation of the particle filter. However, in the manuscript you only provide a reference to a PhD thesis. As a general rule, it is not desirable for an article in a journal to rely on a PhD thesis for the description of the methodology. I note that the referee asks you to provide a figure. I do not consider that you need to do this, but I think it would be helpful if you could add around one paragraph to the manuscript that includes the key details from the information in the response.

We propose to include the following figure (here below) from Rezsöhazi (2021) in the supplementary material with the associated legend and to remove the reference to the PhD thesis in the manuscript. The supplementary figure is referenced on **I106 and on I116**.

The following sentence will also be added on 116l: “In this way, starting from a prior distribution where all the particles have the same weight, the particle filter produces a posterior distribution where the weights of the particles are redistributed according to the observations, for each year of the reconstruction, and independent of the location. **The method does not make any assumptions on the prior and posterior distributions of the state of the climate system, and it can be used without an a priori knowledge of the model, which is a clear advantage of the particle filter. Additionally,** in this framework, the individual particles for a given timestep are dynamically consistent climate states.”



Legend: Before the assimilation, all the N ($= 8$ in our example) particles (blue circles) sampled in the model states (vertical axis) have the same weight, which is proportional to the size of the circle, whatever the year considered (t and $t+1$ in the example) because the prior is fixed throughout the assimilation procedure. The distribution of the available observations with uncertainties for each year is represented by the red curve. After the assimilation, the particles have been weighted relatively to their associated likelihood, given the available observations for each year, and the size of the circle is modified accordingly. When the weight of a particle is zero, it does not appear anymore on the figure. Figure and legend from Rezsöhazy (2021).

Referee #1, source code:

The referee makes two separate queries in regard to the availability of the source code. You state in your response that the code is available upon request and that you will include a

statement to this effect in the manuscript. I apologise if I am missing it, but I cannot locate any such statement. Also, while not required by Climate of the Past, it is nonetheless encouraged to archive source code in a public repository such as Zenodo.

This will be stated as follows on l119: **“The source code for the implementation of the particle filter in the offline data assimilation framework of this study is available upon request.”**

Referee #1, section 145:

It would be beneficial to include this information on standardisation. Could you please add 1-2 sentences of text to the manuscript?

This information on standardization will be added as follows on l145: **“Here, we use the already standardized tree-ring series directly derived from the PAGES2k compilation without any modification. As the tree-ring series are from different studies (referred in the PAGES2k database metadata; PAGES 2k Consortium, 2017), the standardization technique used can differ from one tree-ring series to another. Finally, the TRW records are normalized (...).”**

Referee #2, line 186:

This is useful information that clarifies an aspect of your methodology. Could you please include a summary of it in the manuscript?

This information will be added as follows on l190: **“Data assimilation does not require in principle such a selection based on correlation because the confidence we give to each record during the DA procedure is proportional to the observation error assigned to each record (Sect. 2.5). The potentially low correlation of some simulated tree growth with the observations is thus taken into account in the observation error and in the DA. In the Last Millennium Reanalysis project (Hakim et al., 2016; Tardif et al., 2019), for instance, such a selection is not made. In this study, we apply a selection, using a low value of the correlation as threshold, since tests have shown that including records with a very low correlation can increase the noise and reduce the skill of the reconstruction (Franke et al., 2020).”**

*Kind regards,
Steven Phipps
Handling Editor*