

## ***Interactive comment on “Estimation of gas record alteration in very low accumulation ice cores” by Kévin Fourteau et al.***

**Anonymous Referee #2**

Received and published: 27 September 2019

In the next few years, new data from Antarctic low accumulation sites will push the ice core records to 1.5 million years or older. The annual layer thickness in these ice cores is very small, not within reach of the measurement resolution. The resulting gas record will therefore be smoothed. The processes addressed in this manuscript alter the (naturally) smoothed trace gas record. Understanding the modulation of the natural record is needed and of high importance. The paper is certainly suitable for Climate of the Past. However, I find the manuscript lacks clarity and needs revision. Specifically the method needs better explanation. The entire manuscript needs to be reworked and may benefit from reorganization and shortening. Major revisions are necessary before it is publishable.

P3, Line15: Please write the units out the first time. 2 cm ice equivalent yr-1 (cm ie

C1

yr-1). No dot between cm and ie; otherwise it means cm times ice equivalent.

Please make it clear early in the manuscript that you prefer to use Antarctic high resolution data for comparison as they are not affected by the pole to pole gradient.

There are two continuous records from NEEM. Explain why you prefer to take the one you do or explain that it does not matter, does it?

I have a feeling on how the model works but the mathematical formulation on page 12 does not make sense. Unit wise that equation is definitely wrong. The model needs to be explained in depth and better before this manuscript is publishable.

The manuscript has too many figures where records are also unnecessarily repeated. I suggest fewer graphs. The graphs also lack information on which record the Antarctic data is compared to. Please label Dansgaard-Oeschger events in the manuscript. When sections of the core are compared in the text, it would help to have them labeled in the graph.

Supplemental: S1 The depth scale seems to apply to Vostok not to NEEM. What section of the NEEM core is that? It is quite obvious that there is a gap in the original record that leads to the too much smoothed record. The conclusion about NEEM gas age is not supported in my opinion.

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-94>, 2019.

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