

## ***Interactive comment on “Revised records of atmospheric trace gases CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and δ<sup>13</sup>C-O<sub>2</sub> over the last 2000 years from Law Dome, Antarctica” by Mauro Rubino et al.***

### **Anonymous Referee #1**

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The paper "Revised records of atmospheric trace gases... from Law Dome, Antarctica" by Rubino et al. represents an important contribution to the subject of historical radiative forcing changes of the three major greenhouse gases CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. Moreover, these data and the additional δ<sup>13</sup>C-CO<sub>2</sub> information are most instrumental to improve our understanding of the natural and anthropogenic changes of the biogeochemical cycles of these gases.

The ICELAB greenhouse gas concentration data are amongst the most precise ice core data available for the last about 2000 years and also the δ<sup>13</sup>C-CO<sub>2</sub> data, despite some corrections and data screening required, are of sufficient quality and essential

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for our understanding of carbon cycle changes. Due to the continuing progress in ice core analyses and the understanding of processes affecting the ice core gas archive, the Law Dome data have experienced several updates and corrections, which cannot be assessed or fully comprehended by the non-specialist. As the Law Dome data represent such an important asset in the climate change debate and are heavily used by climate modelers, it is important that an up-to-date data set is available online and a reference document describing this data set and the corrections exists. Accordingly, I strongly support publication of the paper and the connected data set by Rubino et al. in ESSD.

Having said that, the paper obviously does not go deep into the interpretation of the data sets and essentially reviews what has been said in previous papers before. As a reference document for the data set, I think this is mostly o.k. However, to completely fulfill the expectations for such a reference document, I missed some essential information that should be added in a revised version of the manuscript. These issues and some minor language correction are discussed in detail in the annotated version of the combined main text and supplement attached to this review.

The most important issues are:

- the issue of offsets in the δ<sup>13</sup>C-CO<sub>2</sub> data with previous versions of the data set and with data sets from other work is not sufficiently discussed yet. The corrections performed on earlier versions of the Law Dome data set are not sufficiently described in the text to allow the reader to make a quality assessment. In my opinion, it is not enough in this case to just cite older papers.
- it is a pity that the CH<sub>4</sub> and N<sub>2</sub>O isotopic data from Law Dome measured in other labs is not included in the data base. Although these data sets cannot be continuously updated in a way the CSIRO data can, they should at least be included in the data base as published.
- in the supplement the way how ages and corrections are derived (using firn model-

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ing?) is not sufficiently discussed. This needs significantly more detail to assess the quality of the data.

Please also note the supplement to this comment:  
<https://www.earth-syst-sci-data-discuss.net/essd-2018-146/essd-2018-146-RC1-supplement.pdf>

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Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2018-146>, 2018.