

Interactive comment on “Historical porosity data in polar firn” by Kévin Fourteau et al.

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Fourteau et al. publish detailed historical firn pycnometry records from three sites (Vostok, Greenland Summit and Law Dome DE-08) that were never published due to the passing of Jean-Marc Barnola. A porosity parameterization based on these data (published in Goujon et al. 2003) is widely used, and the paper describes the underlying data. These are very valuable observations that need to be published, and I commend Fourteau et al. for taking the effort to do so. I only have some recommendations for technical corrections.

I am very intrigued to see the differences in the close-off density at these three sites (Fig. 3). This suggests highest air content at DE08, and lowest at Vostok. This is indeed the observation of Martinerie et al. (1994). Do you think this is the underlying mechanism of the Martinerie et al. relationship between air content and temperature?

C1

This is certainly what is implied by Fig. 5. I think it would be appropriate to address this briefly in the paper.

Would it be possible to show the newer pycnometry data from the “Lock-In” site (Fourteau et al. 2019) somewhere together with the data from the three old sites (for example as a third panel in Fig. 3)? One would expect them to look more like Vostok than like Summit or DE08. Is that indeed the case? Showing these data would also give us a way to compare the consistency of the older and newer data.

Could you give some examples of mechanisms that can cause system drift in the pycnometry measurements? Are you talking about vapor freezing onto the surfaces, snow getting stuck, etc? Or is it something else?

P1L8: remove “intend to”

P1L20: remove plural “s” from “precipitations”

P2L6 and P2L7: replace “reach” with “connect”

P2L6: airtight is not the right word, given that fugitive gases like Ne still escape. I think you can just remove the phrase “and are therefore airtight”.

P4L4: “on the field” should be “in the field”

P5L2: “depending of” should be “depending on”

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