

Interactive comment on “Is there 1.5 million-year old ice near Dome C, Antarctica?” by Frédéric Parrenin et al.

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This is an interesting study on the hot topic of detecting a suitable site for an "Oldest Ice" core in Antarctica. The 1-D model applied by the authors is rather simple, but it is spiced up significantly by assimilating dated isochrones from airborne radar surveys into the model. The findings are certainly not the final word on the matter (nor do the authors claim that they are), but the paper constitutes a decent step forward along the road.

I only have a few, rather minor comments the authors should consider:

Line 67: "can be written:" -> "can be written as"

Equation (1): This equation is only correct if horizontal flow is neglected. This should

be mentioned already here.

Equation (1): Add a comma after the equation.

Line 74: Add a reference for the equation $\mu = m/a$.

Lines 77/78, "Oldest Ice sites have better chance to exist where ice is not overly thick": I think the work by Seddik et al. (Cryosphere 5, 495-508, 2011, doi: 10.5194/tc-5-495-2011) should be mentioned here. These authors applied a full-Stokes 3-D model (Elmer/Ice) to a 200×200 km windows around Dome Fuji and found exactly that.

Equation (6): If I am not misled, the symbol T has not been defined.

Line 129: "by (Ritz, 1992)" -> "by Ritz (1992)"

Equation (12): The constant in the equation should be 273.16 K rather than 273.116 K. The Clausius-Clapeyron constant $7.4 \times 10^{-8} \text{ K Pa}^{-1}$ is the value for pure ice. Using the value $9.8 \times 10^{-8} \text{ K Pa}^{-1}$ for air-saturated glacier ice would have been preferable (Hooke, "Principles of Glacier Mechanics", CUP, 2nd ed., 2005).

Line 130: What exactly is the meaning of ρ ? The equation for P is only correct if it denotes the depth-averaged density, $\rho = \bar{D}\rho_i$. Please clarify.

Line 132: "latent heat fusion" -> "latent heat of fusion"

Section 3 (Results and discussions): What I am missing here is a critical discussion of the results against those by Van Liefvering and Pattyn (2013) [VLP13]. According to Figs. 1 and 3a,b, the authors' LDC area agrees more or less with the candidate "A" by VLP13. However, NP is not close to any of the VLP13 candidates, and the VLP13 candidates "B"- "E" do not look promising in the current study. What are the likely reasons for these discrepancies?

Reference Cavitte et al. (in preparation): I think papers in preparation should not appear in the list of references. They can be mentioned in the main text, though (Cavitte et al., paper in preparation).

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References Fischer et al. (2013), Fretwell et al. (2012), Parrenin and Paillard (2012), Young et al. (2016): If available, the respective main papers should be cited rather than the discussion papers.

Reference Lliboutry (1979): "Glacialgeol." -> "Glazialgeol." (German journal title)

References Martin and Gudmundsson (2012), Tison et al. (2015): "The Cryosphere" -> "Cryosphere" (ISO-4 abbreviated title)

Reference Purucker (2013): The URL does not appear properly.

Figure 1, title: "radar-lines" -> "Radar lines"

Figure 2: What is the meaning of the white areas that appear in some places above the bed? Supposedly an age beyond the range of the colour bar? This should either be mentioned in the caption or indicated by a white triangle (or the like) on the top of the colour bar.

Figure 2, caption: "red dotted lien" -> "red dotted line"

Figures 3 and 4: The vivid-coloured dots do not make such a good contrast on the pastel-coloured background. Please consider making the dots bigger for better visibility.

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