

***Interactive comment on* “Brief Communication: New radar constraints support presence of ice older than 1.5 Ma at Little Dome C” by David A. Lilien et al.**

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Short Comment of Brief Communication: New radar constraints support presence of ice older than 1.5 Ma at Little Dome C by Lilien et al.

I would like to bring up a few additional points to the RCs submitted.

-I find that the description of radar and modeling work done prior to this study is missing several seminal studies:

1. the Van Liefferinge and Pattyn (2013) study is never mentioned, in particular in the introduction. However, it was their modeling work that identified promising oldest ice

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sites all over the East Antarctic Ice Sheet that then determined the sites (and so LDC) that should be further surveyed. This should be discussed in the paper, in particular in the introduction.

2. In the discussion of radar depth/age uncertainties, only the Winter et al (2017) study is cited. However, Cavitte et al. (2016) laid a lot of the ground work (and cited by Winter et al (2017)). In addition, there is also the work of MacGregor et al (2015) that should be cited here.

-Line 39-40: Van Liefferinge et al. (2018) also used the airborne radar data to refine their basal conditions.

-Line 48-49 (introduction) and Section 4.1: a diffuse reflector at depth in the radar data was already observed in the previous radar surveys, both in the airborne OIA data and the GPR DELORES survey data. This was mostly discussed during BE-OI meetings (which could perhaps be mentioned as BE-OI pers. comm.). Some of it was included in the publicly available thesis Cavitte et al (2017) available here: <https://repositories.lib.utexas.edu/handle/2152/62593>

-Section 4.2: why use such a simple model for dating when there's a 1D inverse model that has shown it works really well in the region (Parrenin et al., 2017 as cited), and Fred Parrenin is one of the co-authors of this paper?

-I wonder how the deepest isochrones traced in the manuscript were dated as they seem to get cut off around 30 km from the EDC site.

-This was not out at the time of submission but there is now a paper (Cavitte et al., 2021) in ESSD Discussions that summarizes all the isochrones that have been traced in the region using the UTIG/OIA/DELORES data sets. It shows that a number of isochrones that are older than 400 ka could be traced in these radar surveys. These deepest isochrones could not be traced to the EDC site due to the steep topography of the Concordia Subglacial Trench, but were dated using the Parrenin et al. (2017) in-

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verse model. The deepest two isochrones in Cavitte et al (2021) show ages of $\sim 610 \pm 35$ ka and $\sim 709 \pm 54$ ka. So, similar ages to those obtained at depth in the manuscript under review. It would be great to see this work referenced and included in the discussion of this manuscript.

Best,

Marie Cavitte

References mentioned: - Van Liefferinge, B. and Pattyn, F.: Using ice-flow models to evaluate potential sites of million year-old ice in Antarctica, *Clim. Past*, 9, 2335–2345, <https://doi.org/10.5194/cp-9-2335-2013>, 2013. -Cavitte, M.G., Blankenship, D.D., Young, D.A., Schroeder, D.M., Parrenin, F., Lemeur, E., Macgregor, J.A. and Siegert, M.J., 2016. Deep radiostratigraphy of the East Antarctic plateau: connecting the Dome C and Vostok ice core sites. *Journal of Glaciology*, 62(232), pp.323-334. -MacGregor JA and 9 others (2015) Radiostratigraphy and age structure of the Greenland Ice Sheet. *J. Geophys. Res.: Earth Surf.*, 120 (2), 212–241. -Cavitte, M. G. P., Young, D. A., Mulvaney, R., Ritz, C., Greenbaum, J. S., Ng, G., Kempf, S. D., Quartini, E., Muldoon, G. R., Paden, J., Frezzotti, M., Roberts, J. L., Tozer, C. R., Schroeder, D. M., and Blankenship, D. D.: A detailed radiostratigraphic data set for the central East Antarctic Plateau spanning the last half million years, *Earth Syst. Sci. Data Discuss.* [preprint], <https://doi.org/10.5194/essd-2020-393>, in review, 2020.

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