

Response to editor of ‘Mapping age and basal conditions of ice in the Dome Fuji region, Antarctica, by combining radar internal layer stratigraphy and flow modeling’ (tc-2023-35)

August 7, 2023

*The manuscript is improved considerably after the first round of revisions. I would ask that the authors make a careful check of the text for English usage and grammar, and also look at my comments below.*

We thank the editor Benjamin Smith for offering helpful review comments to improve the quality of our manuscript. We addressed suggestions specified in detail below.

*Throughout the manuscript:*

*--Model results are presented with far too many significant digits for the uncertainty in the estimates. For example : an age of  $1933.7 \pm 769.3$ . To follow rules for significant digits, this should be  $1900 \pm 800$ , but common practice allows  $1930 \pm 770$ . Please check your significant digits, and do not provide more than one order of magnitude precision beyond the estimated precision of the measurements.*

Thanks for the comment, we have changed the precision of modelled values in our manuscript. E.g., we changed modelled age from  $1933.7 \pm 769.3$  ka to  $1930 \pm 770$  ka, we changed thickness of stagnant ice from 28.5 m to 29 m, we changed basal melt rate from  $1.36 \text{ mm a}^{-1}$  to  $1.4 \text{ mm a}^{-1}$ . And we corrected the corresponding figures.

*--The authors use the word “corresponds” to mean something like “agrees with.” More conventionally, this word is used to mean “plays the same role as” and does not specify whether the two quantities compared agree or disagree. Please check each use of this word in the manuscript, and consider what it is intended to mean.*

Thanks for the comment, we have checked all the "correspond" and change some to "agree with" when we want to specify if the two quantities compared agree or not.

*120: double “the”*

We deleted the repetitive "the".

*285: regionally-> regional*

We changed "regionally" to "regional".

*288: “i.e. in a larger region” – this parenthetical comment is not clear. Please explain or delete.*

We deleted the comment in the parentheses.

*294: “corresponds” is too vague. Please find a specific word for the relationship between these studies*

We changed "corresponds to" to "agrees with".

*316, 327, 378: delete “relatively”*

We deleted "relatively" in Line 316, 327, 338.

*330-348: This section is not clearly relevant to the topic heading "model reliability" and I'm not sure how much it adds to the paper. The age of the basal ice appears to have substantial variability, and I'm not sure that its variability has much to say about the reliability of the model. If you want to explore (as you say) the "assumption [...] that the age–depth function should be rather similar for the same (normalized) ice thickness within a region for small flow velocities and where the overall ice dynamic behaviour (e.g. prevailing divide or flank flow regime) is comparable.", the best way to test this assumption is probably to look at a normalized depth for which your data have good resolution. A normalized depth of 1, where the age is calculated based on a substantial extrapolation from shallower layers, doesn't seem like the right place to do this.*

Thanks for the comment, we have removed this part.

*363: Please provide some detail (an equation, perhaps?) for how delta p was calculated.*

We added an equation for calculating  $\Delta X$  ( $X$  represents model derived parameter,  $X$  could be shape factor, accumulation rate, mechanical ice thickness and age of basal ice).

$$\Delta X = \frac{|X_1 - X_2|}{0.5(X_1 + X_2)}$$

*Table 2 caption: define each variable.*

We defined the variables by changing the caption from " Mean value and standard deviation of relative percentage difference between model runs for the profile 20170240." to " Mean value and standard deviation of relative percentage difference of age of basal ice  $\Delta\chi_b$ , shape function  $\Delta p$ , accumulation rate  $\Delta\dot{a}$  and mechanical ice thickness  $\Delta H_m$  between model runs for the profile 20170240."

*461: should be "...allowed the aircraft to make long-range surveys from a high-altitude camp, covering a large region..."*

We changed "In contrast, despite these shortcomings the simple and light-weight system enabled a long range of the aircraft from a high-altitude field camp to cover a large region around DF." to "In contrast, despite these shortcomings, the simple and light-weight system allowed the aircraft to conduct long-range surveys from a high-altitude field camp, covering a large region around DF."

*469: Please check the sentence beginning "Furthermore," for grammar and parallel structure.*

We changed "Furthermore, although 3-D full Stokes models can lift restrictions, they still come along with new challenges, including heavy computation time, more complicated boundary conditions and conjunction between 3-D model and age observations." to "Furthermore, although 3-D full Stokes models can lift restrictions, they come along with new challenges including heavy computation time and complicated boundary conditions. The conjunction between 3-D model and age observations is still difficult."