

## Responses to Reviewer 2:

1. *In several part of the manuscript you state that the ice core length is 763 m except at page 2 line 2 in the Introduction. Please, may you check?*

There was a typo on the depth which has been corrected. The correct depth is 753.75 m, which is the deepest/oldest age constraint for the RICE ice core. The bottom  $\sim 10$  m of core (753.75-764 m) are not included in the RICE17 age scale.

2. *Page 2, lines 3-4: absolute age markers . . . . Are you referring only to volcanic ash layers? I do not think so . . . . They should be sulphate volcanic peaks and in case also ash layer . . . . Please modify.*

Volcanic ash layers was meant as an example of an absolute age marker, not a comprehensive list. We have modified the text to clarify this point.

3. *Page 6, line 3: I would add also here that the Antarctic dN changes are mostly associated with changes in gravitational separation (see comment from Referee 2).*

We have added the following sentence to page 6, line 3: "In Antarctica, temperature changes gradually and the effect of thermal separation is minimal."

4. *Page 6, line 13. This figure 3 rather than 5. Please modify.*

The markers representing age control points can be seen in both figures 3 and 5. A reference to figure 3 has been included here.

5. *Page 13, line 5: it seems that at the end you did not modify this (see referee comment): the date is not 12.38 ka but 14.71 ka. Please change.*

The date has now been changed.

6. *Page 13, lines 20-22: the sentence starting with "The timing . . . " is not clear. You are referring to the dust record of Taylor Dome ... describe what happened in the dust record of Taylor... Otherwise it is not clear.*

We have now included a description of the changes in dust composition observed in the Taylor Dome ice core by Aarons et al. (2016) and their interpretation of the dust record.

7. Data availability: when the paper will be finally accepted please add a link where the data will be archived.

The methane, d15N-N2, d18O-atm, and TAC data are all included as supplementary text files. We will also archive these data sets and include a link to them.

8. *Page 37: the caption of figure 8 is not correct: b) is methane, c) is Annual Layer Thickness, d) is Lock-in-Depth and e) is accumulation rate ... Please modify.*

The caption has been corrected.