

***Interactive comment on “The Antarctic ice core chronology (AICC2012): an optimized multi-parameter and multi-site dating approach for the last 120 thousand years”***

**Anonymous Referee #2**

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This paper is a significant advance in the ongoing effort to improve the dating of Antarctic ice cores. The authors do an adequate job of explaining and justifying their methods.

*Answer:* We thank the anonymous reviewer for his thorough review that improved our paper. A detailed point-to-point reply is provided below, and we appreciate your statement above.

The new timescales for all the cores, along with estimates of uncertainty for each core as a function of depth, should be deposited in an international data repository prior to publication. The published paper should say where the timescales have been deposited.

*Answer:* The AICC2012 timescale for each ice core record will be made available, both as SOM linked to the paper and as data files deposited on publicly accessible online database with reference to it in the paper.

The paper should clarify how the stated uncertainties should be interpreted. (I.e. is the uncertainty the maximum error, the error that occurs half the time, the error that occurs 90% of the time, the error at the 1 sigma level, act.)

*Answer:* The age uncertainties are estimated on the basis of the probabilistic formulation of the method described in Lemieux-Dudon et al. (2010, QSR) and the SOM, and presented as 1-sigma level standard deviation.

The paper should state under what situations the new timescales should be used and if there are any situations when it makes sense to use the previous timescale.

*Answer:* Similarly to how we addressed a comment of Ref. 1, we state that until further updates were provided - which could be expected to either improve the range and accuracy of stratigraphic linkages (new layer-counted records in the Antarctic, new absolute markers, new or refined stratigraphic tie-points, etc) or provide further methodological improvements for the Datice tool - we strongly argue that for the Antarctic ice core records analyzed in our study (ie., Vostok, EDC, TALDICE, EDML) the AICC2012 timescale is the most comprehensive dating effort available and should be employed as the preferred chronology for both ice and gas phase proxies. As for the other important Antarctic records not yet included in the Datice tool, our aim is to either have these records included progressively, or to convince the community on the advantage of adopting the Datice tool and to build site-related chronologies in direct comparison with the AICC2012 output.

Because we considered that there was no basis at present to adjust the extensively used layer counted Greenland age scale GICC05, AICC2012 has been constructed such that it is virtually identical to GICC05 for NGRIP for the last 60 ka

b2k. For the Antarctic records considered, AICC2012 is now the preferred time scale for direct inter-comparison with NGRIP, as the use of AICC2012 assures the synchronicity of records within the uncertainty of the methods used. However information from GICC05modelext (ie., beyond 60.2 ka b2k) was included only via the background scenarios (and not as age markers) in the construction of AICC2012, and therefore the ages for NGRIP beyond 60.2 ka in AICC2012 are not identical to those in GICC05modelext.

Where issues of phasing between Antarctic cores included in AICC2012 and NGRIP are involved, the NGRIP ages in AICC2012 should therefore be taken to avoid introducing false offsets. However for issues involving only Greenland ice cores, although AICC2012 uses more glaciological information than GICC05modelext beyond 60.2 ka b2k and thus can be regarded as more robust, there is not yet a strong basis to recommend superseding GICC05modelext as the recommended age scale for Greenland ice cores.

The following paragraphs have been introduced in the Abstract for better clarification:

*'It is expected that the future contribution of both other long ice core records and other type of chronological constraints to the Datice tool will lead to further refinements in the ice core chronologies beyond the AICC2012 chronology. For the time being however, we recommend that AICC2012 should be used as the preferred chronology for the Vostok, EDC, EDML and TALDICE ice core records, both over the last glacial cycle (this study), and beyond (following Bazin et al., 2013)'. The ages for NGRIP in AICC2012 are virtually identical to those of GICC05 (for the last 60.2 ka b2k), whereas the ages beyond 60.2 ka are independent of those in GICC05modelext (as in the construction of AICC2012 the GICC05modelext was included only via the background scenarios and not as age markers). As such, where issues of phasing between Antarctic cores included in AICC2012 and NGRIP are involved, the NGRIP ages in AICC2012 should therefore be taken to avoid introducing false offsets. However for issues involving only Greenland ice cores, there is not yet a strong basis to recommend superseding GICC05modelext as the recommended age scale for Greenland ice cores.*