BICC(27?): Developing a globally synchronized ice core chronology and updated bipolar holocene layer count

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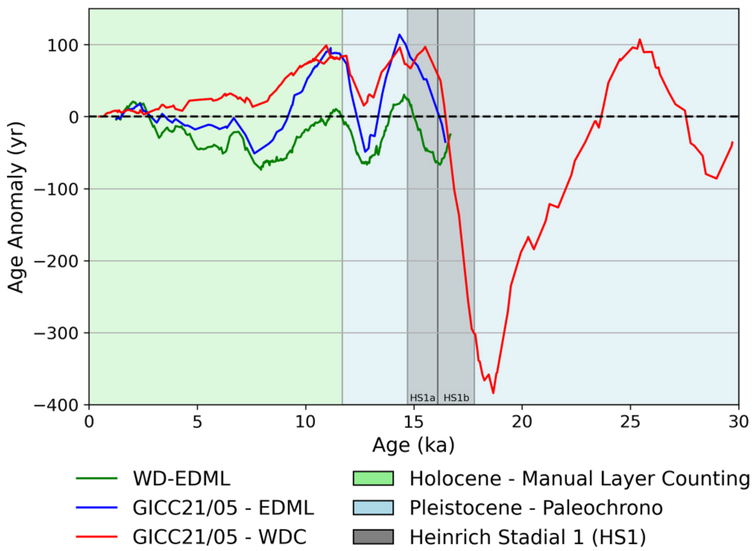
C23C-0942. Tuesday, 2:15 – 5:45PM, Contact: quinn.mackay@oregonstate.edu

Introduction

• The GICC and the AICC have been great resources in deriving consistent timescales amongst cores. However, there currently lacks a Bipolar Ice Core Chronology (BICC) implementing records from both hemispheres. We seek to release a synchronized global chronology with accessible data interfaces. BICC will build upon preexisting efforts in meaningful ways. For example, AICC does not currently include many important cores, such as the WD layer count, or recent bipolar synchronizations. Additionally, constraints could be improved in the last 60ka.

• A revised, modern bipolar chronology would prove exceedingly useful to researchers seeking to implement chronologies into their project. BICC also seeks to discover tiepoint discrepancies through inconsistencies, and publish a list of internally consistent tiepoints.

• *Paleochrono* is a Bayesian probabilistic model primarily for synchronizing ice core records, which is utilized for BICC. Supporting information, such as enhanced layer counts or additional gas data, will be manually analyzed.



(above) Figure showing the anomaly between three different sets of layer counts, based on tiepoints between them. This includes a merge of GICC05 and GICC21, WDC2014 count, and the unpublished EDML count.

Methods

• The highest quality cores (Tier 1) are synchronized, with Tier 2 cores forced to match. We also update the Holocene layer count for WD2014, EDML and GICC. The first 3200 years of WD2014/EDML are forced to match GICC21, otherwise errors in GICC05, WD, and EDML will be taken into account. BICC is split into the Holocene and Pleistocene, with layer counts taking focus in the former, Paleochrono in the latter.

• AICC2023 had 10 tiepoint pairs, and GICC21 had 15 (not counting shallow DYE cores, and combining NGRIP). BICC will have 21 Tier 1 pairs.

Tier 1 Cores

(Antarctica, all cores tied to eachother)

DF–EDML–EDC–WDC

Bipolar tiepoints, each GL core tied to each AA core

NGRIP–GISP2–GRIP

(Greenland, all cores tied to eachother)

Tier 2 Cores

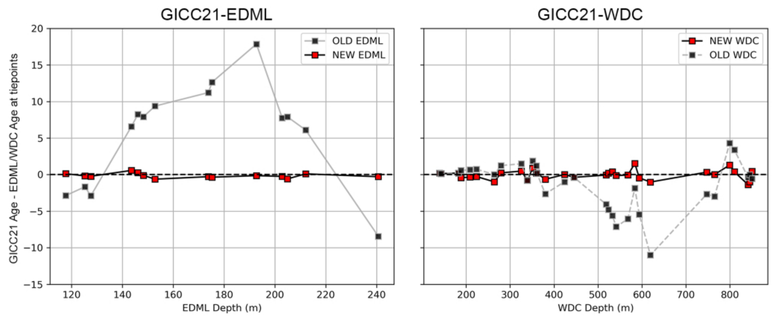
Antarctic:
South Pole, Siple, Taylor, TALDICE, Byrd, Law Dome, Roosevelt Is, Berkner, Skytrain, Fletcher, Vostok

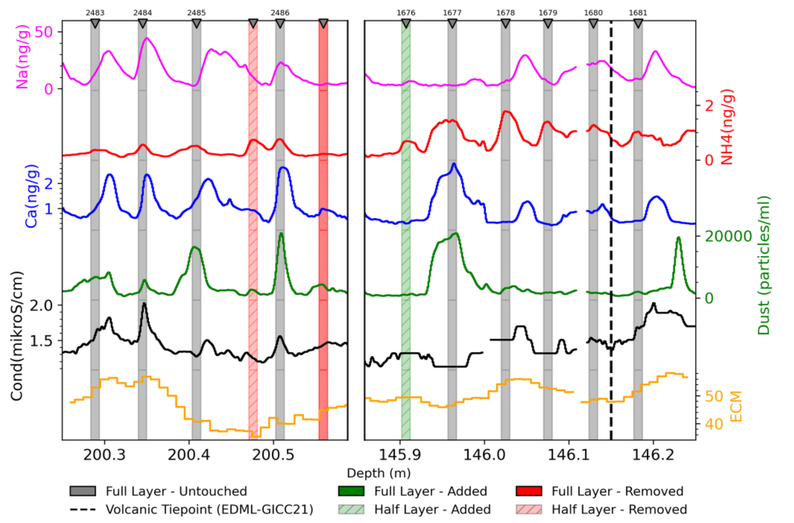
Greenland:
NEEM, EGRIP, DYE3, Renland

Completed Layer Counting

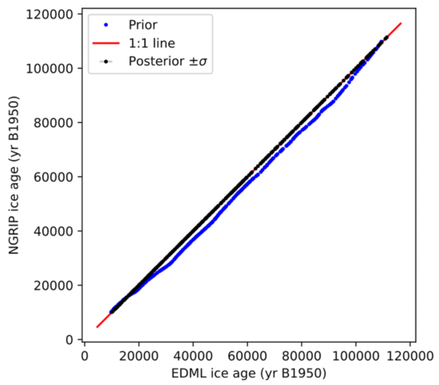
• Synchronization to GICC21 has been completed for EDML and WDC, reducing the existing error in the layer counts.

• *(below)* Completed layer count synchronization GICC tiepoints. *(right)* EDML tiepoint methodology, to remove/add layers.





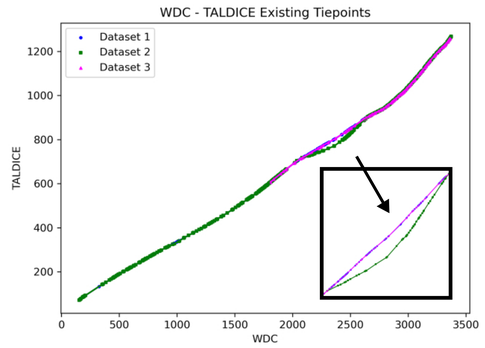
Paleochrono Output



• *(above)* One example of a Paleochrono output, creating a core alignment from given tiepoints and other age constraints.

• Priors calculated from density, thinning, and accumulation. Outputs created for each pair.

Tiepoint Mismatches



• *(above)* A plot showing tiepoint misalignment between multiple datasets for WDC-TALDICE, which is being improved in BICC.

• Through cross-validation of multiple tiepoints, we are determining the accuracy of tiepoints used in chronology construction.

Outcomes

• A chronology for each core, including layer counts of GICC, WD, and EDML.

• This file will allow researchers to easily analyze climate changes between hemispheres, which could be especially useful for analyses of phenomena such as the bipolar seesaw/D-O events.

• The data will be published in two ways. 1) A python and matlab package allowing loading of all data directly within programs. 3) Raw files hosted on Github or Zenodo for non-code access.

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