

Subject: AW: Holocene bipolar updated layer count
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Attachments: ESSD_Fig2_SourceData_VolcanicSynchronizationGreenland (SQC2025).xlsx, Synchronization_GRIP_direct_WD2014.xlsx, GISP2 Ion Data on NS1-2011 Timescale.xlsx, Sigl_ePoster_V3_UPLOAD_marked.jpg

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Hi all.

As promised yesterday here are the tie-points between WDC and GISP2 (sulfate) and GRIP (DEP) as published in Sigl et al., 2022 (ESSD).

To start-off the synchronization of the Greenland ice cores I used a few fixed age markers (marked in blue) of historic eruptions. So you can discard these from the data.

Please also note, that the goal was to provide an extension of volcanic forcing before 500 BCE and in the paper we suggest to merge the new volcanic reconstruction with that from Sigl et al. (2015) somewhere between 500 BCE and 1 CE. So the density of match-points is lower than in previous work. There are for example more volcanic tie-points for the Common Era for GISP2 (also attached) against NEEM-2011-S1.

As Florian just wrote there are a number of ongoing efforts on improving chronologies and volcanic histories using a large set of methods with various people involved (see also an old Poster which shows that the volcanic tie-points closely follow the 10Be/10Be bipolar ice-core matching). My own main interest at the moment is on retrieving the exact dates for some of the largest eruptions of the Holocene (9-6 ka BP) which may then be used to constrain the annual layer counting in Greenland and Antarctica. The data I have assembled (also thanks to Raimund's input on the 10Be peak for the 5259 BCE Miyake event) suggest that WD2014 is in the past 9000 years in pretty close agreement with the tree-ring records (i.e. 0 to +6 years) over this range. I also agree that WD2014 is slightly undercounting in the early Holocene before 7000 BCE. This is not data related but rather a subjective counting bias. So changes to the WD2014 annual-layer counting should be minimal over large parts of the Holocene. Regarding the volcanic synchronization I marked up in the Poster (in yellow) two section where revisions may be needed.

The first is related to an erroneous matching between GISP and WDC at around 4000 BP which was caused by a data gap in the GISP2 record containing the equivalent fallout from an eruption dated 2039 BCE in Antarctica. I can correct this myself using other Greenland records and will do so in a manuscript led by Kurt Nicolussi, who identified the year 2036 BCE as probably the coldest summer in the Alps in 10,000 years.

Here is the correct match:

WDC: 931.37m

NGRIP: 702.08m

For the other apparent kink around 8500 BCE we could check the synchronization done by Svensson et al. (2020) which includes the NGRIP CFA sulfate data as an additional record.