

Interactive comment on “The SP19 Chronology for the South Pole Ice Core – Part 1: Volcanic matching and annual-layer counting” by Dominic A. Winski et al.

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Dear Frédéric Parrenin,

Thank you very much for the very useful and positive comments. We greatly appreciate your input. Below are our line-by-line responses to your review.

Winski et al. present a first chronology, named SP19, for the South Pole Ice Core (SPICEcore), back to 54,302 yr BP. This chronology is based on a combination of 251 volcanic matching to the WAIS Divide ice core and annual layer counting (back to 11,341 yr BP for the latter). More precisely, the SP19 chronology is strictly tied to the

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WD2014 chronology at the depth of the volcanic matches, and then layer counting is used to interpolate in-between. Before 11,341 yr BP, a spline interpolation method is used instead of annual layer counting. The layer counting is based on CFA measurements of magnesium, sodium, sulfate, chloride and dust. It has been performed by 4 different operators and reconciliation is found a posteriori when there is a discrepancy. A comparison is also made with visual stratigraphy but chemical stratigraphy is preferred because it is found to be more accurate.

It is argued that the WD2014 is used because it is more precise (annual layer thickness is larger at WD) and to have a WD2014 compatible time scale. The relative uncertainty to WD2014 is small during the Holocene, generally less than 18 yr and always less than 25 yr. For older parts, the relative uncertainty to WD2014 is less than 124 yr. The accumulation rate which is found in the SPICEcore is found to be mainly due to the upstream spatial pattern of accumulation along the flow line. The accumulation reconstruction is also compatible with nitrate concentration, nitrate amplitude of seasonal variations and N-15 of N₂ in air bubbles (through a dynamical Herron-Langway firn model for the latter). It is therefore argued that the SPICEcore is a good candidate to test the influence of surface accumulation rate on the Lock-In Depth.

This article is very well written and its content is consistent. I therefore recommend to accept it.

–Thank you!

I only have a few technical corrections. l. 385: suppress "accumulation rate" since it is actually not plotted on this figure.

–Done.

l. 489, l. 531 and l. 535: double space after dot.

–Fixed.

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