Comment: Assessing the potential for an ice core in the southern Antarctic Peninsula to elucidate Holocene climate history

Davis et al.,

Thank you for this valuable contribution, to which I would only like to add a brief comment. I previously made a related comment to two corresponding authors (J. Sutter and J. Bodart) of the Bingham et al. (2025) review paper during the open discussion phase, though not interactively. These comments were not included in the final published paper, so I reiterate the main message here.

In line 79, you rather cryptically state that the IRH arise from *'variations in electrical conductivity related to paleo-accumulation events*'. Setting aside the fact that the ice sheets themselves are the product of paleo-accumulation events, here you miss the opportunity to mention that these variations are caused by the deposition of volcanic acids across the polar ice sheets, and that some of these volcanic layers can be detected and dated very precisely and accurately in ice cores across the entire Antarctic, as well as the Greenland ice sheets (Sigl et al., 2022). Not only do the ages of these volcanic layers differ (in both directions, though still within uncertainties) by around 140–240 years in state-of-the-art ice-core chronologies such as WD2014 compared to estimates based on remote sensing used in this manuscript (see **Figure 1**, below), but the uncertainties in the ice-core ages are also an order of magnitude smaller (see **Table 1 and 2**, below). The volcanic sulfate anomalies that form these IRH layers are among the largest of the late Holocene, and the climate effects caused by the respective eruptions can be traced in tree-ring records over the past 5,000 years (Salzer and Hughes 2007). This allows the eruption dates, and thus the age of the IRH, to be pinpointed to within a few years.

Applying the updated ice-core ages to your Figure 4c (see **Figure 1**, below) shows that the ice-core ages would align much more closely with your optimized model ages, while also adjusting the layer thickness by up to 15 % (i.e. a 400-year difference between two time markers separated by 2,500 years). Since you also constrain your forward model with the accumulation profile from WDC (on WD2014), wouldn't it make sense to use the time markers on the WD2014 chronology too?

I am convinced that my queries will not affect the main conclusion of this manuscript -- that this site likely contains a continuous Holocene record. However, I would appreciate it if you could clarify the volcanic nature of the radar layers, as well as the possibility of using ice cores and other evidence to better constrain their ages.

In Figure 1 and in the caption, you call the ice-core site WD2014, which is the name of the latest chronology. The site of the deep ice core is typically abbreviated with WDC (sometimes WD) and the deep ice core with WDC06A.

Best regards,

Michael Sigl

Table 1: Ages and volcanic fallout characteristics of IRH layers across West and East Antarctica (Abbott et al., 2024; Cole-Dai et al., 2021; McConnell et al., 2017; Sigl et al., 2016; Sigl et al., 2022; Salzer & Hughes 2007)

IRH layers	**2.62 ka**	**4.72 ka**	**6.94 ka**	**17.5 ka**
WD2014 Age Yr BP (1950)	2377	4862	7179	17748
Age (CE)	-427	-2912	-5229	-15798
2σ	5	19	32	178
Dendro Age (CE)	-426	-2907	N/A	N/A
Age ka BP 1950 (2σ)	**2.38 ± 0.005**	**4.86 ± 0.02**	**7.18 ka ± 0.03**	**17.74 ± 0.18**
Source Volcano	Tropics	Tropics	Tropics	Regional (Mt. Takahe)
H^+ abundance	high	high	high	high
S abundance	high	high	high	medium
Rank (HolVol1.0)	2 in 3000 yrs	1 in 6000 years	1 in 7500 years	N/A
Cl abundance	low	low	low	high
Cryptotephra abundance	no tephra found (e.g. Abbott et al., 2024)	tephra of small size and number; no proposed match (Abbott et al., 2024)	N/A	tephra of small size and number; Mt. Takahe (McConnell et al., 2017)

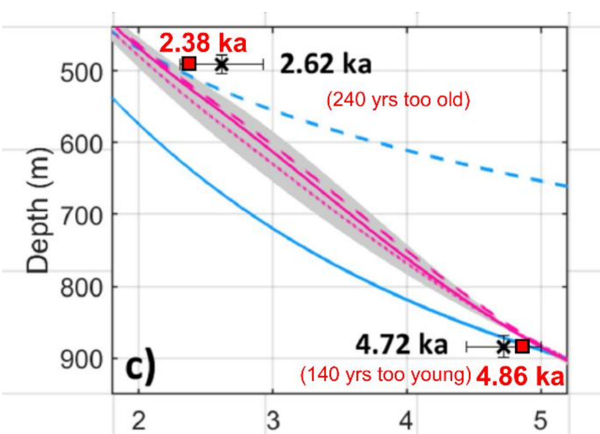

Figure 1: Your Figure 4c with updated age information for the two layers as described in Table 1.

Table 2: Age differences between IRH and major volcanic sulfur anomalies in WDC (Cole-Dai et al., 2021) on the WD2014 chronology (Sigl et al., 2016).

IRH (this study)	**2.62 ± 0.31 ka**	**4.72 ± 0.28 ka**	**6.94 ± 0.31 ka**
sulfur (WD2014)	**2.38 ± 0.005 ka**	**4.86 ± 0.02 ka**	**7.18 ± 0.03 ka**
direction	too old	too young	too young
difference (yrs)	-243	142	239

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