

Interactive comment on “Refractory Black carbon (rBC) variability in a 47-year West Antarctic Snow and Firn core” by Luciano Marquetto et al.

Anonymous Referee #2

Received and published: 1 January 2020

The paper provides a 47-year ice core record of refractory black carbon (rBC) from West Antarctica, specifically Pine Island Glacier. rBC was analyzed by a Single Particle Soot Photometer. The core was dated to 1968, primarily using seasonality of rBC. BC impacts on snow albedo were modeled using the Snow, Ice, Aerosol, Radiation (SNICAR) model. BC emissions were explored with fire spot inventories and spectral analysis was conducted by the REDFIT method.

With respect to the TC guidelines: 1. The paper provides additional field observations of rBC in snow and ice in a data-sparse region of the cryosphere. Making field observations like this available to the community is important for refining our understanding of impurities in the cryosphere and their impact on surface albedo of the Antarctic ice sheet. 2. While the paper provides an additional valuable dataset, it is unclear to me

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whether the record interpretation is particularly novel. 3. The main finding appears to be that BC transport to the site is not related to marine air masses, which has previously been shown in other ice core records in Antarctica (i.e. Bisiaux et al., 2012). 4. The analytical details appear to be outlined in Marquetto et al., 2019, however, I am having trouble locating the manuscript. 5. Thus, I have some remaining analytical questions outlined below. 6. Having access to Marquetto et al., 2019 would assist with reproducibility. 7. The authors provide credit to related work, but I think they should further identify/emphasize the novelty of their contribution. 8. The title clearly reflects the content of the paper. 9. The abstract provides a concise and complete summary of the existing manuscript. 10. The paper could have benefited from more thorough proofreading before submission; there are some typos. 11. Please refer to 10. 12. Black carbon and refractory black carbon are abbreviated at times and then spelled out at others (i.e. Lines 36, 67, 338). 13. Current figures and tables seem to appropriately support the text. 14. The number of references seems appropriate. 15. The Marquetto et al., 2019 paper would have been useful supplementary information.

Specific Suggestions:

Line 29: Typo: 'while there they change'

Line 45 – 48: Sentence could be restructured for clarity.

Line 58 – 61: This section could be expanded, including more specific references.

Line 77: I cannot find Marquetto et al., 2019 online. Thus, a lot of important analytical details seem to be missing from this manuscript. For example, how long before analysis were the samples melted?

Lines 83 and 90: Duplicate sub-section titles.

Line 87: Why were polypropylene vials used instead of glass vials? Was particle loss explored with leaching on the vials? Additionally, how long did the samples sit in the vials before analysis?

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Line 146: I don't think Sr is mentioned in Legand and Mayewski, 1997.

Line 197: Suggest 'fit' as opposed to 'fitted'.

Line 199: Suggest using the same past tense, 'chose' as opposed to 'choose'.

Section 4.1 Dating: Given that the main findings of the paper rely on dating based on seasonality of the rBC record, I think this section could be expanded. For example, the authors could add more discussion as to why the authors think the addition of the rBC record to the layer counting would lead to a dating difference of one year or more, with respect to the core collected nearby that was analyzed for trace elements.

Line 338: The starting date here (1969 – 2015) does not match the abstract or Table 4 (1968 – 2015).

Figure 4 Legend: Suggest (bottom) instead of (base).

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-207>, 2019.