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Climate of the Past Discussions

Interactive comment on "Water-soluble organic carbon in snow and ice deposited at Alpine, Greenland, and Antarctic sites: a critical review of available data and their atmospheric relevance" *by* M. Legrand et al.

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This comprehensive manuscript provides a detailed overview and interpretation of organic carbon (OC) accumulation in snow cores collected in both temperate and Polar locations. OC data are utilised from published work as well as fresh analysis of snow samples collected from the Alps and Antarctica - the latter helping to improve the rather limited datasets on OC time-series in snow cores – to reconcile the OC signals with global sources e.g. anthropogenic vs biogenic. Importantly the authors provide critical insight to reported concentrations based on blank artefacts and measurement

techniques and then use this knowledge to provide sound interpretation of OC trends based on surprisingly limited datasets.

Overall this is a very well written and comprehensive paper that will be well received and I have no reservations in recommending its publication in CP.

Points of note: The authors are to be congratulated for picking apart differences in analytical techniques and for utilising the operationally-defined fractions of OC (e.g. WSOC, HULIS etc) with regards to interpreting OC data.

What is interesting (but also troubling) is that sealed collecting vessels generally show higher blank OC levels the longer they are left prior to analysis. This is especially important with regards to Antarctic samples, when sample vessels may be in storage for much long periods compared to samples collected elsewhere. On page 9 the authors expand on this issue and state that for their sampling work in Antarctica and the Alps, the blanks generally remained below 25 ppb C, yet for vessels (containing purewater) analysed only a few hours after cleaning, blanks were close to detection limits of 3-5 ppb C. Given the importance of blank artefacts and the low levels of OC reported in Antarctica (re: Table 1), it would be useful if the authors could report method detection limits (i.e. MDL = mean blank + 3xStd Dev), rather than the arbitrary 'twice the variability' reported on page 5 (this is not used in analytical chemistry). If blank subtraction has been undertaken, then the MDL = 3xStd Dev. The authors could also expand on why they felt that blank subtraction was necessary for some samples (i.e. Antarctic snow) and yet not for others (e.g Alps). Surely blank subtraction will have a pronounced impact on the ensuing dataset and make comparisons difficult with data where this procedure had not been conducted.

Given the water-soluble nature of various OC fractions it is surprising that the authors fail to mention the possibility of OC migration within the snow following seasonal warming of the perennial snowpack, particularly in Alpine or Greenland snow. Migration of OC with meltwater may blur temporal trends and affect winter and summer accumula-

tion patterns. Could the authors comment on this?

Minor errata Page 2, line 25: . . .secondary production dominates. . .. Page 4, line 4: others Page 22, line 13: permits Page 26, line 26: Most of the large..

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