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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ice core records of biomass burning tracers (levoglucosan, dehydroabietic and vanillic acids) from Aurora Peak in Alaska since 1660s: A new dimension of forest fire activities in the Northern Hemisphere" *by* Ambarish Pokhrel et al.

Anonymous Referee #3

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This manuscript presents records of the biomass burning tracers levoglucosan, dehydroabietic acid and vanillic acid from an ice core retrieved at Aurora Peak, Alaska, and covering the time period from ca. 1660 to 2009. In general, this seems to be a high-quality data set, which may be interesting and may deserve publication, since only few ice core records of such tracers are available up to now.

Unfortunately, the manuscript does not meet basic scientific criteria, as outlined below,

is very descriptive and not well-written (requires English editing), and lacks a clear structure, which makes it hard to digest. Before becoming publishable, major revisions are therefore required.

- Method description is incomplete (no detection limits) and basic ice core data are missing (dating, dating uncertainty, melt extend, etc.).

- The record presented is incomplete, only 40% of the core was analysed, i.e. the records are not suitable to discuss short-term biomass burning events. Records should not be shown as continuous line; data points should indicate for which time period they are representative.

- The Aurora ice core is affected by melting with melt feature percentages of up to 100%. It should be discussed how this effects the records of biomass burning tracers.

-Recent other publications in this field should be discussed and cited (list at the end of this review).

- There is no discussion with respect to other available data. Concentrations in the Aurora core seem to be higher than in the Kamchatka core, although Aurora is located much further away from the sources.

- What is the reasoning behind conducting a correlation analysis with nss-sulphate and nss-calcium. They are not expected to have a biomass burning source. Where the ion records averaged to match the incomplete sampling of the organic tracers?

-It is unclear what can be learned from the fire spot data. Here you need to come up with a quantitative number to compare with ice core records.

- There are no conclusions, just a summary.

- Fig. 1: Already shown in Pokhrel et al., 2015 and Pokhrel et al., 2016, is this not a copyright issue?

Gambaro, A., et al. (2008). "Direct Determination of Levoglucosan at the

Picogram per Milliliter Level in Antarctic Ice by High-Performance Liquid Chromatography/Electrospray Ionization Triple Quadrupole Mass Spectrometry." Analytical Chemistry 80(5): 1649-1655.

Grieman, M. M., et al. (2017). "Aromatic acids in a Eurasian Arctic ice core: a 2600-year proxy record of biomass burning." Clim. Past 13(4): 395-410.

Grieman, M. M., et al. (2018). "Aromatic acids in an Arctic ice core from Svalbard: a proxy record of biomass burning." Clim. Past 14(5): 637-651.

Grieman, M. M., et al. (2018). "Burning-derived vanillic acid in an Arctic ice core from Tunu, northeastern Greenland." Clim. Past 14(11): 1625-1637.

Grieman, M. M., et al. (2015). "A method for analysis of vanillic acid in polar ice cores." Clim. Past 11(2): 227-232.

Kehrwald, N., et al. (2012). "Levoglucosan as a specific marker of fire events in Greenland snow." Tellus B: Chemical and Physical Meteorology 64(1): 18196.

Zennaro, P., et al. (2014). "Fire in ice: two millennia of boreal forest fire history from the Greenland NEEM ice core." Clim. Past 10(5): 1905-1924.

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