

## ***Interactive comment on “Fire in ice: two millennia of Northern Hemisphere fire history from the Greenland NEEM ice core” by P. Zennaro et al.***

### **Anonymous Referee #3**

Received and published: 31 March 2014

This paper reports variation in concentrations of levoglucosan and ammonium measured in the NEEM ice core, and black carbon from the NEEM-2011-S1 core for the past two millennia. The authors used these reconstructions to infer fire activity from northern hemisphere high latitudes. In the light of previous studies (fire proxies transport, potential sources of fire proxies to the site, climate change and human activities) the authors raised the conclusion that fire activity recorded in the NEEM ice core reflects boreal forests fire from North America and Siberia. They suggest that this signal is mainly driven by temperature for the last two millennia except during periods of extreme Asian droughts that would trigger Siberian fires. The paper should be publishable after minor/major revisions suggested below to clarify the manuscript.

Detailed comments:

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Line 5, page 811: “broad-scale” remains unclear (same line 4, page 814)

Line 9, page 811: “over the past 2000 years” Add: to infer changes in boreal fire activity

Line 15, page 811: “monsoon failures” Add Asian

Line 28, page 812: remove “are” before “have multiple potential sources

Line 8, page 813: Add dot after “Whitlow et al., 1994). However (...)

Line 7, page 814: remove square brackets

Line 11, page 814: remove “to reconstruct fire activity for the past 2000 years”

Line 24, page 816: change title for “Sources of NEEM products”?

Line 9 page 817: Change “for punctual analysis” by “for short term analysis”

Line 4, page 818: give the p-values for correlations

Line 12, page 818: add dates described in the text and Table 1 to figure 2.

Line 13-14, page 818: “(Fig. 2)”. Add Fig S5 and Table 1. Remove “other major peaks are reported in Table 1”.

Line 23, page 818: what about the low at 1700-1800 CE?

Line 26, page 818: change “when” by “while” and remove “absolute” in “absolute maximum in BC concentration” as you discussed about smoothed curve

Line 3, page 819: change title to something like “major ions transport and deposition”

Line 7, page 819: CITE ???

Line 25-28, page 820: please add a short sentence at the beginning to say that you discuss the 1973 CE fire peak in the NEEM core. Otherwise confusing with the 342 CE paragraph.

Line 26, page 821: “The NEEM levoglucosan” centennial scale “maximum”

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Line 27, page 821: "from the Belukha ice core" located in Siberia

Line 20-30, page 822: add the other ice cores discussed in the text to figure 1 (and other archives in general).

Line 15, page 823: "can not be used to quantitatively characterize BC in environmental samples". This sentence remains unclear.

Line 25, page 823: add "s" to read "compiles"

Line 4, page 824: (Linuma et al.

Line 15, page 824 : "but this trend is not is not" remove "is not"

Line 24, page 824: "which are" probably "underrepresented"

Line 17, page 825: "the pronounced peak" of levoglucosan "centered on. . ."

Line 9-14, page 827: sentence too long and unclear

Line 24, page 828: change "determines" by "suggest"

Line 3, page 829: remove title "natural climate interactions"

Line 13, page 829: change 4.4.2 to 4.4.1

Line 23, page 829: "and in the GCD between 1000-1400 CE", representing which composite curve?

Line 3, page 830: "in the NH GCD" change to read "in the global NH curve (based on GCD syntheses)"

Line 12, page 830: change 4.4.3 to 4.4.2

Line 10, page 831: add "in Asia" after "major droughts"

Line 25, page 831: Change "our results show" to "we suggest that"

Line 19, page 832: change 4.4.4 to read 4.4.3

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Line 24, page 832: change "the GCD synthesis" to read "Marlon et al. (2008) argues (. . .)" and remove reference at the end of the sentence.

Line 27, page 832: same comment, "However, Marlon et al. (2008) assert"

Line 7, page 833: modify "observable in the GCD" to read "in the global NH curve (Marlon et al)"

Line 17, page 833: anthropogenic peak at 1900 CE or 1750 CE? Be consistent

Line 1-4, page 835: sentence too long and unclear

Line 21, page 835: remove lines 21 to 24.

Table 2a: add a comment of the meaning of tree-ring proxy in the table

Figure 1: add locations of other records discussed in the text (such as the Belukha ice core)

Figure 2a: add all dates for significant peaks in levoglucosan; change scale in AD (year) by CE/BCE to be consistent with the main text.

Table S1 and S2: add the meaning of numbers in bold (significant correlation?)

Figure S5: change 1974 to read 1973 as in Table 1

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Interactive comment on Clim. Past Discuss., 10, 809, 2014.

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