

## ***Interactive comment on “Boreal fire records in Northern Hemisphere ice cores: A review” by Michel Legrand et al.***

**P. Vallelonga (Referee)**

ptravis@nbi.ku.dk

Received and published: 12 August 2016

### General comments

The manuscript “Boreal fire records in Northern Hemisphere ice cores: A review” by Legrand and co-authors provides a thorough evaluation of the major proxies used to evaluate biomass burning activity from Greenland and alpine ice cores. There is an appropriate treatment of the chemical precursors to biomass burning proxies and the fire processes involved in their emission. The manuscript provides a good summary of the state-of-the-art for these techniques as well as an outlook on problems and opportunities for future research. The manuscript could benefit from some small improvements suggested below in the specific comments, but is already in a very good state. I will be happy to provide NEGIS data to develop the discussion regarding the 1908 event

C1

described below.

### Specific comments

Continuous measurement of TOC. The Sievers 900 technique described in section 2 is novel and should be described in additional detail. Given the technique is susceptible to contamination by drill liquid, it would be good to show data from the dry-drilled TUNU core, for which ammonium data is also available.

Data used for evaluation. The treatment of geographical distribution of ammonium signals in Greenland (discussed in section 4 and shown in figures 9, 14, 15) would benefit from the inclusion of ice core data from Northeast Greenland, such as the TUNU and NEGIS (Vallelonga et al., 2014, *The Cryosphere*, doi: 10.5194/tc-8-1275-2014) sites. For example, the 1908 ammonium peak is visible in both the TUNU and NEGIS records, pointing to a widespread signal across Greenland, that is curiously absent at NEEM. The absence of such a signal at NEEM may be indicative of an atmospheric transport path that does not arrive at NEEM and is perhaps distinct from that which transports aerosols from North America.

Levoglucosan (section 3.2.5) The authors have rightly pointed out that levoglucosan records are not available in annual or sub annual resolution, which limits comparisons to other biomass burning proxies such as ammonium or BC. Given that levoglucosan measurements are relatively slow and laborious, it is unlikely that annually-resolved data will be produced in the foreseeable future. Consequently, it is important for a critical review such as this one to provide a critical evaluation of the available data. The authors should be more explicit regarding their observation that levoglucosan data produced to date is inconsistent with ammonium and BC records (sections 4.2 and 4.3) and this should be highlighted as an important concern to be resolved in future studies.

C2