

## ***Interactive comment on “Representativeness and seasonality of major ion records derived from NEEM firn cores” by G. Gfeller et al.***

**G. Gfeller et al.**

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*italic: referee 1*

**bold: Gfeller et al.**

*General comments: A proxy representativeness assessment is a basic prerequisite for interpreting climate archives in terms of past climate and climate change. Concerning ice (and firn) cores, ionic impurities originate primarily from aerosol and water soluble atmospheric trace gases. Up to now, a vast number of publications dedicated to unravel past climate conditions (including source region and atmospheric transport pathways) are based on ionic impurity profiles retrieved from ice and firn cores. This amount of scientific work with focus on deducing climate history from proxies is in strong dispro-*

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portion to the number of studies dedicated to confirm the representativeness of the used proxy records. The manuscript by Gfeller et al. addresses exactly this crucial point and, presents unique results drawn from ion records obtained from firn cores in the vicinity of the NEEM drill site in north-west Greenland. The study covers seasonal, inter-annual as well as spatial representativeness of several ionic proxies and also addresses the impact of snow accumulation and its seasonality. The meaningful conclusions are predicated on a thorough state of the art analysis of high quality data sets. Although the main conclusions are primarily restricted to the chosen site, there are certainly strong implications for interpretation of ionic profiles in ice cores in general. Accordingly, the authors give valuable recommendations to assess proxy representativeness for other, drilling sites. The hope remains that these recommendations will be considered for ice core drilling sites in general. The paper is written and organized in a clear, comprehensible and succinct way. From my point of view, the manuscript is clearly appropriate to TC and I recommend publication as it is, having only some (very) minor comments:

Page 2548, line 13-17: The lower  $\text{Ca}^{2+}$  and  $\text{Na}^{+}$  representativeness for months with highest concentration appears peculiar. This would mean that higher concentrations are not very robust. A short discussion may be enlightening.

**If looking at single month representativeness it looks indeed like higher concentrations in calcium and sodium are not very robust. This could be due to higher wind speeds during winter months. However, the results should not be over-interpreted since the confidence intervals are also rather high. A sentence has been added to the manuscript to clarify this.**

*Figure 5 contains a great deal of information and should be finally drawn to a larger scale. In particular the grey lines regarding B29 are nearly indistinguishable.*

**The figure has been adapted.**

Interactive comment on The Cryosphere Discuss., 8, 2529, 2014.

C1526

TCD

8, C1525–C1526, 2014

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