The Cryosphere Discuss., 3, S5–S6, 2009
www.the-cryosphere-discuss.net/3/S5/2009/

The Cryosphere Discussions

Interactive comment on "Frost flower chemical signature in winter snow on Vestfonna ice cap (Nordaustlandet, Svalbard)" *by* E. Beaudon and J. Moore

M. Pelto

mspelto@nichols.edu

Received and published: 20 February 2009

The title of the paper does not lead one to suspect how fascinating the paper will be. This paper was a pleasure to read. An interesting hypothesis is proposed and chemical processes to test the hypothesis are clearly, simply and thoroughly presented. This is not an easy task with snow and ice chemistry issues. Further the data presented is sufficient to warrant the conclusions reached. My comments are more questions than criticisms.

168-14: Given that Pit 2 is at a similar elevation and is further from the ocean in terms or precipitation tracks, why did a melt event occur here and not at Pit 1? This is an

important question to address better.

168-2: The two prevailing wind directions are from the NW and SE at Ripfjorden. It makes sense given the enrichment in mean ion concentration at Pit 1, yet with similar accumulation rates as Pit 2, that the NW wind direction is the predominant wind direction during precipitation events. If this is true state this more plainly. Is the SE wind a localized down glacier wind or a regional wind direction?

A point that I would suggest elaborating upon: In the conclusion it is noted that frost flowers would from preferentially in areas lacking multi-year ice. Is it than likely that the appearance of a frost flower chemical signature layer is indicative of nearby open water? If so, in an area that is dominated by multi-year ice, say northern Ellesmere Island, would such a layer be a good indicator of a period of reduced multi year ice? To me this is the potential value of the identification of this frost flower chemical signature.

Table 1 Illustrates the difference in ion concentrations between Pit 1 and Pit 2. I would also like the Frost flower layer data to be in this table. It is important to contrast the values of the layer to the Pit 1 mean and Pit 2 mean. This is done graphically in Fgiure x, but I should be done in the table 1 also for ease of comparison.

Figure 2: What is the cause of the spike in Pit 1 of Log [Na+]/[Mg2+] ratio? It is noted earlier that an increase in this ratio indicates summer melting. What does it indicate in the winter? In Figure 3 this layer does not stand out in terms of ion concentrations. Yet, this obvious anomaly should be explained.

Figure 3: What is the reason for the NH 4 minimum in the frost free layer? As noted this is the exact opposite of that expected from a warm weather event. Why would a warm weather event associate with NH4 enhancement?

A minor comment P 165 line 14 major marine species: makes me think of mollusks. Change to clearly indicate chemical species not aquatic species.

Interactive comment on The Cryosphere Discuss., 3, 159, 2009.