

***Interactive comment on* “Supraglacial dust and debris: geochemical compositions from glaciers in Svalbard, southern Norway, Nepal and New Zealand” by K. A. Casey**

Anonymous Referee #1

Received and published: 15 May 2012

Comments on this manuscript titled: Supraglacial dust and debris: geochemical compositions from glaciers in Svalbard, southern Norway, Nepal and New Zealand

In general

This manuscript presents a new set of data that has not been published based on my knowledge. The data set consists of 70 samples from 4 locations, targeting at 45 elements or components and 10 oxide compound abundances. The author aims to report geochemical compositions based on supraglacial dust debris results on glaciers, which are encouraged to publish.

Broad range abundance comparison of trace elements provides a wide scope of differ-

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ence of those elements in different regions in both S and N hemispheres.

However, the manuscript is poorly organized and some necessary information is missing while many sections throughout the manuscript are repeating, including tables and figures as well as text expression. Some of the descriptions or explanations are not pertinent. Wording is quite informal, impertinent to journal's format.

Not enough information to evaluate the data quality based on the current version as there is no information on in-situ sampling and tools used for generating the data set.

This manuscript is not ready for publishing. A major revision is recommended.

Major concerns (not limited):

Redundant, not well organized/presented. For example, Table 1 and Chapter 3, instrument and reagent information were not provided precisely. Notations are complicated, which makes readers hard to follow.

Not enough details how those samples were collected even though there is a section on Sample Collection (4.1): for example, how did the sampling personnel take the samples? What tools were used especially for ice samples? If the field personnel wore a clean jacket?

Quotations from literatures are not precise. In some cases, literature conclusions sound from this study.

Some of the explanations in Results and discussion are not convincing. For example, L10 to 16 on page 115, results from two locations (Gronfjordbreen and Aldegondabreen) and different seasons are compared. My questions here are: 1. When soluble elements are washed away during melting, why not K? If this is due to imbedding particles, explain it. Also, why does not the similar pattern happen to S. Norway samples? 2. If washing effect is suitable to your data set, why does it conflict of this explanation between Svalbard (washed away when melting) and New Zealand (concentrated in ice samples when melting)? 3. Concentrations of insoluble elements in

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ice samples are often much higher than their counterparts in snow samples, up to 100x times. If this is due to melting, it suggests 100x times concentrated. How does this happen? 4. 10x times higher Pb concentrations were with the Nepal snow samples while 10x lower in the Norway snow samples compared to the same site ice samples. How do you explain the washing effect?

Sections 5.5 and 5.6 are weak.

Both chapters 5 and 6 contain discussion. They should be combined.

Conclusion contains significant explanation and description that should be avoided.

Minor (a few examples only):

Table 1: no explanations for your notations such as 1a, 1b, 2a. . . Move those in Table 2 to Table 1 and then note it in Table 2. Also, based on the row alignment of this table, 8 snow samples were taken in April 2009 while 2 ice samples, in July 2009 for Svalbard sites. This is understandable. However, Bodalsbreen site, there is no sampling date for the 4 ice samples. If they were taken also on June, say so. Reading the original data set suggests me that Table 1 was not organized in order but arbitrarily.

Duplications for same information in Table 1 and Chapter 3 (Geochemical influences to the study areas).

Line 3 to 5, P111: the wording reads vague. It sounds to me that the author did the meteoric solubility of the elements measurements.

Line 1, P114: Thermal Finnigan Element 2 or XR? Give the instrument detail. Line 4, P114: Romil SA or SpA or UpA? Give what you really used?

Line 12, P114: What is the blank value subtracted? And what is the blank range?

Table 2. Why are there data missing for 4b and 4c samples? Were you analyzing the samples in a different batch? Explain why?

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Table 5. Site separation line (vertical line) for New Zealand is misplaced.

Fig. 1. Not accomplished in this study and can be removed.

Fig. 2. photos can be removed.

Fig. 5. Inconsistent presentation in the figures. Also, for S. Norway, you have 2a as well.

Table 7 and Fig. 5 are actually equal as the author stated. Repeating presentation is not necessary.

5.1 Line 8, P115 and Table 2: seasonal patterns and comparison between the two sites in Svalbard: You need demonstrate how you conclude seasonal variations. From my reading, you seem do not have enough data supporting this conclusion.

Interactive comment on Earth Syst. Sci. Data Discuss., 5, 107, 2012.

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