

## ***Interactive comment on “Desert dust deposition on Mt. Elbrus, Caucasus Mountains, Russia in 2009–2012 as recorded in snow and shallow ice core: high-resolution “provenancing”, transport patterns, physical properties and soluble ionic composition” by S. Kutuzov et al.***

**Anonymous Referee #2**

Received and published: 18 June 2013

In this study sources of dust deposited on Mt. Elbrus in the Caucasus between 2009 and 2012 were investigated using a combination of methods including meteorological data, back trajectory modeling, and satellite images. The dust events were identified visually supported by particle size distributions. The majority of dust events were attributed to sources in the Middle East. Saharan dust was also identified whereas local sources were not important. Overall this is a careful and innovative study interpreting snow pit and ice core data with satellite and instrumental data. The manuscript is well

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structured and written. I have only a few questions and comments.

Specific comments:

As I understand, only dust events detected in the pit and the core were investigated, but no climatology of potential dust events from satellite images and air mass trajectories was obtained. This should be feasible for the short time period studied and would be fundamental for answering the question if glaciers can be used as reliable dust transport archives. Is every event preserved or only those for which precipitation is initiated by frontal activity?

How do you avoid settling of the coarse particles (30  $\mu\text{m}$ ) in the sample when determining particle size distribution with the Coulter Counter? Our experience is that you can produce different results when stirring the sample or when different settling times are applied.

Have you compared the accumulation from the shallow core with instrumental precipitation? Particularly in winter 2011/2012 there is low accumulation compared to the previous winters. Is this real or an artifact?

Are the concentrations of 89 to 253 mg/kg of dust comparable to other studies?

Why are the number of particles obtained with SEM and CCM an order of magnitude different? Do you have an explanation?

There are two events with distinctly larger particle mode diameters (19/05/2011 and 12/02/2010). What is the reason for those large particles?

I think Cl would be the better sea-salt tracer since the contribution of terrestrial sources is lower compared to Na.

Technical corrections:

The title seems a bit long. Suggestion: Provenance of desert dust deposited on Mt. Elbrus, Caucasus in the years 2009 to 2012

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Abstract, first sentence: This is not presented for the first time, but the first record, I guess.

1624, line 28: "While was research..." sounds awkward, reformulate

1625, line 20: Please give a reference for the statement that significant seasonal melt is absent above 4600 m.

1626, line 14: "a 12 m firn and ice core" Could you be more specific? Down to which depth was it firn? If there is no significant melt there should not be any ice even at 12 m depth.

1626, line 18: filters

1626, line 24: How was the density of the shallow core measured?

1628, line 22: at LGGE

1631, line 16: Explain why you focused on the February–July and September–November periods.

1633, line 22:..dust entrainment and transport. These vary in strength

1634, line 4: ...provided by chemical composition of the samples. . .

1637, line 11: ... affects particle number distribution, its effect on particle volume distribution ...

1637, line 24: ...revealed no systematic coarse particle mode. . .

1640, line 9: Biomass burning is not a significant source of SO<sub>2</sub>

1642, line 7: stratigraphy

1644, line 24: predominantly of from

Fig. 1: Could you add a map of the mountain with the drilling site indicated? What is the point 5642 m, the main summit?

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Fig. 3: I do not understand the color coding: What do sources/km<sup>2</sup> mean?

Caption Fig. 5: (e): 4-8 May or March?

Check reference list: Walter and Wilkinson, 1991; Brand and Brindley, 2012; Wilkinson, 1991 are cited in the text, but are not in the list.

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Interactive comment on The Cryosphere Discuss., 7, 1621, 2013.

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