

Interactive comment on “The Elbrus (Caucasus, Russia) ice core glaciochemistry to reconstruct anthropogenic emissions in central Europe: The case of sulfate” by Susanne Preunkert et al.

Anonymous Referee #2

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This publication reads like a solid piece of work, well written, and logically structured. The caveat is that I am not an icecore specialist- and if there are methodological issues in this part, I have probably not spotted that. From a general atmospheric chemistry perspective, however, the manuscript and story make a lot of sense. I can therefore recommend this manuscript for publication in ACP, with some minor suggestions for improvements below.

Minor suggestions: General: As this manuscript is submitted to a more general Atmospheric Chemistry journal, I would recommend to spell out/explain specialized abbreviations used in this manuscript. E.g. I didn't know the meaning of Yr cal BP; also BP,

C1

CE may not be known to all readers. Possibly a table ?

General: it would be useful if in addition to concentrations also the deposition fluxes would be presented, which is the more obvious quantity for comparison with models.

P1 l. 19 focus on dust-free sulfur pollution. (to clarify).

P1 l. 26 I would say also the much later onset is an important piece of information, which confirms knowledge on industrialization.

P2 l 2 In general short lived climate forcers, with one of the most important components being aerosol.

P 2 l 6 this is somewhat naïve statement, as models will usually calculate the concentrations and verify them with observations. Only from the satellite era onward, aerosol is assimilated but not in ‘climate’ models.

P 2 l 6 A number of other continental icecores are mentioned, but only CDD is explored later in the text. It is not entirely clear, why a comparison with the other icecores is not included in the manuscript.

2 l 26 Another argument is that there is a quite strong seasonal dependency of the oxidation chemistry of SO₂, which has probably been oxidant limited in the emission era.

P3 l. 15 explain meter water equivalent, and if this information is available how do these precipitation rates compare to a larger footprint around Mt. Elburus?

P 3 l 28-32. Later in the text outliers are removed, are these outliers related to these known problems? If not what could be the cause of such outliers?

P 4 l. 12 Again for non experts explain whether the decrease of NH₄ with depth is a ‘real’ signal, or rather related to gradual degradation/oxidation with time.

P 4 l. 34 I understand the chemical stratification is a preferred method compared to

C2

radio carbon dating, can you confirm because that is because of higher accuracy?

P 6 l. 27 the 616 and 67 numbers are the samples influenced by high dust? Sentence is ambiguous.

P 7 l. 4 at the best=>at the most

P 7 l. 14 Dust may contain a quite large fraction of CaSO₄, which is quite insoluble under alkaline conditions, may be dissolve when more acidic. If I understood well this would not be picked up in the analysis, and can not influence the trend estimates? Please confirm.

P 8 l15- you can mention here that the corrected values were rather constant as also shown in Figure 9. p. 9 l 1 Please provide some plausible reasons for the outliers, or connect to the statements in the analysis section.

P 9 l. 27 It would be good to mention here which emission database was used.

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