Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-437-RC2, 2020


Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Distinct chemical and mineralogical composition of Icelandic dust compared to North African and Asian dust" *by* Clarissa Baldo et al.

**Konrad Kandler (Referee)**

kzk@gmx.de

Received and published: 23 June 2020

Review of "Distinct chemical and mineralogical composition of Icelandic dust compared to North African and Asian dust" by Clarissa Baldo et al.

Mineral dust within the Arctic (High Latitude Dust) recently emerged as a new topic in aerosol research. Dust in a such a sensitive system may play a pronounced role with respect to climate or ecosystem interactions. This role might be therefore greater than expected from its relatively loss mass emission compared to the hot desert dust. Some of these possibilities of interaction are determined by dust properties like size distribution and composition of the dust.



Iceland is one of the largest Arctic sources. It can be expected that due to its largely different geological origin in comparison to, e.g., the Sahara, and due to the different climate, its properties are, thus, vastly different.

The manuscript sheds some light mainly on the iron-related properties of the dust, which are probably among the most important details to be investigated. State-of-the art techniques are applied extensively to reach this aim. The authors draw careful conclusions based on the properties of the identified materials, but also make clear that more research in particular related to the optical properties of the amorphous fraction is needed.

The paper is well-written and concise. Existing literature is extensively and appropriately referenced.

The only flaw is related to the disagreement between the reported CIA values and the numbers and formula given. It appears that a recalculation and a reassessment of the according conclusions is required, which, however, will probably not be largely different.

I suggest that after this modification the manuscript should be published.

Remarks

Major

Table 1: the shown CIA values don't agree with the formula given in line 185 and the oxide weights in the table. E.g., the CIA in the first line is 51. Recalculate. 385/390: Adjust the statements. Figure 7 + 8: Adjust the plot and in case conclusions.

Minor

140: Why was PM20 less than PM10? That doesn't seem to be logical without further explanation.

150-152: How can a mineral (augite) be chosen as reference for an amorphous matter

in XRD?

171-175: XRF determined elements. Why is oxide weight calculated, if iron content then is back-transformed from the oxide weights? Apart from that, is Fe2O3 a reasonable assumption for Icelandic dust?

186: How can the CIA defined the given way become larger than 100?

Table 2: Why was the uncertainty for anorthite calculated differently? Why is the chi square for H55 so much higher? Apparently the spectrum fit was worse – missing minerals?

332-333: While the fractionation is surely lower than the one observed in the hot deserts, at least for the H55 there is some with respect to microcline and glass. Maybe because Hagarvatn is a lake and might have longer residence time of sediments, similar to the hot desert hot spots?

357-359: The photochemical activity is commonly described for rutile. But this is not identified by XRD, instead titanomagnetite is found. Also, the glass phase could contain considerable amounts of Ti, as the titanomagnetite contents doesn't seem to explain the total TiO2 content. Therefore, the conclusion here doesn't appear to be sound.

506-510: The conclusions refer to magnetite, but mainly titanomagnetite was identified. Is there anything known about the optical (and also Fe dissolution) properties of the latter?

Corrections

72: Check the spellings of Möller/Moller/Moeller. They have the same name (Möller)

85: Check the references. E.g., Urupina is not in the list.

93: Dust source areas?

167-170: That can be removed, as creation of defined standards is not topic.



190: Please remove the comments related to PIA and CIW, as they don't seem to be used.

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