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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Space based observation of volcanic iodine monoxide" *by* Anja Schönhardt et al.

Anonymous Referee #2

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This is a very nice and important study. The paper describes the first time that gas-phase iodine emissions (in the form of IO) have been observed from a volcanic eruption. Two satellite spectrometers are used to corroborate the observations of the IO plume in the upper troposphere which persisted for several days off the coast of Alaska. The authors emphasise that this was a major eruption, which is probably why IO was observable. Nevertheless, with appropriate caveats, they arrive at several important scientific conclusions:

1. Iodine is very enriched in the magma of this maritime volcano, compared to its relative abundance to bromine/chlorine in seawater.

2. The observations of IO/BrO allow extrapolations to be made to the iodine emissions due to outgassing and eruptions from other volcanoes where only BrO can be ob-

served. This is critical information for putting volcanic emissions of iodine into a global context.

3. The IO from violent eruptions of this type should enter the lower stratosphere and cause significant O3 depletion on a wide scale. For very major eruptions which inject material into the mid-stratosphere, this could have a hemispheric or even global impact.

Technically, the DOAS spectroscopic retrievals seem to have been performed to a very high standard. Several definitions of the plume extent are discussed and compared in detail, giving confidence to the conclusions listed above.

The authors make the point in several places that the atmospheric chemistries of iodine and bromine (and their behaviour in the magma) are different, which probably explains why the IO and BrO do not correlate perfectly in time and space. Given that iodine oxides polymerize into particles - and bromine oxides do not - it is likely that the IO/BrO ratio is underestimated. However, it is striking that Figure 4 shows little change in the ratio as the plume ages. I find that particularly interesting, since it suggests that the higher iodine oxides are photochemically labile, thereby enabling the IO to persist in the plume. If the IO mixing ratio is around the estimated 3 ppt, then formation of I2O2, I2O3 etc. should be quite fast. This might be worth mentioning in a revised manuscript.

I found the paper to be clearly written and appropriately illustrated. There are some minor points of grammar and punctuation which the authors may wish to correct.

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