

Interactive comment on “Reactive bromine chemistry in Mt. Etna’s volcanic plume: the influence of total Br, high temperature processing, aerosol loading and plume-air mixing” by T. J. Roberts et al.

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Roberts et al. investigate halogen chemistry in Mt. Etna’s volcanic plume. The study is very interesting and I recommend publication in ACP after considering several minor changes as described below.

- According to the IUPAC Recommendations (page 1387 of Schwartz & Warneck “Units for use in atmospheric chemistry”, Pure & Appl. Chem., 67(8/9), 1377-

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1406, 1995, <http://www.iupac.org/publications/pac/67/8/1377/pdf>) the usage of “ppb” and “ppt” is discouraged for several reasons. Instead, “nmol/mol” and “pmol/mol” should be used for gas-phase mole fractions. I suggest to replace the obsolete units.

- Page 5448, line 5: “BrO forms at 100’s pptv to ppbv concentrations”
The physical properties “mixing ratio” and “concentration” are used as if they were identical. This is not the case! (for details, see <http://www.rolf-sander.net/res/vol1kg.pdf>) Please check all occurrences of the word “concentration” in the main text and check if it should read “mixing ratio” instead.
- Page 5449, lines 2-4: “HSC [...] predicts the thermodynamic equilibrium composition of a gas mixture at a defined temperature, pressure and atomic composition.”
Shouldn’t this be “chemical composition” rather than “atomic composition”? You use H₂O, CO₂, SO₂, H₂S, . . . as input and not H, C, O, and S.
- Page 5450, line 10: What is the meaning of “very trace concentrations”? Are you referring to “low concentrations”?
- Page 5452, line 24: What is the meaning of “trace quantities”? Are you referring to “low concentrations”?
- Page 5454, line 1-2: “rapid ozone loss (10’s ppbv)”
If you call the ozone loss rapid, it should be mentioned what time is needed for the loss of 10 ppb.
- Page 5454: The reaction sequence described here is only autocatalytic if it proceeds via (R5). When going through (R6), it is *not* autocatalytic because (R6) does not activate any additional bromide.
- Page 5455, line 7-8: “This rapid rate of HBr conversion is somewhat slowed by the inclusion of the reaction Br + BrONO₂”

C1513

This reaction does not affect HBr directly. Can you explain why it affects the rate of HBr conversion?

- Page 5455, line 17-18: “we use two chemistry schemes that either include BrNO_2 formation and its photolytic loss (using a two reaction chemistry scheme following von Glasow, 2010)”

It would be interesting to show these additional reactions and their rate coefficients, for example in a table. In particular, I would like to know if the heterogeneous reaction of N_2O_5 with bromide is also considered as a source of BrNO_2 .

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 5445, 2014.