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-
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”

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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 BrNO₂ 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 N₂O₅ with bromide is also considered as a source of BrNO₂.

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