

## ***Interactive comment on “Halogen activation in the plume of Masaya volcano: field observations and box model investigations” by Julian Rüdiger et al.***

**Anonymous Referee #3**

Received and published: 29 July 2020

The manuscript by Rüdiger et al. presents observations of halogens (chlorine, bromine, iodine) from the Masaya volcano in Nicaragua. The observations are used together with box modelling by the CAABA/MECCA model to investigate halogen activation in the plume over the first few km and minutes from the volcano. The study presents an impressive collection of data from various sources that help to constrain and validate the modelling. This is an important contribution to the science field and I recommend publication in ACP after consideration of the following points. The manuscript is in general well written, but I had at parts difficulties in following the line of thought. The text may be streamlined a bit by moving part of the details from the Results and Discussion section to section 1 or 2 (where appropriate) and to lay out an overview of the paper at the end of the Introduction.

C1

Table 1 states that the BrO self reaction  $\text{BrO} + \text{BrO}$  produces  $\text{Br}_2 + \text{O}_2$ , but the main channel gives  $2 \text{Br} + \text{O}_2$ , only about 15% yield  $\text{Br}_2 + \text{O}_2$ . Would that affects the model results? Related to that, I was surprised that according to the model  $\text{Br}_2$  forms such a large fraction, in most cases increasing with time. Does  $\text{Br}_2$  production by the BrO self reaction play a role here or is this all heterogeneous production ?

Fig.1: It would be great if you could link panels c) and d) in Fig.1 by indicating the corresponding easting and northing of d) in c).

Page 9, l.4: I wonder how representative the wind measured with a handheld anemometer close to the surface is for the plume transport?

Page 10, l.9 “Table 2”->“Table 3”

Page 11: Please define/explain meaning of symbols in Eq. 1. Are the fitted parameters (a, b, c) given somewhere? I was a bit confused at this point and would have expected to find somewhere the results on the fitted e-folding time or distance.

Page 11, l.5: what are the “coefficients from field data”?

Fig.9: Label on y-axis should read “Fraction of total chlorine”, not “bromine”

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-284>, 2020.

C2