Supplement of

A regional modelling study of halogen chemistry within a volcanic plume of Mt Etna’s Christmas 2018 eruption

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1 Figures

Figure S1. Time evolution of BrO loss rates in [molec.cm$^{-2}$s$^{-1}$] without the photolysis of BrO and the BrO + BrO → Br + Br + O$_2$ reaction, from 24 December at 12:00 to 31 December 2018 at 00:00 UTC in the near volcano plume.
Figure S2. Time evolution of Br production rates in [molec.cm$^{-2}$s$^{-1}$] without the photolysis of BrO and the BrO + BrO $\rightarrow$ Br + Br + O$_2$ reaction, from 24 December at 12:00 to 31 December 2018 at 00:00 UTC in the near volcano plume.
Figure S3. Time evolution of: (a) BrO column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for BrO both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S4. Time evolution of BrO loss rates in [molec.cm$^{-2}$.s$^{-1}$] without the photolysis of BrO and the BrO + BrO $\rightarrow$ Br + Br + O$_2$ reaction from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S5. Time evolution of: (a) BrO column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for BrO both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S6. Time evolution of BrO loss rates in [molec.cm$^{-2}$.s$^{-1}$] without the photolysis of BrO and the BrO + BrO $\rightarrow$ Br + Br + O$_2$ reaction, from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S7. Time evolution of: (a) Br column concentration in \([\text{molec. cm}^{-2}]\), (b) production rates and (c) loss rates for Br both in \([\text{molec. cm}^{-2}.\text{s}^{-1}]\) from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S8. Time evolution of Br production rates in [molec.cm$^{-2}$.s$^{-1}$] without the photolysis of BrO and the BrO + BrO $\rightarrow$ Br + Br + O$_2$ reaction, from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S9. Time evolution of: (a) Br column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for Br both in [molec.cm$^{-2}$s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S10. Time evolution of Br production rates in [molec.cm$^{-2}$.s$^{-1}$], without the photolysis of BrO and the BrO + BrO $\rightarrow$ Br + Br + O$_2$ reaction from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S11. Time evolution of: (a) $\text{Br}_2$ column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for $\text{Br}_2$ both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S12. Time evolution of: (a) Br$_2$ column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for Br$_2$ both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S13. Time evolution of: (a) BrCl column concentration in [molec.cm\(^{-2}\)], (b) production rates and (c) loss rates for BrCl both in [molec.cm\(^{-2}\).s\(^{-1}\)] from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S14. Time evolution of: (a) BrCl column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for BrCl both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S15. Time evolution of: (a) HOBr column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for HOBr both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S16. Time evolution of: (a) HOBr column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for HOBr both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S17. Time evolution of: (a) HBr column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for HBr both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S18. Time evolution of: (a) HBr column concentration in [molec.cm$^{-2}$], (b) production rates and (c) loss rates for HBr both in [molec.cm$^{-2}$.s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
**Figure S19.** Time evolution of: (a) BrONO₂ column concentration in [molec.cm⁻²], (b) production rates and (c) loss rates for BrONO₂ both in [molec.cm⁻².s⁻¹] from 24 December at 14:00 to 31 December 2018 at 00:00 UTC in the young plume.
Figure S20. Time evolution of: (a) BrONO$_2$ column concentration in [molec. cm$^{-2}$], (b) production rates and (c) loss rates for BrONO$_2$ both in [molec. cm$^{-2}$ s$^{-1}$] from 24 December at 20:00 to 31 December 2018 at 00:00 UTC in the aged plume.
Figure S21. Time evolution of the total burden of the NO$_2$ within plume in [molec] from 24 December at 12:00 to 31 December 2018 at 00:00 UTC in the near volcano domain.