

Supplement of

“Effects of halogens on European air-quality”

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This document contains two tables and five figures.

Table S11 - Scaling applied to VOC emissions used in simulation.

Species	Scaling
C_3H_8	2
Acetaldehyde	4
CH_2O	4
Acetone	1

Table footnote: The base emissions, prior to scaling, for C_3H_8 are assumed to be equivalent to C_2H_6 and acetaldehyde emissions are used to scale CH_2O and acetone emissions. A scaling of four is applied to acetaldehyde.

Table S12 - Definition of families.

Family	Definition
particulate matter less than 2.5 microns ($PM_{2.5}$)	$1.51 * ([NH_4] + [NIT] + [SO_4]) + [BCPI] + [BCPO] + 1.2 * ((OCPI * 1.24) + OCPO) + [DST1] + 0.38 * [DST2] + 2.42 * [SALA]$

Table footnote: Definition of particulate matter less than 2.5 microns ($PM_{2.5}$) used here. Where “NIT”=nitrate aerosol, “BCPI”=Hydrophilic black carbon aerosol, “BCPO”=Hydrophobic black carbon aerosol, “OCPI”=Hydrophilic organic carbon aerosol, “OCPO”=Hydrophobic organic carbon aerosol, “DST1”=Dust aerosol (with $R_{eff} = 0.7$ microns), “DST2”=Dust aerosol, ($R_{eff} = 1.4$ microns), and “SALA”=Accumulation mode sea salt aerosol ($R_{eff} = 0.1 - 2.5$ microns). The scaling factors used assume an average RH of 50% for the domain.

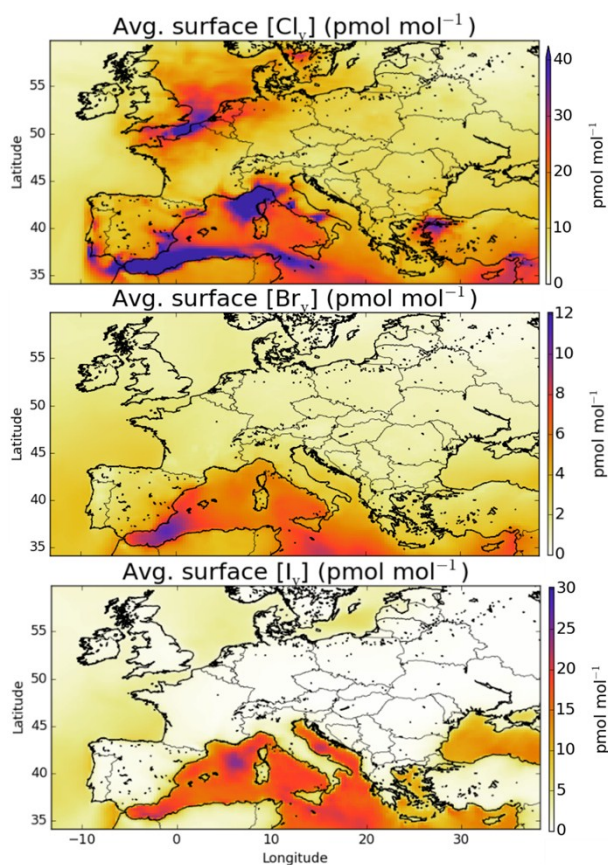


Figure S11 - Modelled surface mixing ratios/concentrations of X_y ($\text{X}=\text{Cl}, \text{Br}, \text{I}$) in “HAL” simulation for the summer observation period (2015/06/29-2015/08/01). Maximum values in figure are 27, 11 and 99 pmol mol^{-1} , for I_y , Br_y and Cl_y respectively. When X_y is the sum of inorganic halogens.

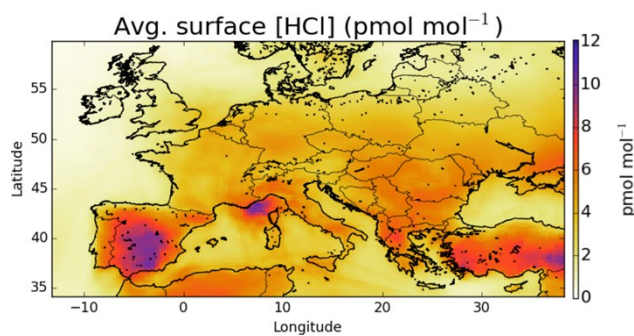


Figure S12 - Modelled surface mixing ratio of HCl in “HAL” simulation for the summer observation period (2015/06/29-2015/08/01) .

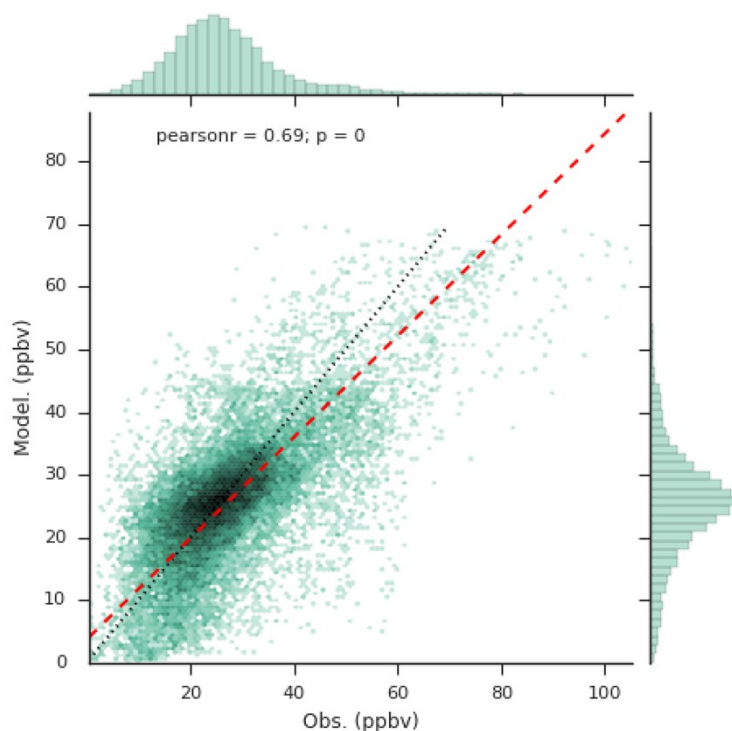


Fig. S13 Comparison of observed and modelled O_3 concentrations at UK AURN background sites (N=63) for the observation period (2015/06/29-2015/08/01). Red line shows orthogonal distance regression. Values are coloured in hexbins by log of number density, with probability distributions shown. Line of equality is shown in dashed black.

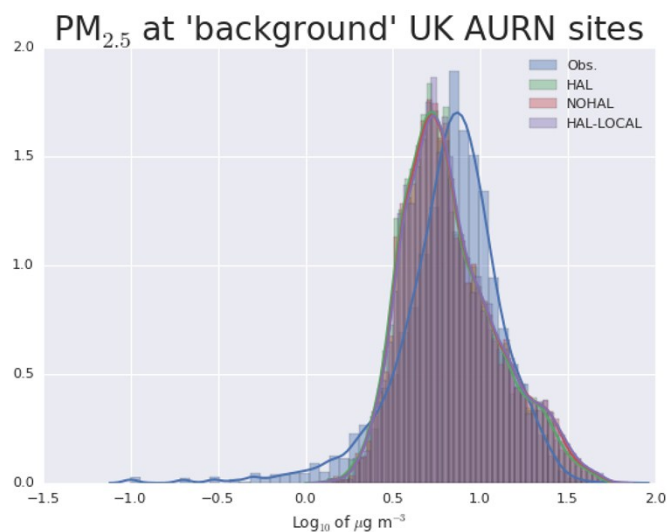


Fig. S14 Probability distribution function of the log of observed and modelled $PM_{2.5}$ concentrations at UK AURN background sites (N=39) for the observation period (29th June-1st August 2015). Values are shown for the simulation with halogens (“HAL”), without halogens (“NOHAL”), and with halogens only with the European domain (“LOCAL-HAL”).

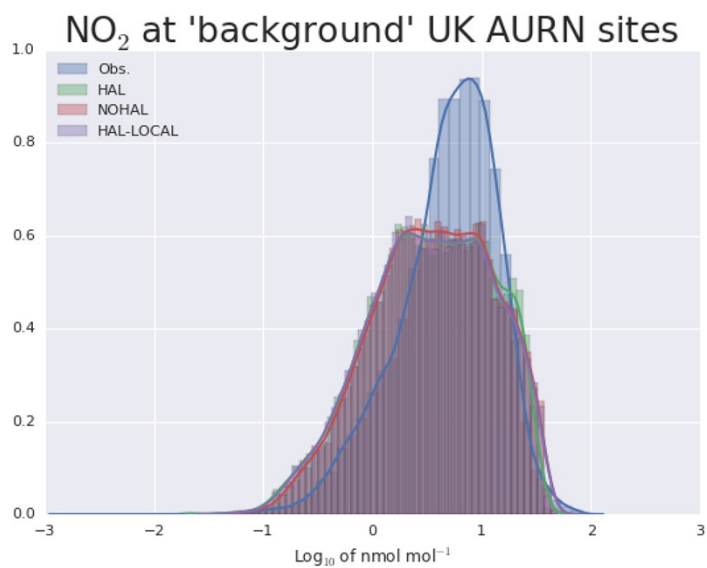


Fig. S15 Probability distribution function of the log of observed and modelled NO₂ concentrations at UK AURN background sites (N=62) for the observation period (29th June-1st August 2015). Values are shown for the simulation with halogens (“HAL”), without halogens (“NOHAL”), and with halogens only with the European domain (“LOCAL-HAL”).