

1 **Contents of this supporting information**

- 2 1. Supporting tables S1 to S2.
3 2. Supporting figures S1 to S3.

4

5 **Introduction**

6 This text presents additional information to illustrate in more detail present-day
7 tropospheric ozone (CNTRL; year 2000), changes in column ozone and temperature
8 due to the different drivers investigated in this study, and additional sensitivity
9 simulations to further assess the robustness of the results presented in the main
10 manuscript. Tables S1 and S2 present global and annual column ozone changes for
11 the above drivers and period, and additional model simulations used in the main text
12 to explore non-linearities respectively. Figures S1 and S2 show annual mean
13 tropospheric burden distribution for ozone and stratospheric ozone tracer (O3S)
14 respectively. Finally, Figure S3 shows changes in annual and zonal mean temperature
15 due to climate, lightning, ozone depleting substances (ODSs), and methane over
16 2000–2100.

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Table S1. Global and annual mean ozone columns (DU)^a.

Simulation	Total column	Tropospheric column	Stratospheric column
CNTRL	280.6 ± 8.7	28.9 ± 1.5	251.7 ± 8.1
CLIMATE	281.5 ± 9.9	27.7 ± 1.6	253.8 ± 9.3
+LIGHTNING	284.2 ± 9.7	29.8 ± 1.7	254.4 ± 9.1
++O3-RECOVERY	299.0 ± 9.5	31.2 ± 1.7	267.8 ± 8.8
+++METHANE	308.9 ± 9.5	35.9 ± 1.9	273.0 ± 8.8
CNTRL+LNOx	280.3 ± 8.6	28.4 ± 1.5	251.9 ± 8.1

^a The annual global mean is given along with the (±) standard deviation.

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Table S2. Additional model simulations

Simulation	Climate ¹	ODSs ²	CH ₄ ³
CLIMATE[CH4-2100]-fLNO _x	2100 (fLNO _x) ⁴	2000	2100
CLIMATE[CH4-2100]	2100	2000	2100
ODS	2000	2100	2000

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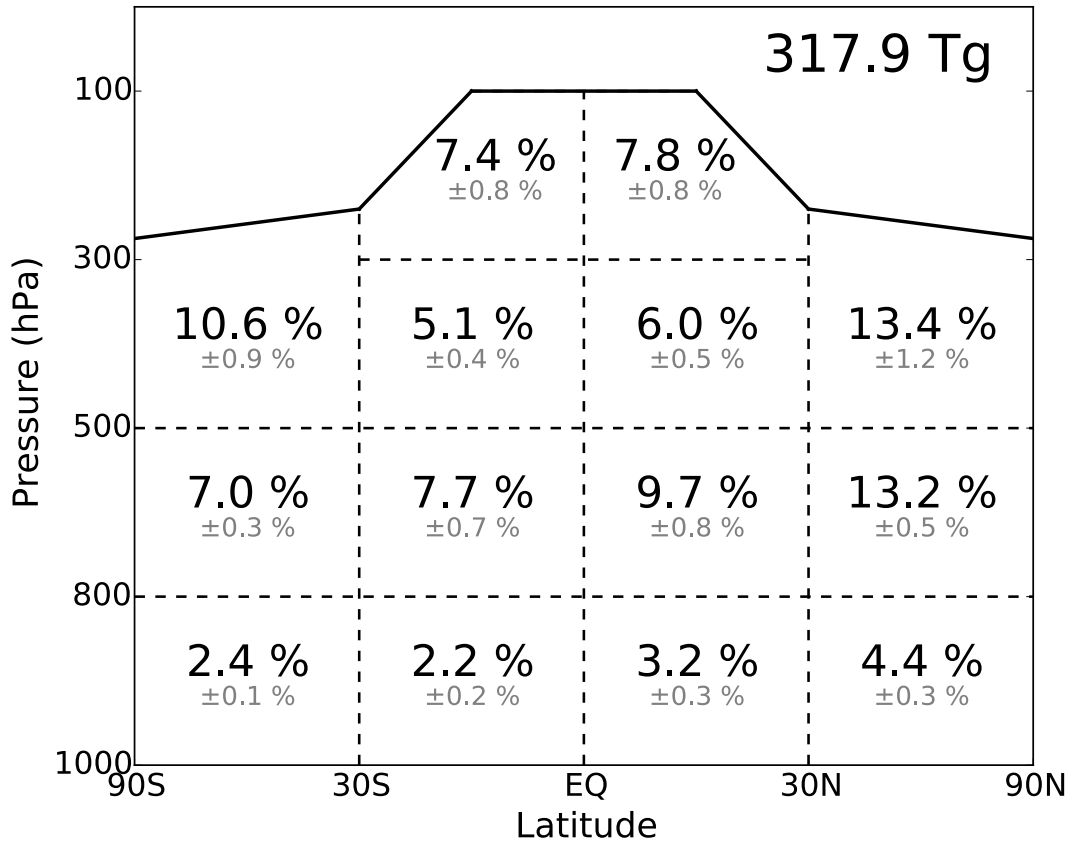
2 ¹ Climate (SSTs, sea ice, CO₂ and N₂O, if not otherwise specified).

3 ² Relative to CNTRL, ODS simulation is driven by ODSs boundary conditions of -63.2% (2.156 ppbv)
 4 total chlorine, -35.7% (8.1 pptv) total bromine and -67.6% (1.376 ppbv) total fluorine.

5 ³ Relative to CNTRL, CLIMATE[CH4-2100] simulations are driven by CH₄ boundary conditions of
 6 214.2 % (3744 ppbv).

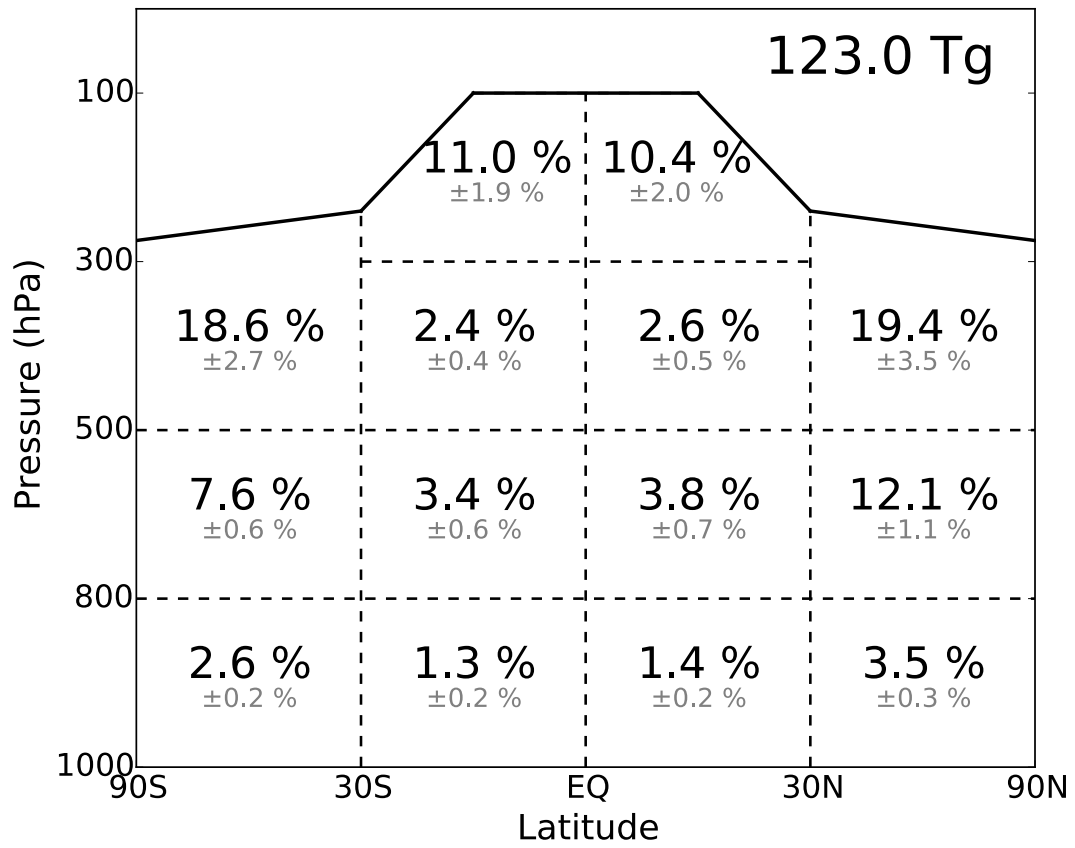
7 ⁴ Offline lightning-induced NO_x emissions imposed by applying a monthly mean climatology of the
 8 CNTRL simulation.

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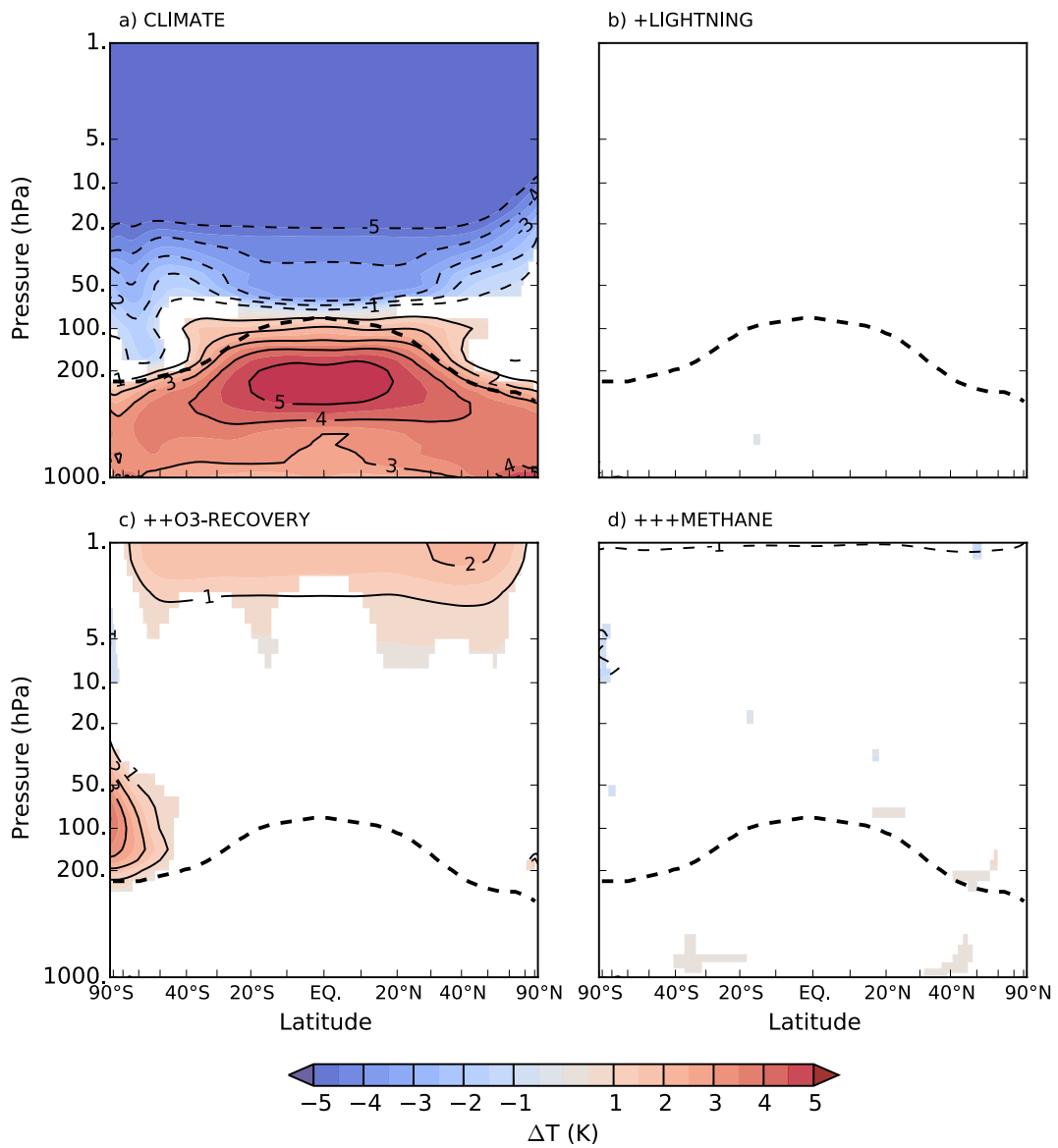
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2 Figure S1. Present-day (CNTRL) annual mean tropospheric ozone burden distribution
 3 (black) and the ± 1 standard deviation (grey), represented by “boxes” (dashed black
 4 lines) of approximately equal air masses, as per Young et al. (2013). The tropopause
 5 is represented by the black thick line (i.e. regions below 150 ppbv ozone levels). The
 6 annual and global tropospheric ozone burden mean is shown in the top right corner.



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2 Figure S2. Same as Fig. A1 but for stratospheric ozone tracer (O3S).



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2 Figure S3. Same as Fig. 2 but for temperature (K).

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1 **References**

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