Supporting Information for "Global distribution and chemical impact of stratospheric Blue Jets modeled with WACCM4"

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Introduction We include in this supporting material an additional table and some additional figures illustrating the different global chemical influence of Blue Jets over one year using four different lightning parameterizations based on: (1) the convective precipitation rate at the surface (only for precipitations stronger than 7 mm/day) (CP) [*Allen and Pickering*, 2002], (2) the product of the convective precipitation and the convective available potential energy (CPCAPE) [*Romps et al.*, 2014], (3) the updraft mass flux at 440 hPa (MFLUX) [*Allen and Pickering*, 2002] and (4) the upward ice flux [*Finney et al.*, 2014].

Table S1 shows the Blue Jet frequency and production of NO, N_2O and O obtained from one year simulations using different lightning and Blue Jet parameterizations, while figures S1, S2, S3 and S4 show the globally averaged chemical influence of Blue Jets at different altitudes for different lightning and Blue Jet parameterizations.

L-BJ parameterizations	**BJ frequency [min^{-1}]**	**Tg NO-N yr^{-1}**	**Tg N_2O-N yr^{-1}**	**Tg O yr^{-1}**
CP IS-TROP UP R_1	1.06	7×10^{-3}	0.5	4×10^{-7}
CP IS-TROP UP R_2	1.06	0.15	16.4	10^{-5}
CP IS-TROP LOW R_1	0.01	7×10^{-5}	4.6×10^{-3}	4×10^{-7}
CP IS-TROP LOW R_2	0.01	2×10^{-3}	0.12	10^{-9}
CP LPC-TROP UP R_1	30.0	0.2	12.0	10^{-5}
CP LPC-TROP UP R_2	30.0	5.4	294.0	3×10^{-4}
CP LPC-TROP LOW R_1	3.0	0.02	1.2	10^{-6}
CP LPC-TROP LOW R_2	3.0	0.54	29.0	3×10^{-5}
CPCAPE IS-TROP UP R_1	0.59	4×10^{-3}	0.27	2×10^{-7}
CPCAPE IS-TROP UP R_2	0.59	0.1	6.7	5×10^{-6}
CPCAPE IS-TROP LOW R_1	6×10^{-3}	3×10^{-5}	3.5×10^{-3}	2×10^{-9}
CPCAPE IS-TROP LOW R_2	6×10^{-3}	1×10^{-3}	6.7×10^{-2}	5×10^{-8}
CPCAPE LPC-TROP UP R_1	4.8	5×10^{-2}	3.0	3×10^{-6}
CPCAPE LPC-TROP UP R_2	4.8	0.8	44.0	4×10^{-5}
CPCAPE LPC-TROP LOW R_1	0.48	3×10^{-3}	0.2	2×10^{-7}
CPCAPE LPC-TROP LOW R_2	0.48	0.1	4.4	4×10^{-6}
MFLUX IS-TROP UP R_1	0.34	2.4×10^{-3}	0.14	10^{-5}
MFLUX IS-TROP UP R_2	0.34	6×10^{-2}	4.0	3×10^{-6}
MFLUX IS-TROP LOW R_1	3.4×10^{-3}	2.5×10^{-5}	1.6×10^{-3}	1×10^{-9}
MFLUX IS-TROP LOW R_2	3.4×10^{-3}	6×10^{-4}	4×10^{-2}	3×10^{-8}
MFLUX LPC-TROP UP R_1	5.2	4×10^{-2}	2.0	2×10^{-6}
MFLUX LPC-TROP UP R_2	5.2	0.9	50.0	3×10^{-7}
MFLUX LPC-TROP LOW R_1	0.5	4×10^{-3}	0.2	2×10^{-7}
MFLUX LPC-TROP LOW R_2	0.5	9×10^{-2}	6.1	4×10^{-6}
ICEFLUX IS-TROP UP R_1	0.14	1×10^{-3}	6.7×10^{-2}	5×10^{-8}
ICEFLUX IS-TROP UP R_2	0.14	2.5×10^{-2}	1.7	10^{-6}
ICEFLUX IS-TROP LOW R_1	1.4×10^{-3}	10^{-5}	6.6×10^{-4}	5×10^{-10}

L-BJ parameterization	**BJ frequency [min^{-1}]**	**Tg NO-N yr^{-1}**	**Tg N_2O-N yr^{-1}**	**Tg O yr^{-1}**
ICEFLUX IS-TROP LOW R_2	1.4×10^{-3}	2.5×10^{-4}	1.7×10^{-2}	10^{-8}
ICEFLUX LPC-TROP UP R_1	1.44	10^{-2}	0.6	7×10^{-7}
ICEFLUX LPC-TROP UP R_2	1.44	0.27	15.0	1×10^{-5}
ICEFLUX LPC-TROP LOW R_1	0.14	10^{-3}	6×10^{-2}	5×10^{-8}
ICEFLUX LPC-TROP LOW R_2	0.14	2.7×10^{-2}	1.77	10^{-6}

Table 1: Blue Jet frequency and production of NO, N_2O and O obtained from one year simulations using different Blue Jet parameterizations and the lightning parameterizations denoted as CP, CPCAPE, MFLUX and ICEFLUX.

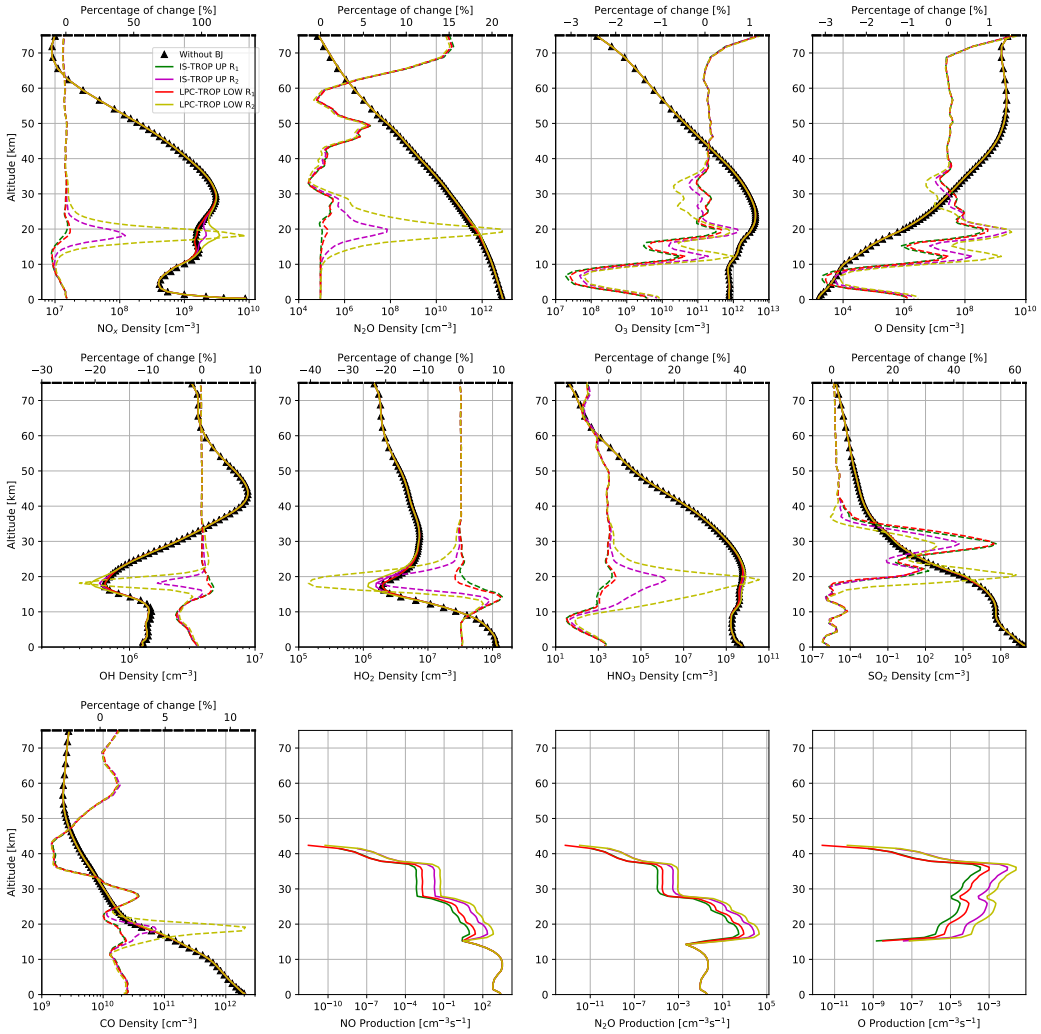

Figure 1. Solid lines correspond to annual global average density of some species after a WACCM4 simulation of 1 year including Blue Jets and using the lightning parameterization CP [*Allen and Pickering*, 2002]. Triangles correspond to the same simulation with lightning but without Blue Jets. Dashed lines represent the percentage difference when Blue Jets are included. The last three subplots in the lower row show the total production of NO, N_2O and O by lightning and Blue Jets.

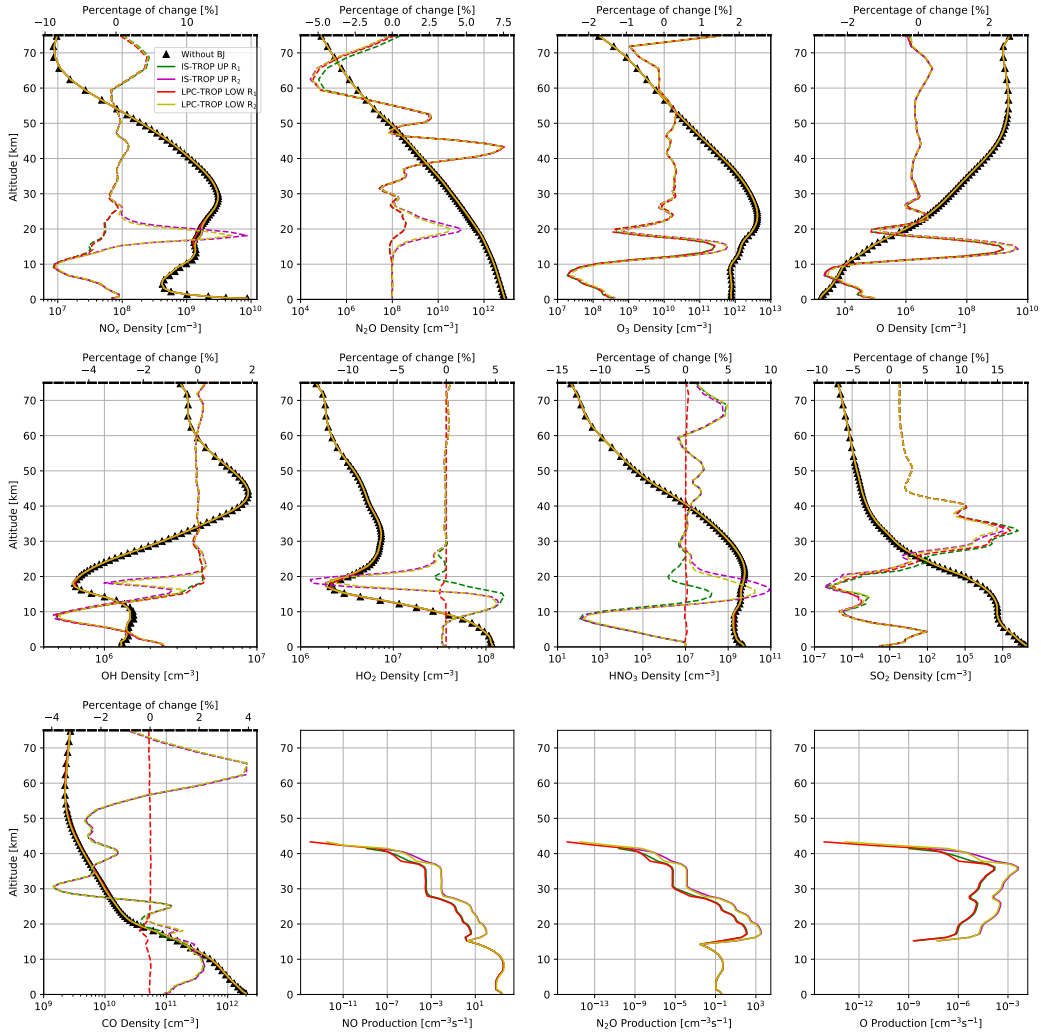

Figure 2. Solid lines correspond to annual global average density of some species after a WACCM4 simulation of 1 year including Blue Jets and using the lightning parameterization CPCAPE [*Romps et al.*, 2014]. Triangles correspond to the same simulation with lightning but without Blue Jets. Dashed lines represent the percentage difference when Blue Jets are included. The last three subplots in the lower row show the total production of NO, N_2O and O by lightning and Blue Jets.

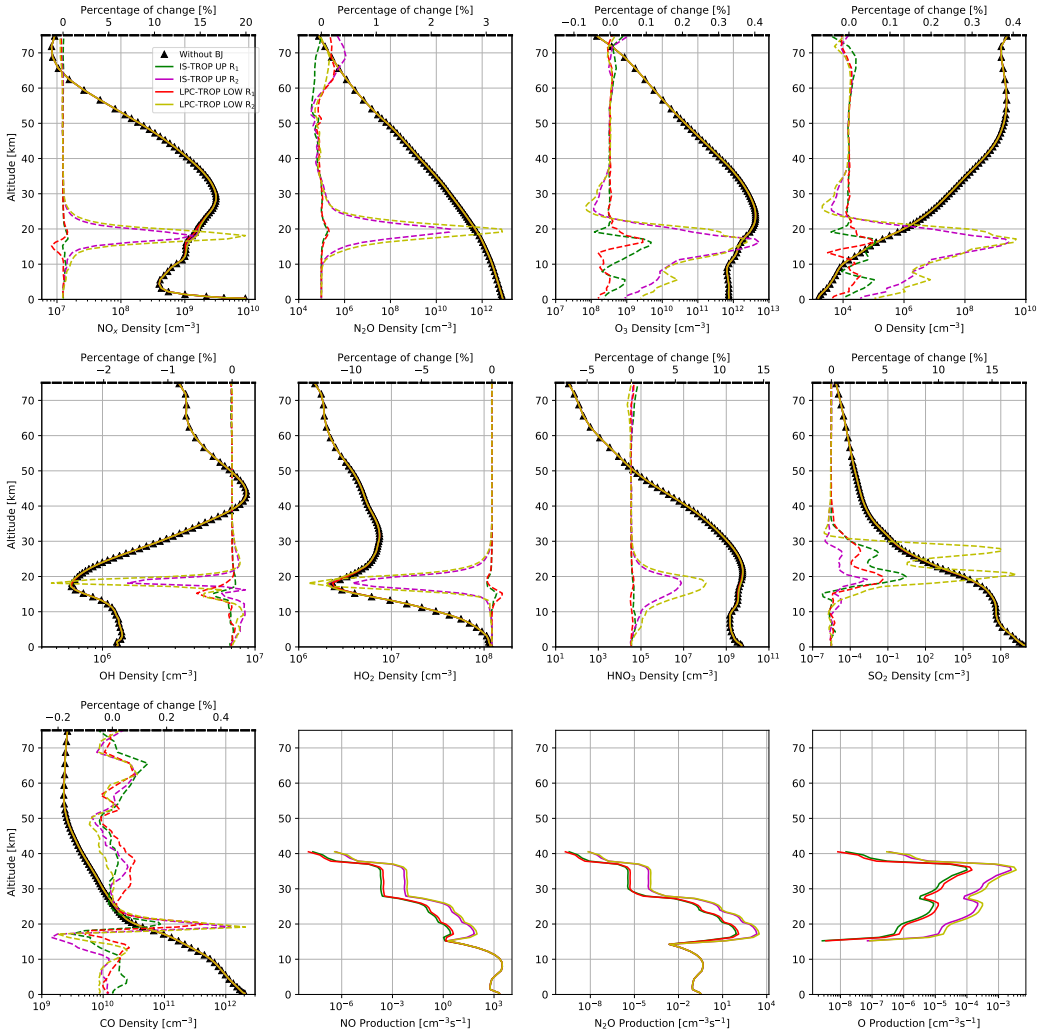

Figure 3. Solid lines correspond to annual global average density of some species after a WACCM4 simulation of 1 year including Blue Jets and using the lightning parameterization MFLUX [*Allen and Pickering*, 2002]. Triangles correspond to the same simulation with lightning but without Blue Jets. Dashed lines represent the percentage difference when Blue Jets are included. The last three subplots in the lower row show the total production of NO, N_2O and O by lightning and Blue Jets.

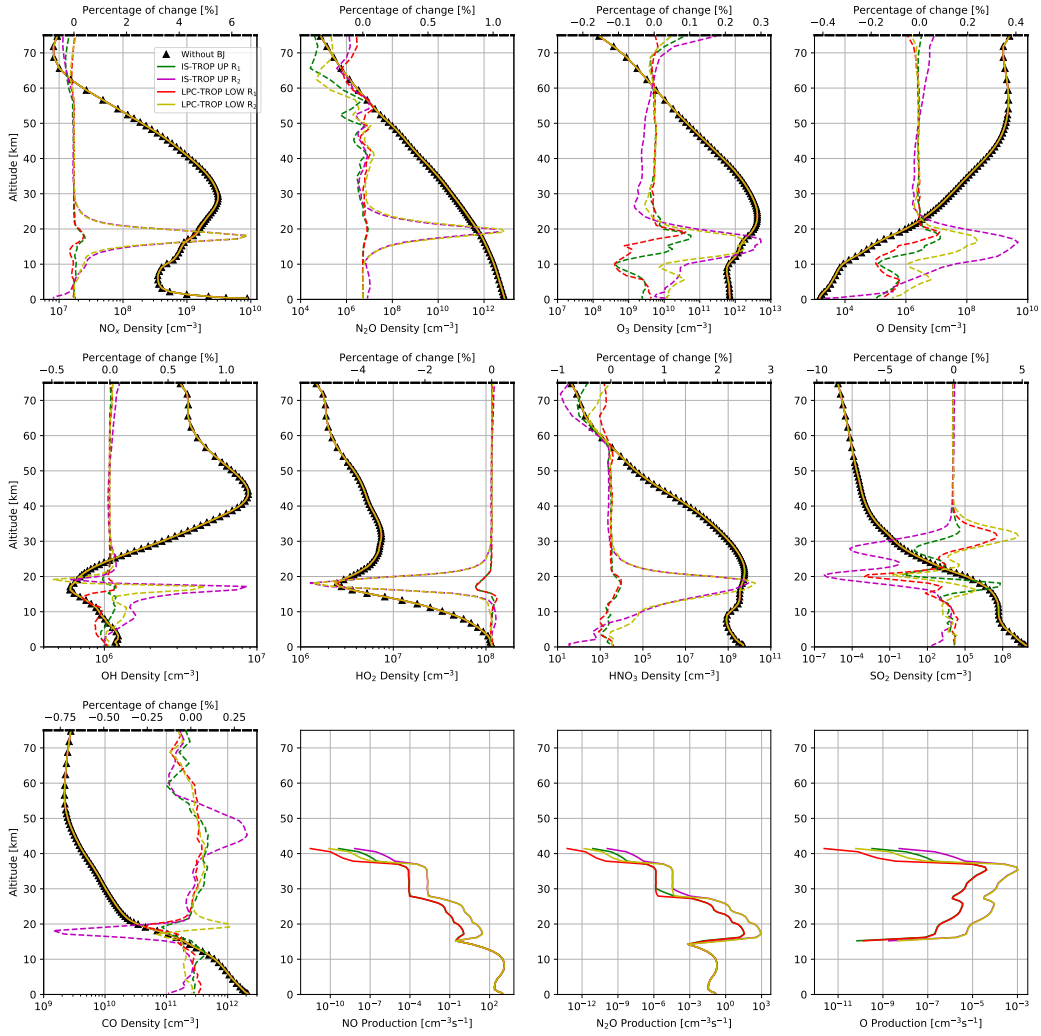

Figure 4. Solid lines correspond to annual global average density of some species after a WACCM4 simulation of 1 year including Blue Jets and using the lightning parameterization ICEFLUX [*Finney et al.*, 2014]. Triangles correspond to the same simulation with lightning but without Blue Jets. Dashed lines represent the percentage difference when Blue Jets are included. The last three subplots in the lower row show the total production of NO, N_2O and O by lightning and Blue Jets.

References

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