## Supplement of

# An Arctic ozone hole in 2020 if not for the Montreal Protocol 

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Figure S1. Evolution of stratospheric Total Equivalent Effective Chlorine in ppbv, globally averaged, in the Real World run and the World Avoided, calculated as a linear combination of $\mathrm{Cl}_{\mathrm{y}}$ and $\mathrm{Br}_{\mathrm{y}}$, with $\mathrm{Br}_{\mathrm{y}}$ given weighting factors of 60 in the midlatitudes and 65 in the polar regions. The two diverge beginning in 1985 as described in the main text.

## Total Column $\mathrm{O}_{3}$ on 26-Mar-2011


(c) SD-WACCM: (WA-RW)

(d)


Figure S2. As for Figure 1, but for March 26, 2011.


Figure S3. As for the left panel of Figure 2, but in log-scale.


Figure S4. Comparison of ozone profiles for four different SD-WACCM simulations at SD-WACCM gridpoints nearest (top) Alert, (middle) Eureka, and (bottom) Resolute Stations for days in Spring 2020 where ozonesondings exist and reach at least to the middle stratosphere for a station. Note that the middle panel of the middle row is the same as Figure 4a in the main text.


Figure S5. As for Figure 5, but for the Antarctic from $70^{\circ} \mathrm{S}$ to $90^{\circ} \mathrm{S}$.


Figure S6. Minimum ozone mixing ratios across the polar cap ( $70^{\circ} \mathrm{N}-90^{\circ} \mathrm{N}$, all longitudes) for each day in 2020 for Real World (teal) and
World Avoided (orange) runs in SD-WACCM at 73 mb .


45 Figure S7. (a) Comparison between the Real World and World Avoided profiles in SD-WACCM at the model gridpoint nearest to Eureka station for August $1^{\text {st }}, 2019$. Note the y-axis goes to lower pressures than the profiles in Figures 2 and 5. (b) Comparison between the total column ozone depletion and the partial column ozone depletion at altitudes above 20 mb in the Real World vs World Avoided runs.

