

Supplementary Information for

The Montreal Protocol is delaying the occurrence of the first ice-free Arctic summer

Mark R. England and Lorenzo M. Polvani

Lorenzo M. Polvani.
E-mail: polvani@gmail.com

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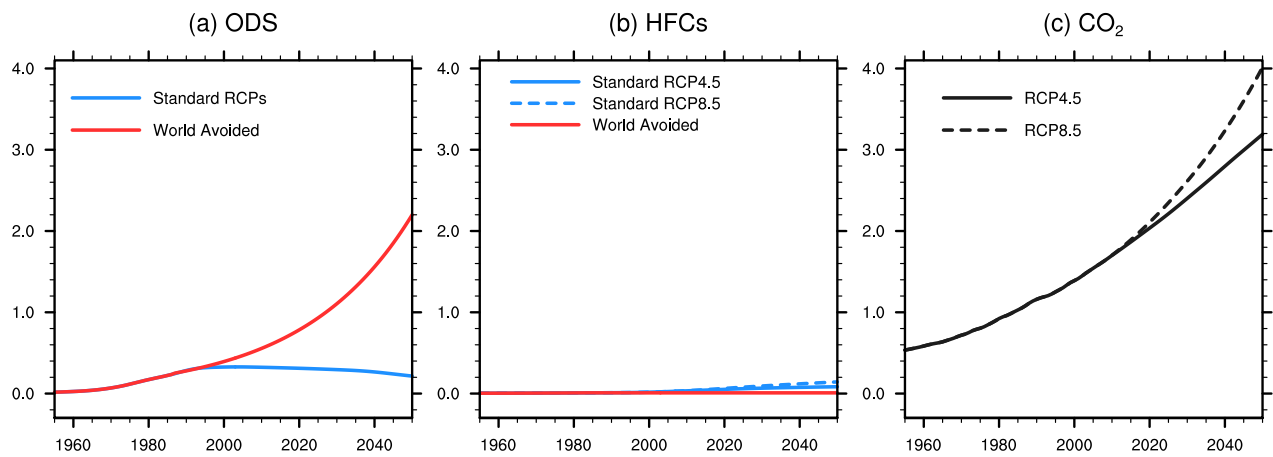


Fig. S1. Radiative forcing, in W/m^2 , for (a) ODSs, (b) HFCs, and (c) CO₂ in the World Avoided and Standard scenarios. For the standard scenarios the values are taken from reference (1). For the World Avoided scenarios they are estimated from the radiative efficiencies reported in Table 8.A.1 of reference (2).

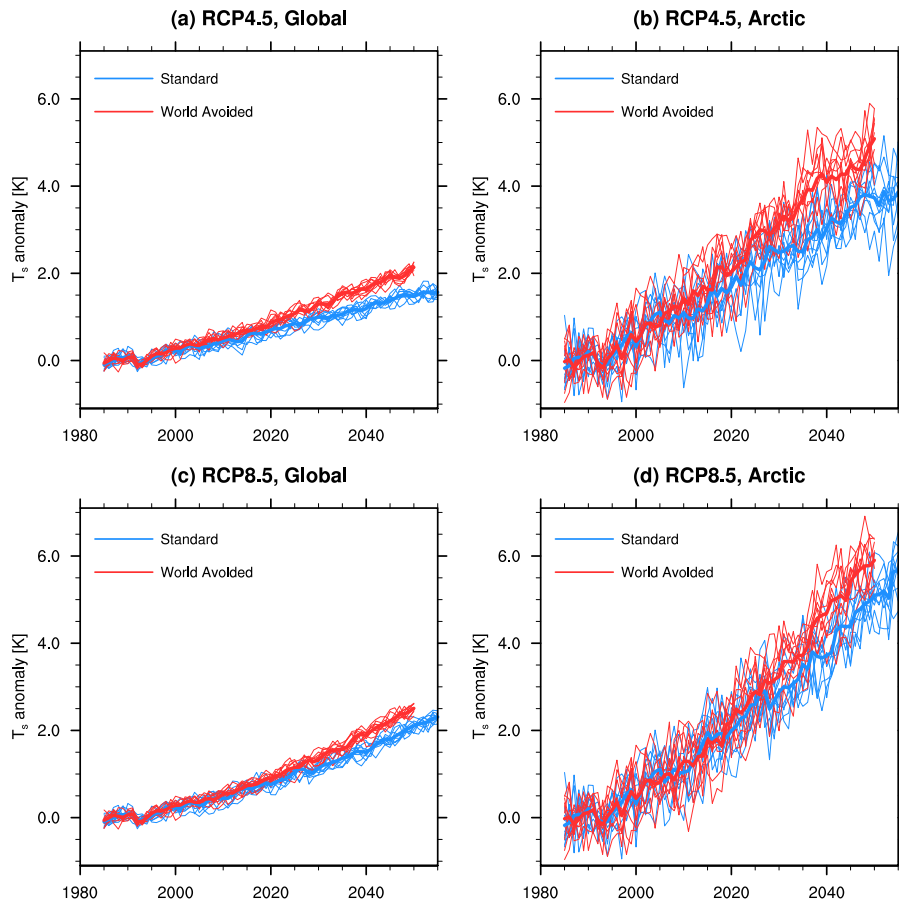


Fig. S2. (a) Global and (b) Arctic mean surface temperature anomalies, from the 1980-1989 time-average, in the World Avoided (red) and Standard (blue) scenarios for the RCP4.5 pathway. The thin lines show the 10 individual members, and the thick lines the ensemble means. (c) and (d): as in (a) and (b), but for the RCP8.5 scenario.

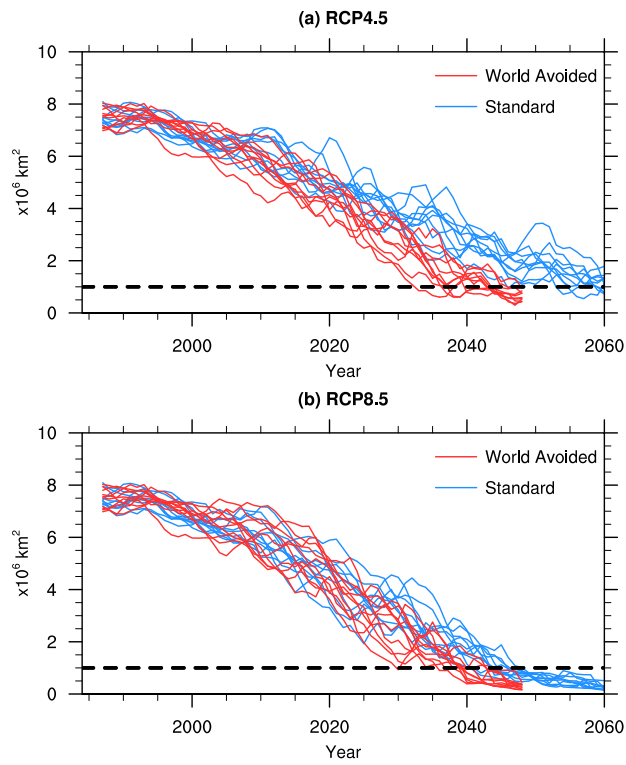


Fig. S3. As in Fig. 2, but smoothed with a 5-year running mean.

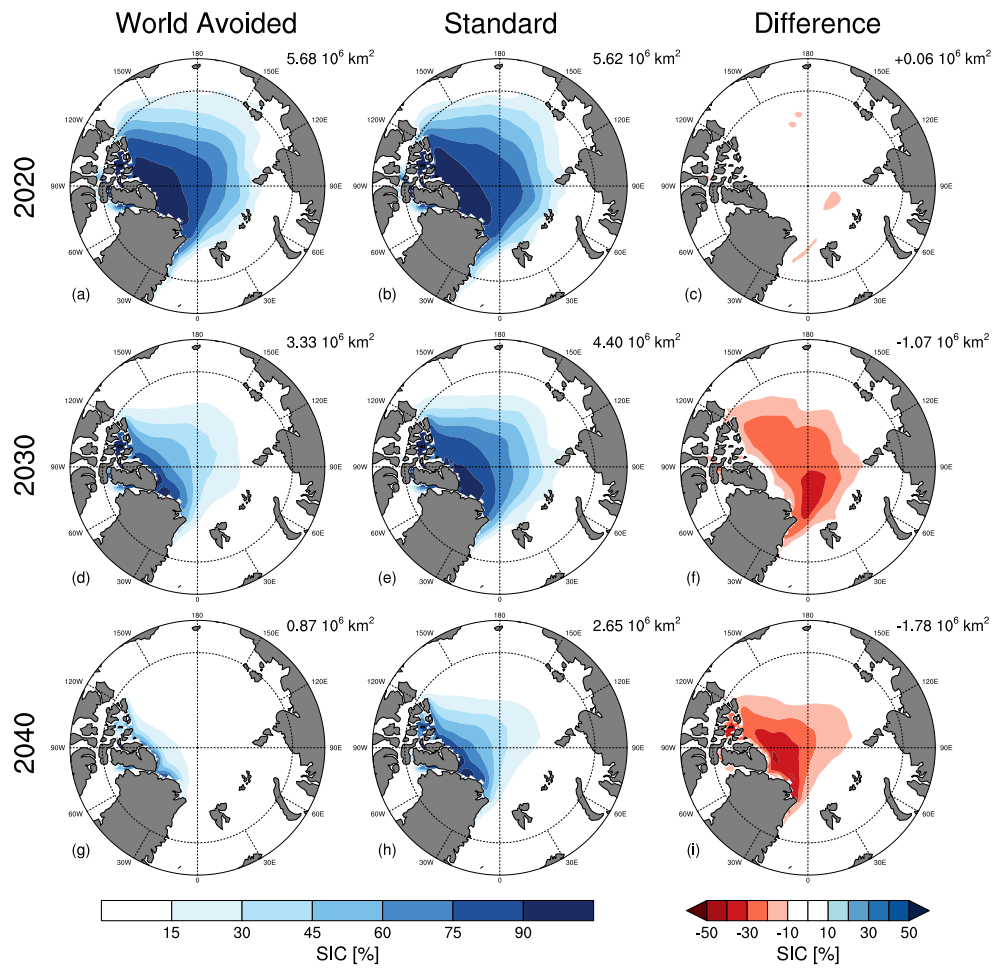


Fig. S4. As in Fig. 3, but for the RCP8.5 pathway.

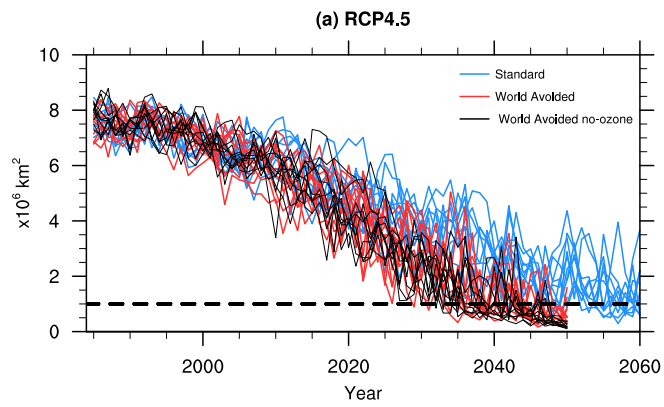


Fig. S5. As in Fig. 2a, but with the “World Avoided ODSs only” runs superimposed in black; in those runs stratospheric ozone depletion does not take place.

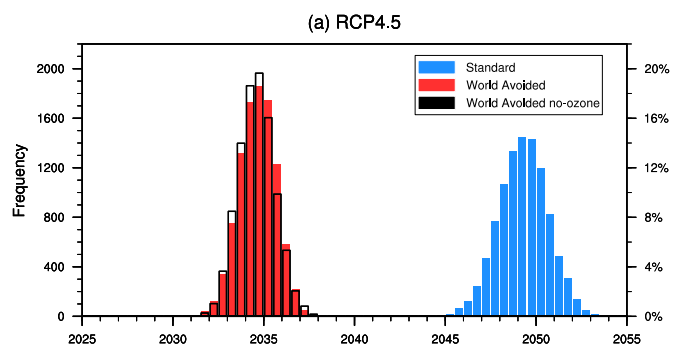


Fig. S6. As in Fig. 4, but with the “World Avoided ODSs only” runs superimposed in black; in those runs stratospheric ozone depletion does not take place.

Table S1. The mean value (rounded), and the 2σ -range of the first year for which the Arctic is ice-free in September, in World Avoided and Standard scenarios, and for both the RCP4.5 and the RCP8.5 pathway, obtained from the 10,000-member synthetic bootstrapped PDFs..

Pathway	World Avoided scenario	Standard scenario	Montreal Protocol delay
RCP4.5	2035 \pm 2.0	2049 \pm 2.7	14.7 years
RCP8.5	2033 \pm 1.9	2040 \pm 2.1	7.4 years

References

1. M Meinshausen, et al., The RCP greenhouse gas concentrations and their extensions from 1765 to 2300. *Clim. Chang.* **109**, 213–241 (2011).
2. T Stocker, et al., Climate change 2013: The physical science basis (Cambridge, United Kingdom and New York, NY, USA) (2013).