

# Reduction in Surface Climate Change achieved by the 1987 Montreal Protocol

Rishav Goyal<sup>1,2,\*</sup>, Matthew H. England<sup>1,2</sup>, Alex Sen Gupta<sup>1</sup> and Martin Jucker<sup>1</sup>

1. Climate Change Research Centre, University of New South Wales, NSW, 2052 Australia
2. ARC Centre of Excellence for Climate Extremes, University of New South Wales, NSW, Australia

---

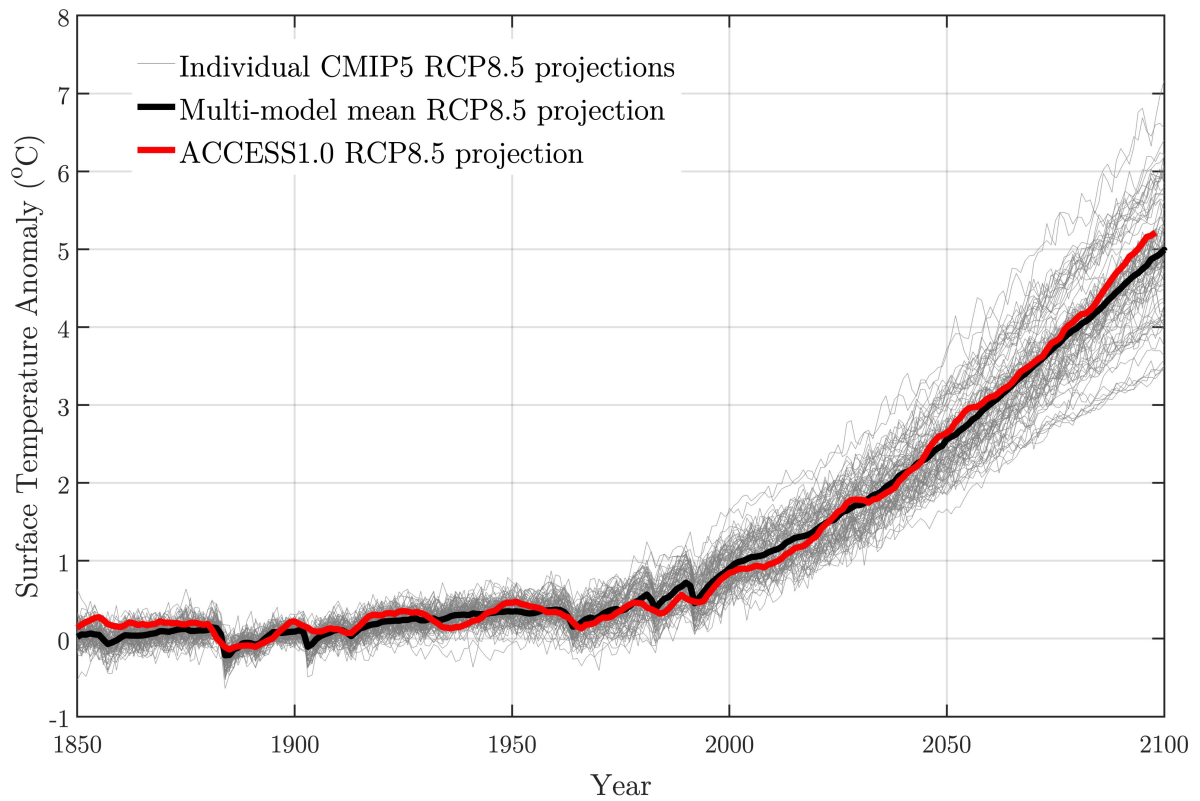
Submitted as a Letter to *Environmental Research Letters*

23 May 2019

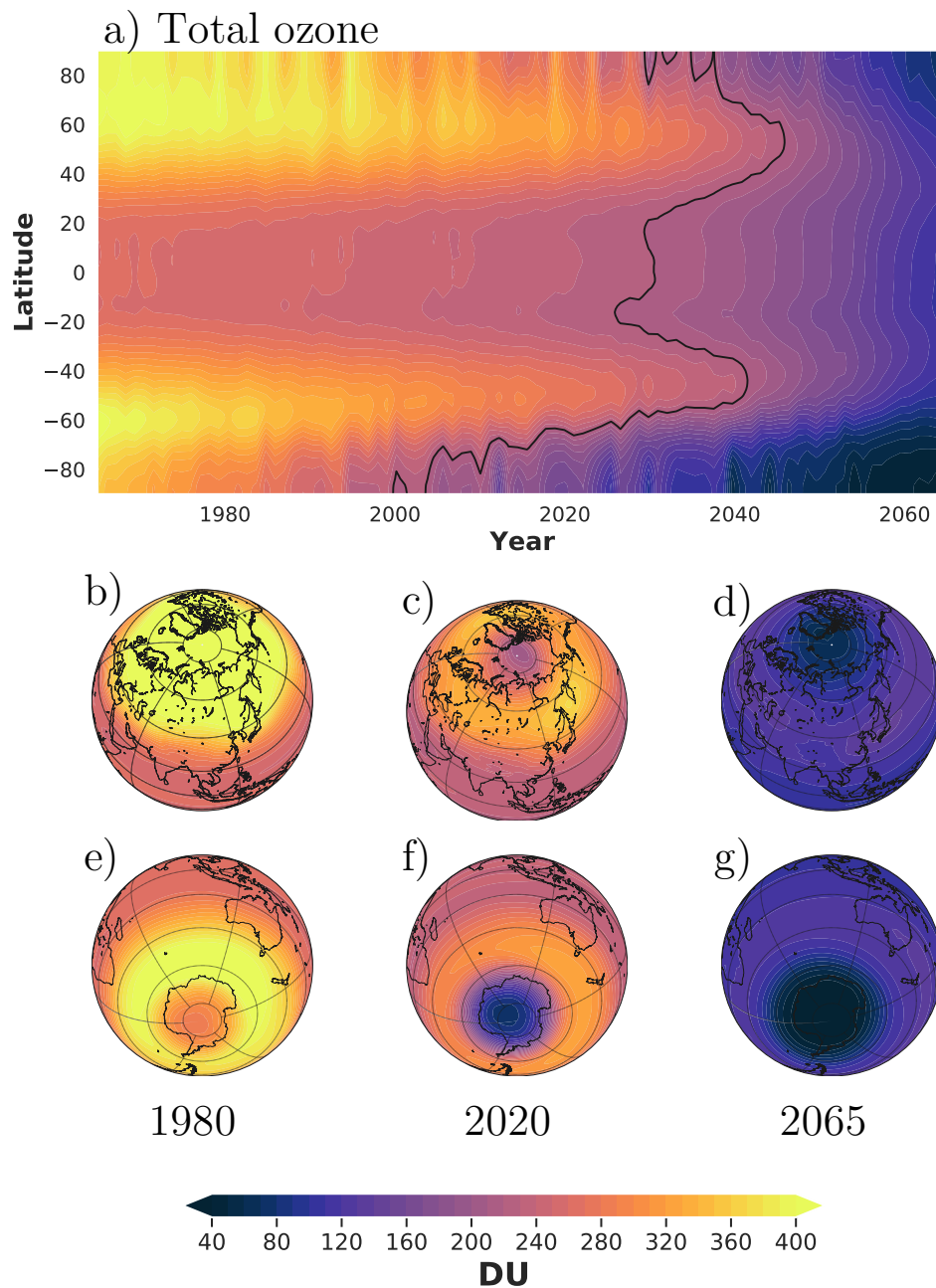
## Supplementary Material

---

\* Corresponding author: [rishav.goyal@unsw.edu.au](mailto:rishav.goyal@unsw.edu.au)



**Figure S1 | Global averaged surface temperature anomaly from CMIP5 models.** A total of 90 ensemble members from 39 CMIP5 models are used. The RCP8.5 members (i.e. the high emissions scenario) are used for future projections (2006 onwards). The thick red and black lines represent respectively the surface temperature anomaly from ACCESS1.0 (average of 3 ensemble members) and the multi-model mean (MMM).



**Figure S2 | Time evolution of total ozone in the No Protocol scenario.** a) Annual averaged total ozone concentrations from 1974 to 2065. The solid black line represents the 220 DU contour which is considered as a threshold for the ozone hole (Newman *et al* 2006). Panels (b), (c) and (d) represent total ozone over the Arctic during April of year 1980, 2020 and 2065 respectively. Panels (e), (f) and (g) represent total ozone over the Antarctic during September of year 1980, 2020 and 2065 respectively. All values are shown in Dobson units (DU).

#### Supplementary Material References

Newman P A, Nash E R, Kawa S R, Montzka S A and Schauffler S M 2006 When will the Antarctic ozone hole recover? *Geophys. Res. Lett.* **33** 1–5