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Ozone Depletion in the Arctic Lower Stratosphere; Timing and Impacts on the Polar Vortex.

Cameron Rae (1) and John Pyle (1,2)

(1) University of Cambridge, Centre for Atmospheric Science, Department of Chemistry, Cambridge, United Kingdom (cdr39@cam.ac.uk), (2) NCAS, University of Cambridge

There a strong link between ozone depletion in the Antarctic lower stratosphere and the strength/duration of the southern hemisphere polar vortex. Ozone depletion arising from enhanced levels of ODS in the lower stratosphere during the last few decades of the 20th century has been accompanied by a delay in the final warming date in the southern hemisphere. The delay in final warming is associated with anomalous tropospheric conditions. The relationship in the Arctic, however, is less clear as the northern hemisphere experiences relatively less intense ozone destruction in the Arctic lower stratosphere and the polar vortex is generally less stable. This study investigates the impacts of imposed lower stratospheric ozone depletion on the evolution of the polar vortex, particularly in the late-spring towards the end of its lifetime. A perpetual-year integration is compared with a series of near-identical seasonal integrations which differ only by an imposed artificial ozone depletion event, occurring a fixed number of days before the polar vortex final warming date each year. Any differences between the seasonal forecasts and perpetual year simulation are due to the timely occurrence of a strong ozone depletion event in the late-spring Arctic polar vortex. This ensemble of seasonal forecasts demonstrates the impacts that a strong ozone depletion event in the Arctic lower stratosphere will have on the evolution of the polar vortex, and highlights tropospheric impacts associated with this phenomenon.