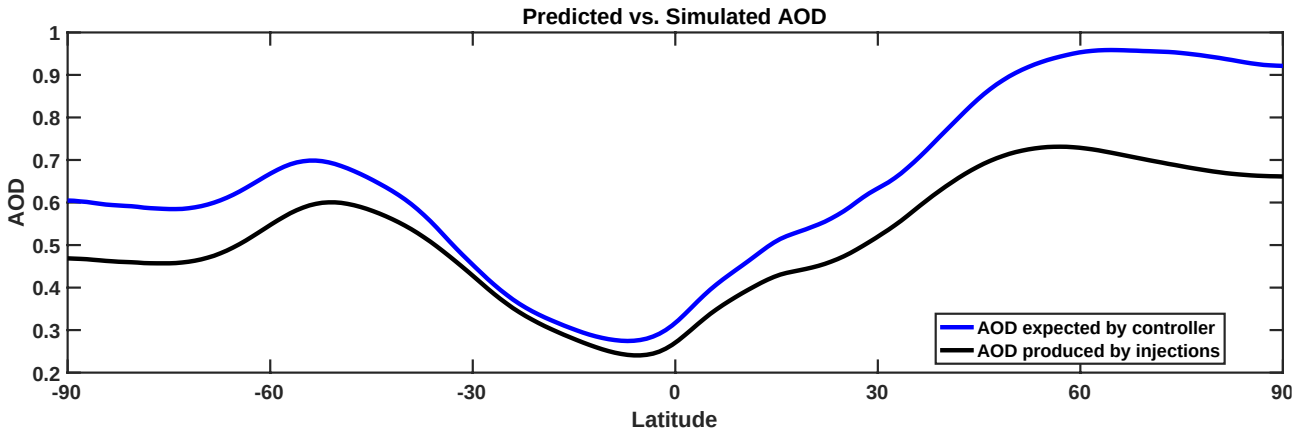

Fig.S1 Comparison of zonally averaged AOD in the last 20 years of simulations (2080-2099) between the one expected by the controller, given a linear combination of the single-point injections described in MacMartin et al. (2017) (blue), and the one simulated in CESM1(WACCM) given the four simultaneous injections (black).

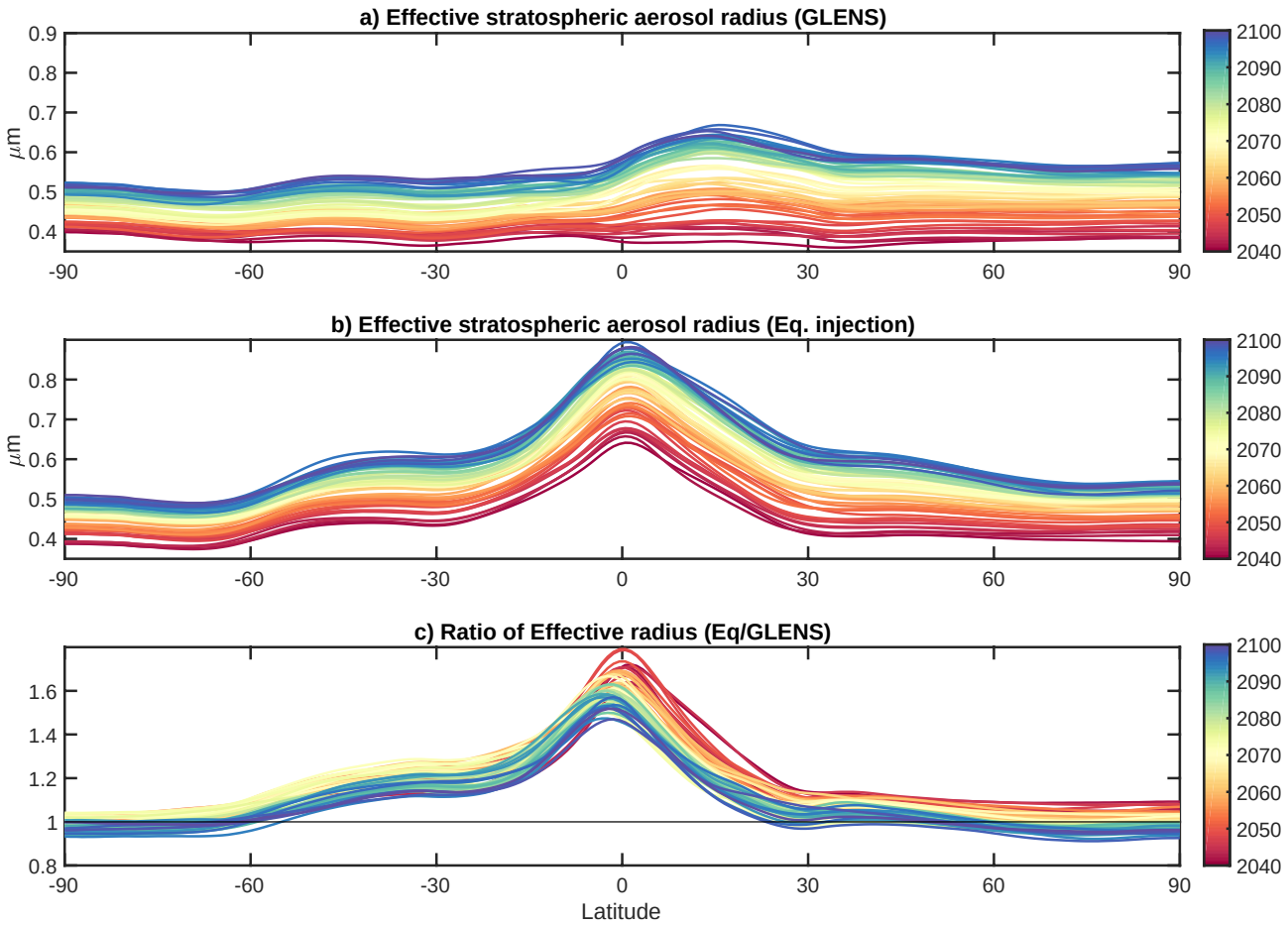

Fig.S2 Effective stratospheric aerosol radius in a) GLENS and b) Eq. injection, with the color scale similar to Fig. 1. In panel c) we show the ratio of the radii between the two cases.

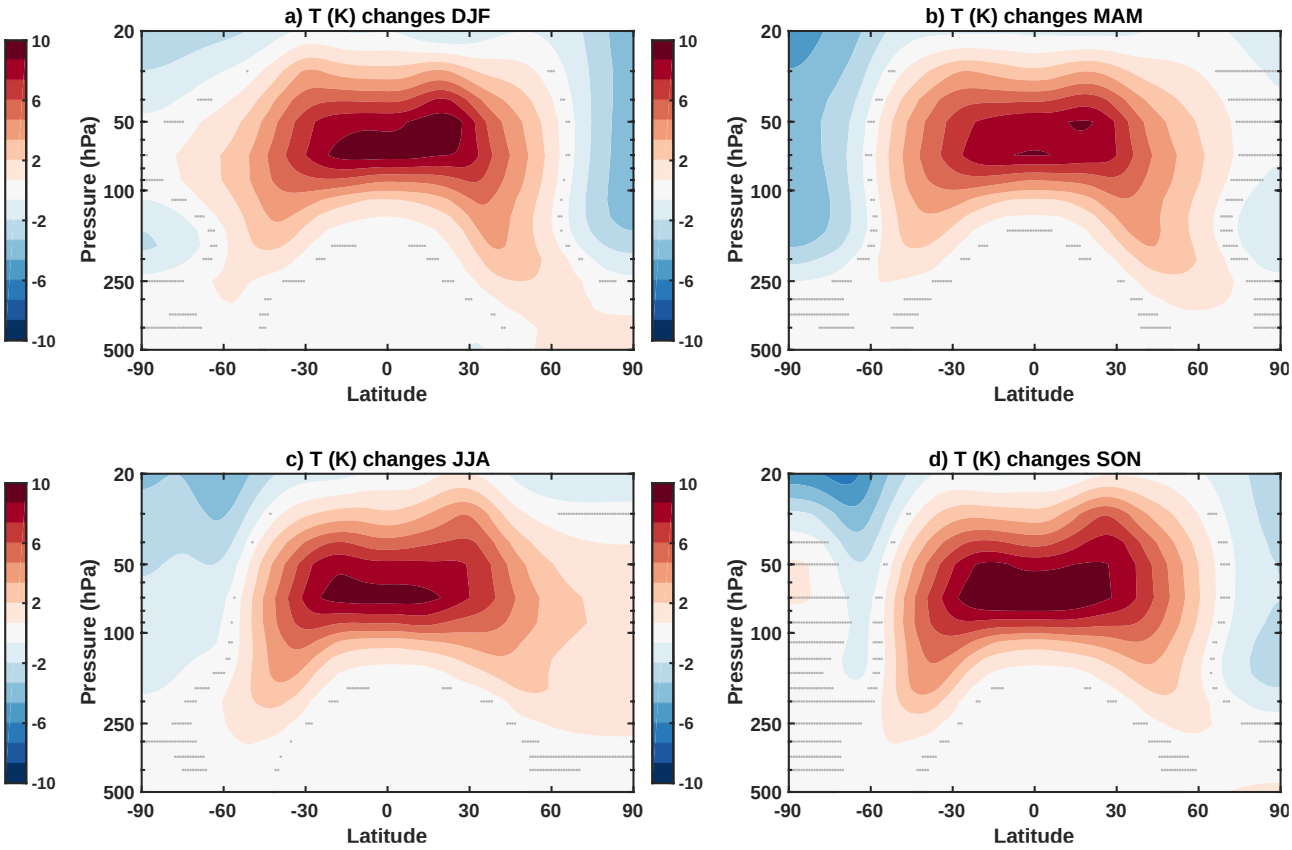

Fig. S3: zonal mean air temperature changes between the last two decades of the experiment (2080-2099) compared with the Control period (2010-2029). Gray areas indicate regions where the differences are not significantly different from zero (p value < 0.05) using a two-sided t test.

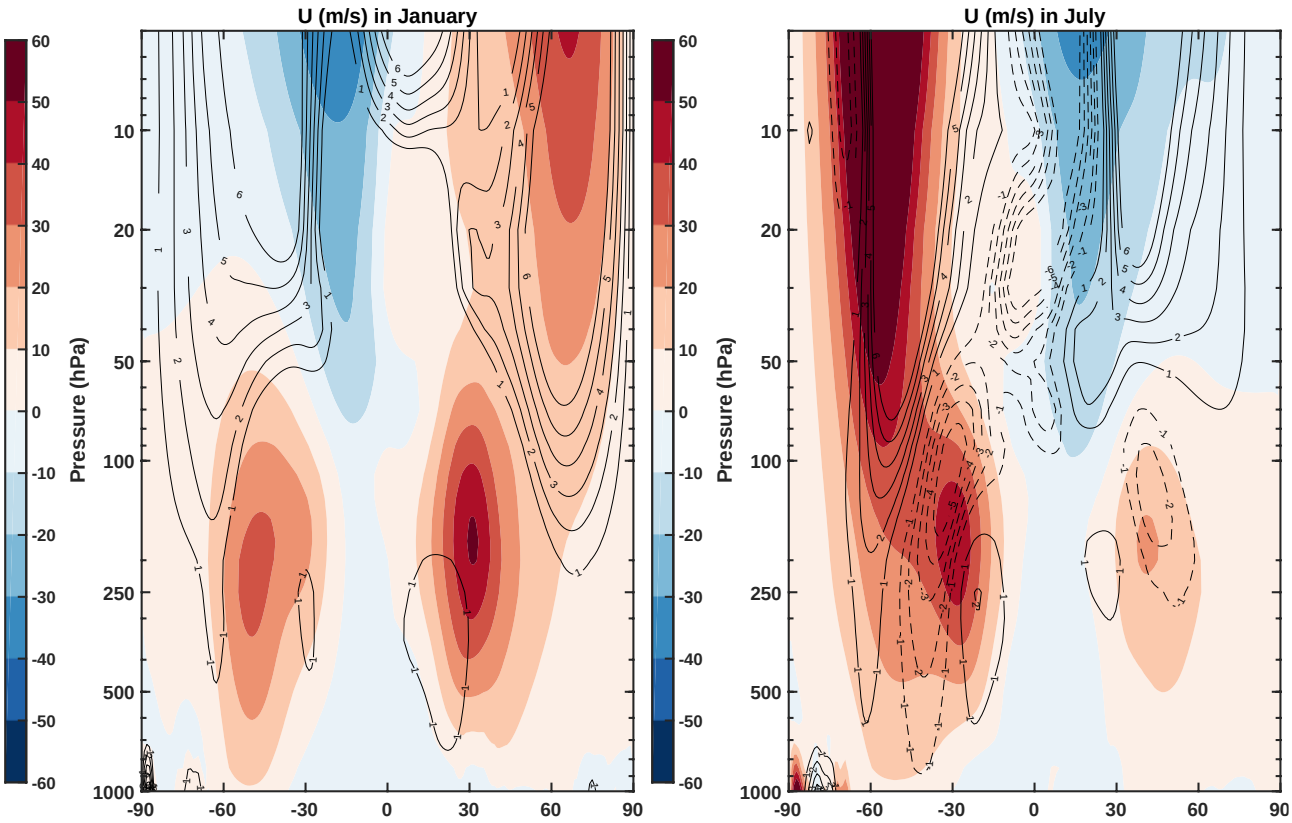

Fig.S4 Zonal winds in NH winter (left) and SH winter (right) in 2010-2029 under RCP8.5 (color shading) and differences in zonal winds between GLENS in the period 2080-2099 and RCP in 2010-2029 (contours).

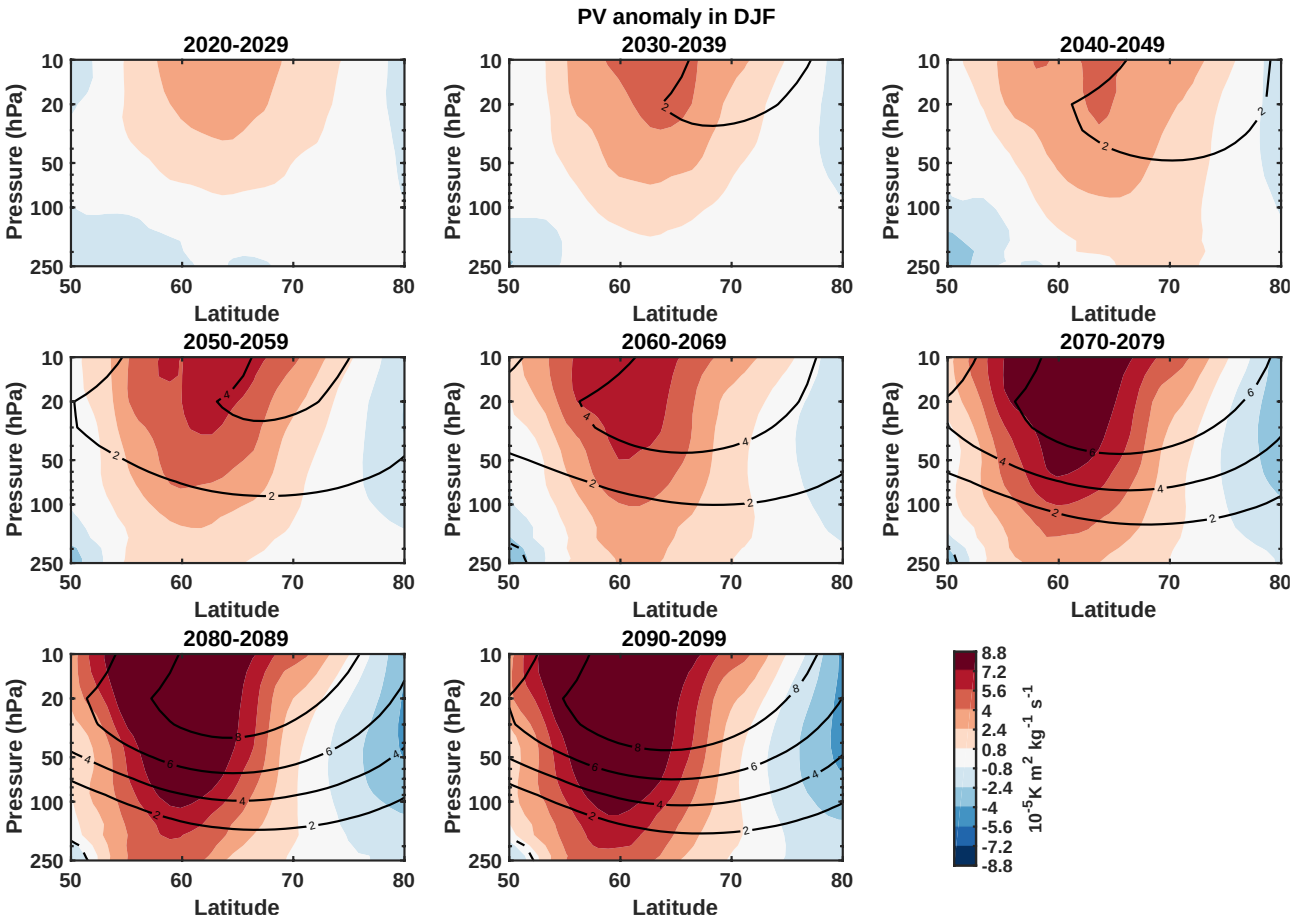

Fig.S5 Potential Vorticity zonal gradient anomalies for each decade compared to the 2010-2029 period (colored shading) and U winds (black contours, in m/s) in DJF in the Northern Hemisphere.

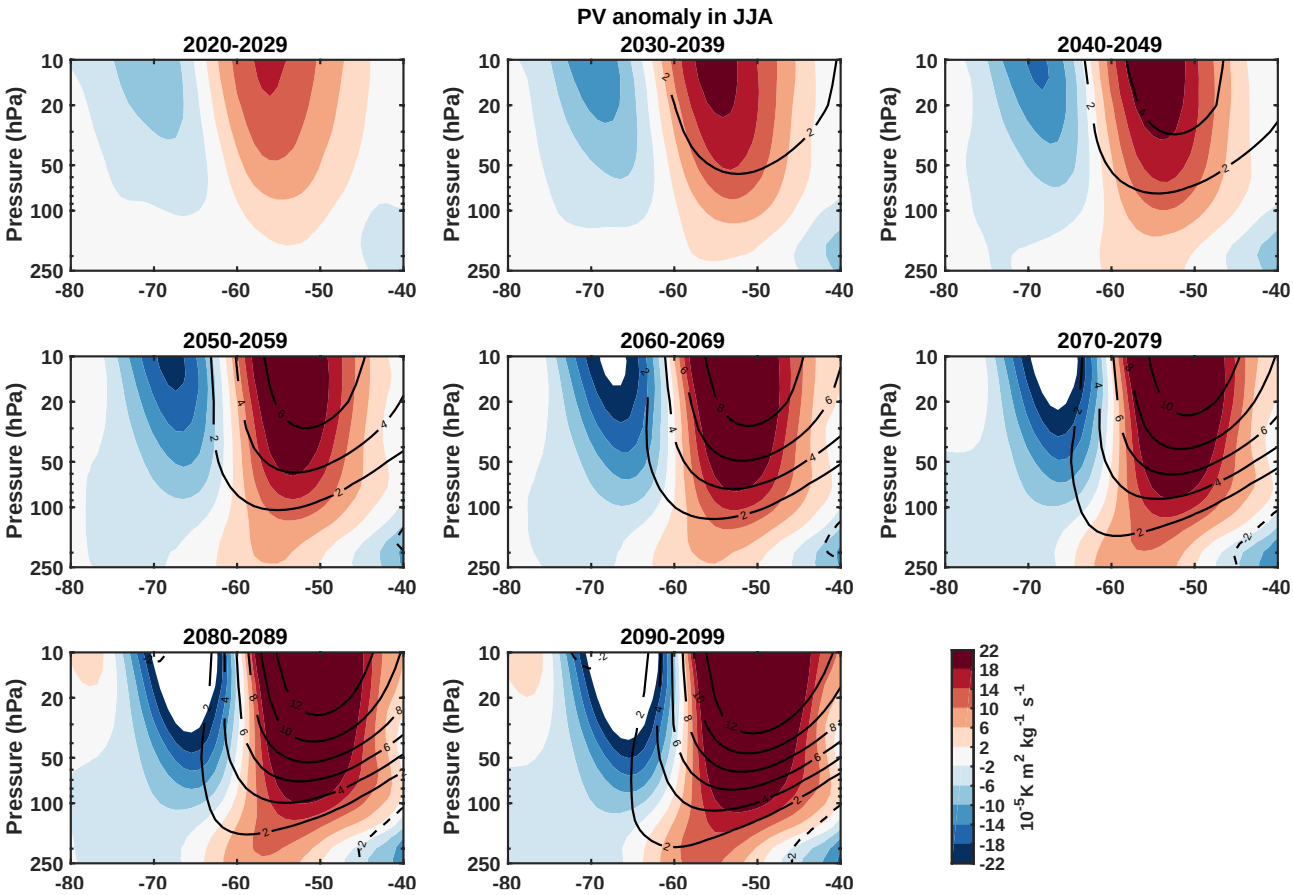

Fig.S6 Potential Vorticity gradient anomalies for each decade compared to the 2010-2029 period (colored shading) and U winds (black contours, in m/s) in JJA in the Southern Hemisphere.

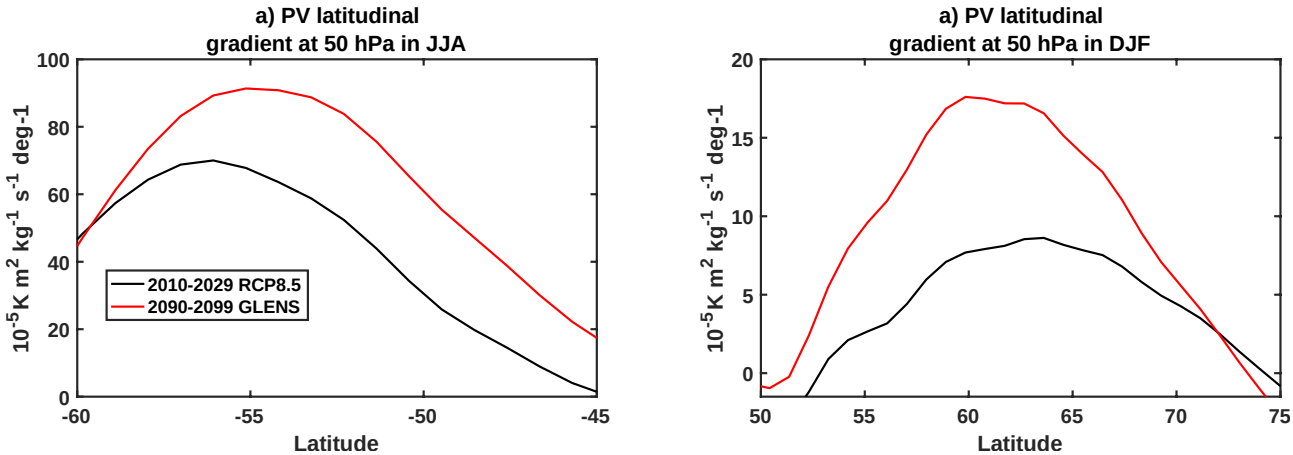

Fig.S7 Potential Vorticity gradient in the 2010-2029 period (black line) and at the end of century in the GLENS case (red line) in DJF in the Northern Hemisphere (panel a) and in JJA in the Southern Hemisphere (panel b).

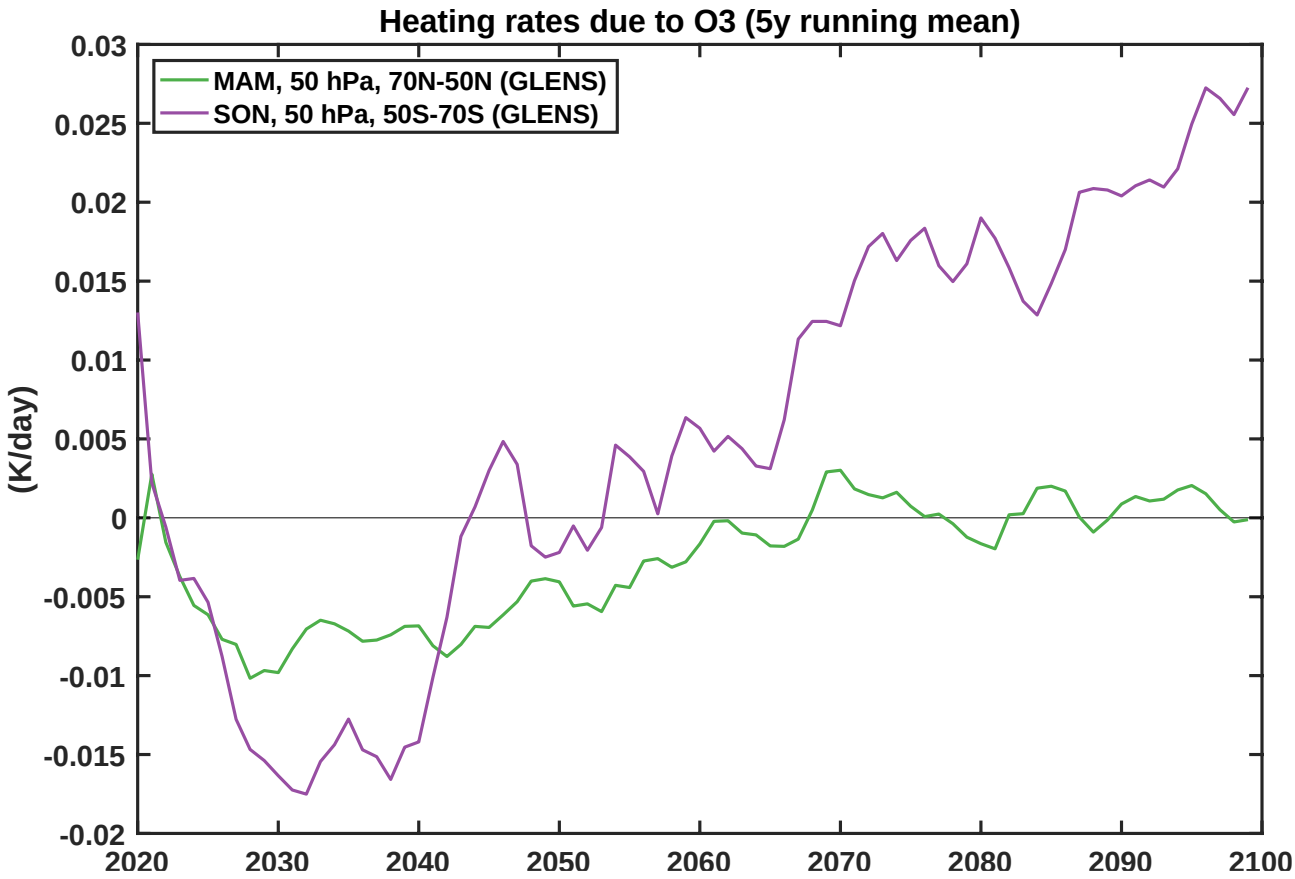

Fig.S8 Changes in O_3 heating rates compared to the same period in 2010-2029 in RCP8.5 in both hemispheres at 50 hPa between 50° and 70° in the spring of both hemispheres, when ozone destruction is maximized.