Supplement to: Stationary waves weaken and delay the near-surface response to stratospheric ozone depletion

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ABSTRACT

Figure S1 shows the climatological zonal mean zonal wind in STAT and AQUA80. Figure S2 shows the zonal wind at 850hPa response to ozone depletion in STAT and AQUA80. Figure S3 shows the Eliassen-Palm flux divergence response to ozone depletion in AQUA80 and STAT, while Figure S7 is similar but for a stratospheric diabatic cooling perturbation. Figure S4 shows the climatological Eliassen-Palm flux for reference. The main body documents some aspects of the response when an ozone hole is placed in the Northern Hemisphere, and Figure S5 shows more. Figure S6 shows the transformed Eulerian mean momentum budget for AQUA80. Figure S8 shows the response to ozone when the jet latitude is pushed poleward for the AQUA80 configuration.

Acknowledgments. CIG, IW, and ME acknowledge the support of a European Research Council starting grant under the European Union Horizon 2020 research and innovation programme (grant agreement number 677756). EPG acknowledges support from the US NSF through grant AGS 1852727. MJ acknowledges support from the Australian Research Council (ARC) Centre of Excellence for Climate Extremes (CE170100023) and ARC grant FL 150100035. SWS was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (Ministry of Science and ICT 2017R1E1A1A01074889.

References

Garfinkel, C. I., I. White, E. P. Gerber, and M. Jucker, 2020: The impact of sst biases in the tropical east pacific and agulhas current region on atmospheric stationary waves in the southern hemisphere. *Journal of Climate*, **33 (21)**, 9351–9374.

LIST OF FIGURES

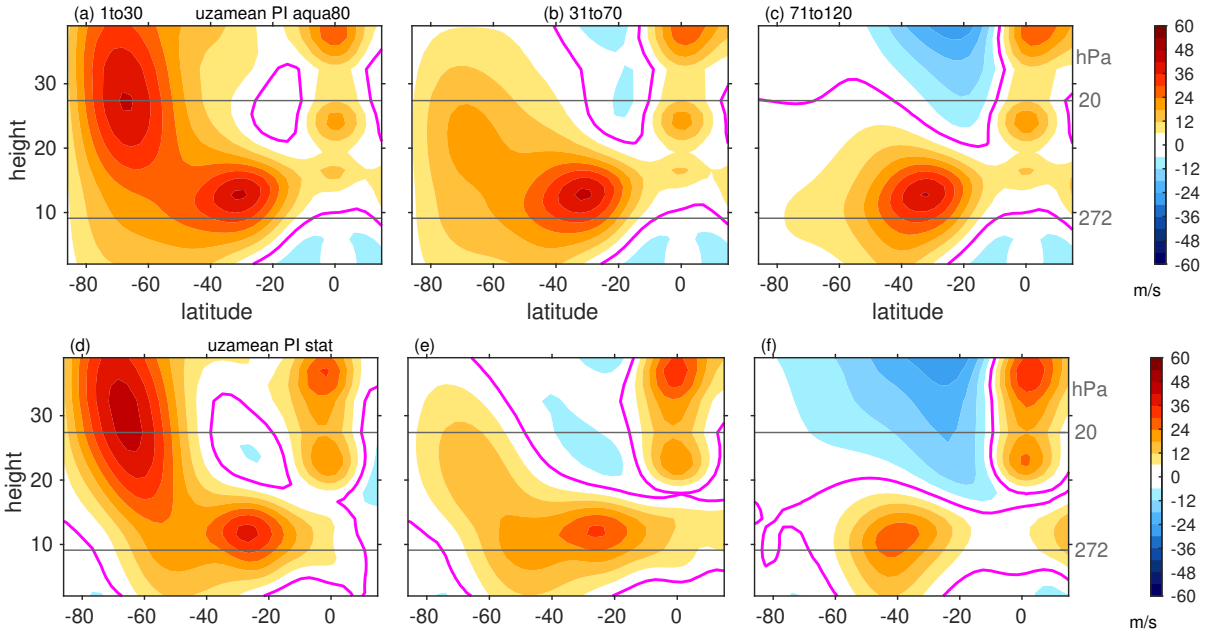

Fig. S1. Climatology of zonal wind in the postindustrial control run of STAT (bottom) and AQUA80 (top) for the three periods focused on in the other figures. The zero-line is magenta.

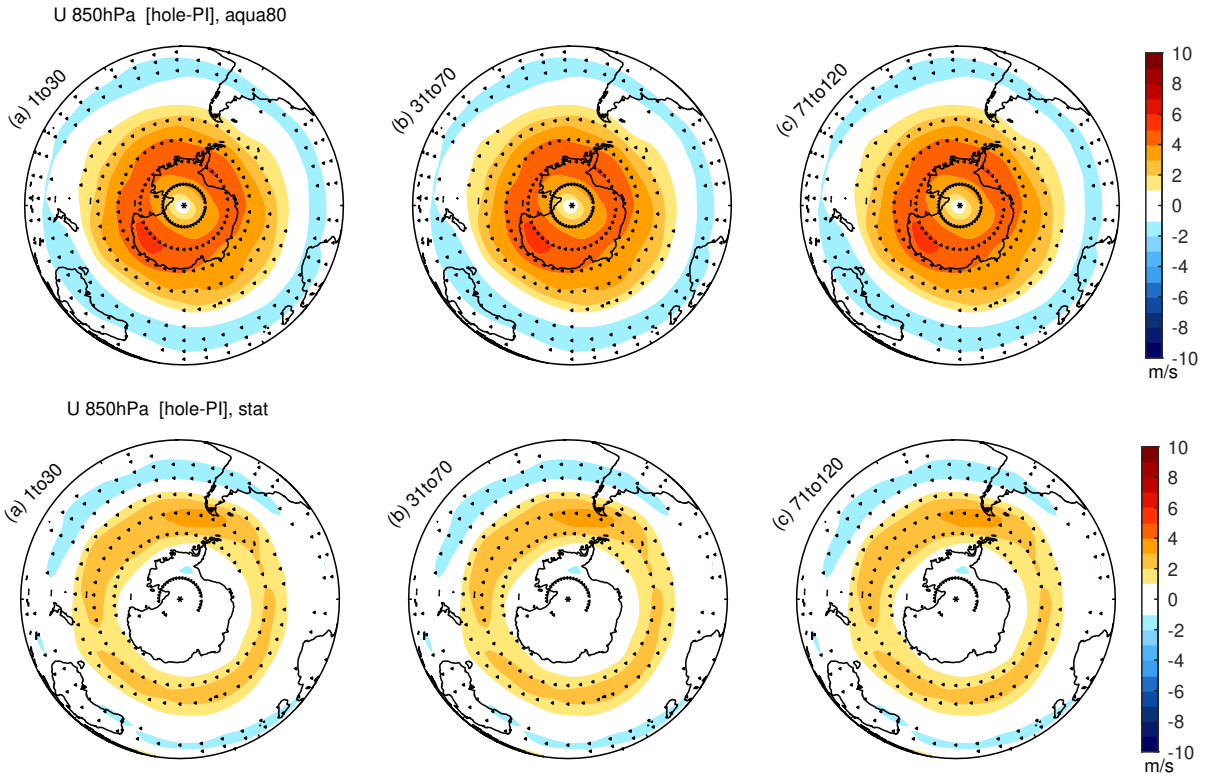

Fig. S2. Zonal wind response [hole - PI] at 850hPa in STAT and AQUA80.

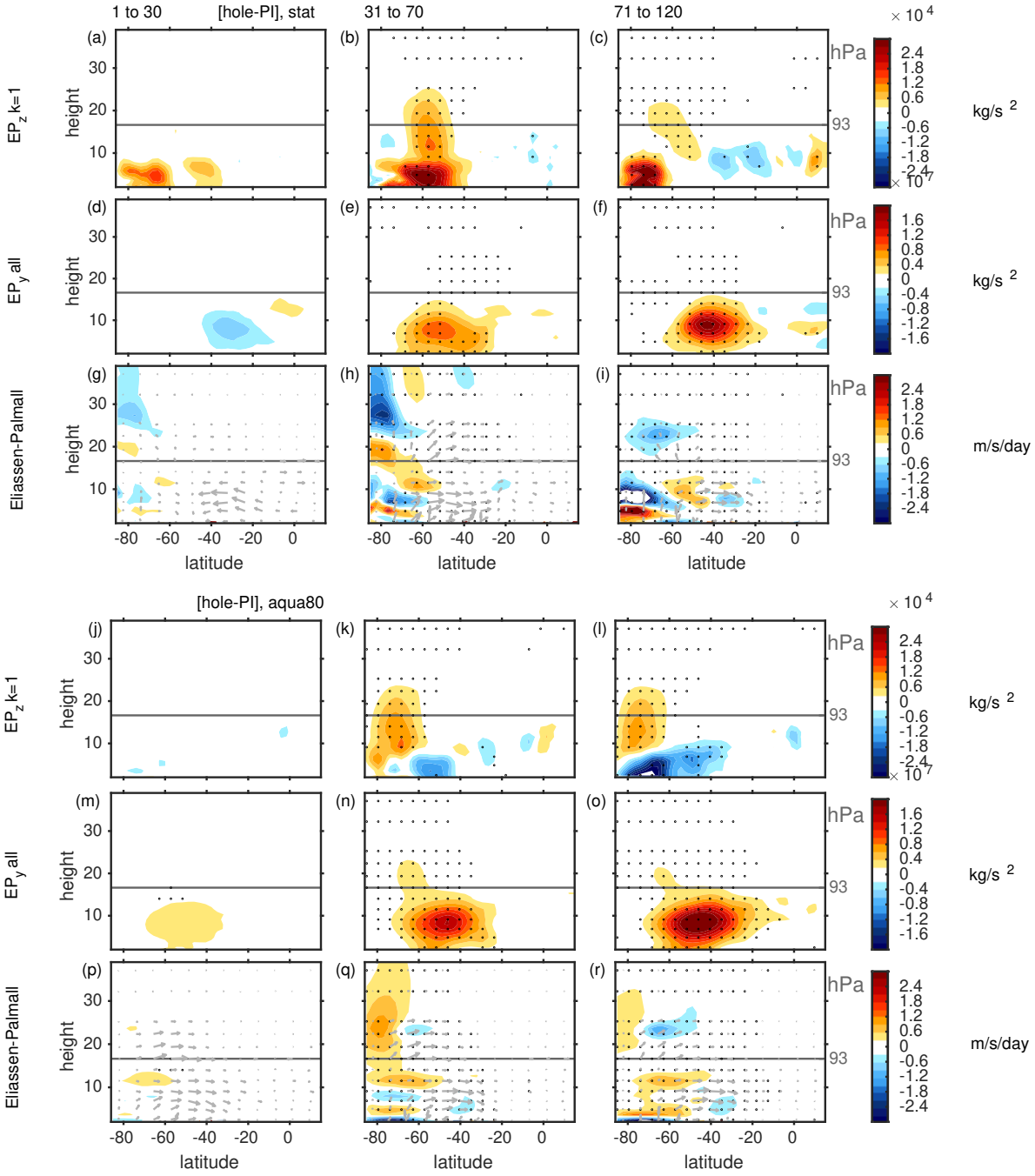

Fig. S3. EP_z for wavenumber-1, EP_y for all wavenumbers, and EPFD for all wavenumbers for the [ozone hole-PI] runs in (left) days 1-30 after branching, i.e. October; (middle) days 31 to 70; (right) days 71 to 120. Top three rows are for STAT, and the bottom three rows are for AQUA80. For the EPFD, we show the EP_z and EP_y components for all wavenumber with arrows with the EP_z enhanced by a factor of 50; above 93hPa, the arrows are multiplied by a factor of 5.

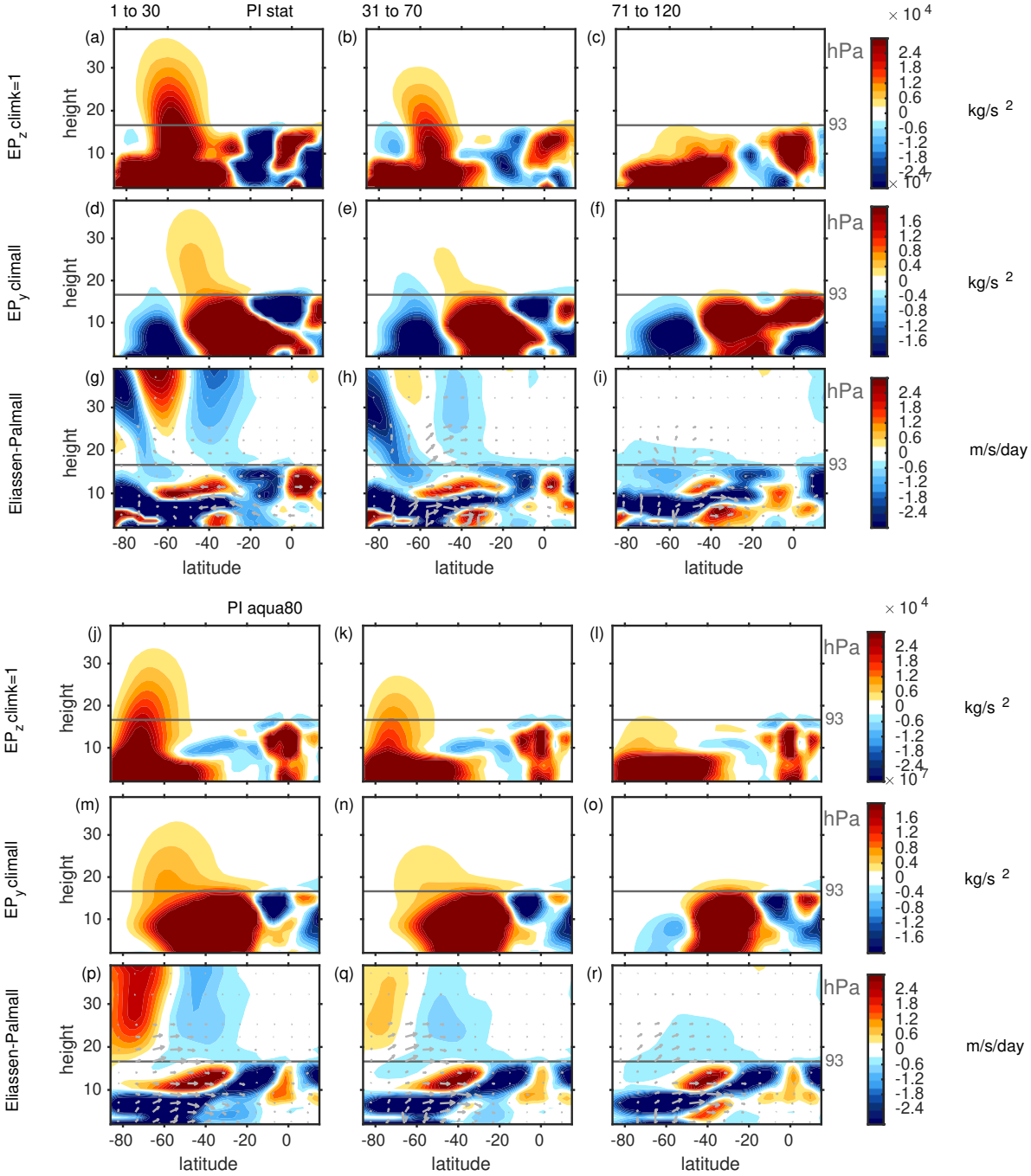

Fig. S4. EP_z for wavenumber-1, EP_y for all wavenumbers, and EPFD for all wavenumbers for the PI climatology in STAT and AQUA80. Other conventions intentionally follow Figure S3, which leads to saturation of colors in the troposphere.

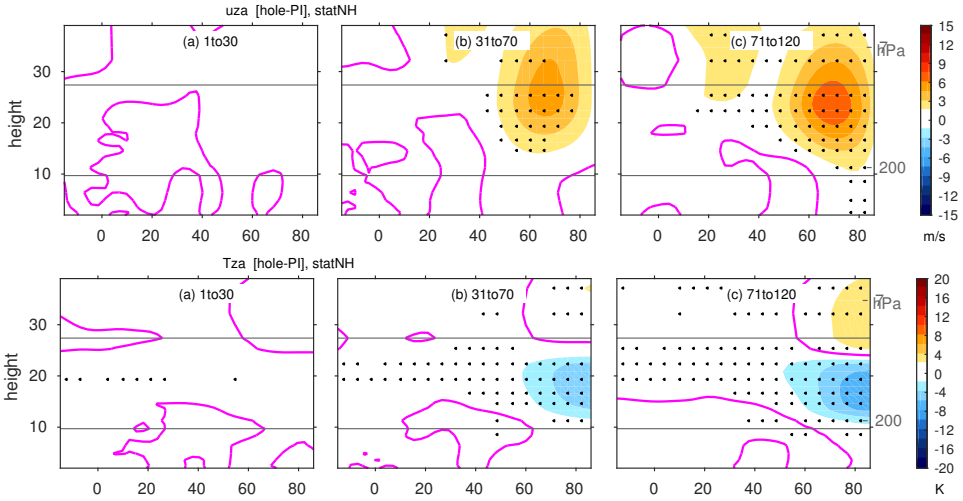

Fig. S5. Zonal-mean responses of temperature and zonal wind for a NH ozone hole branch ensemble starting on March 1st.

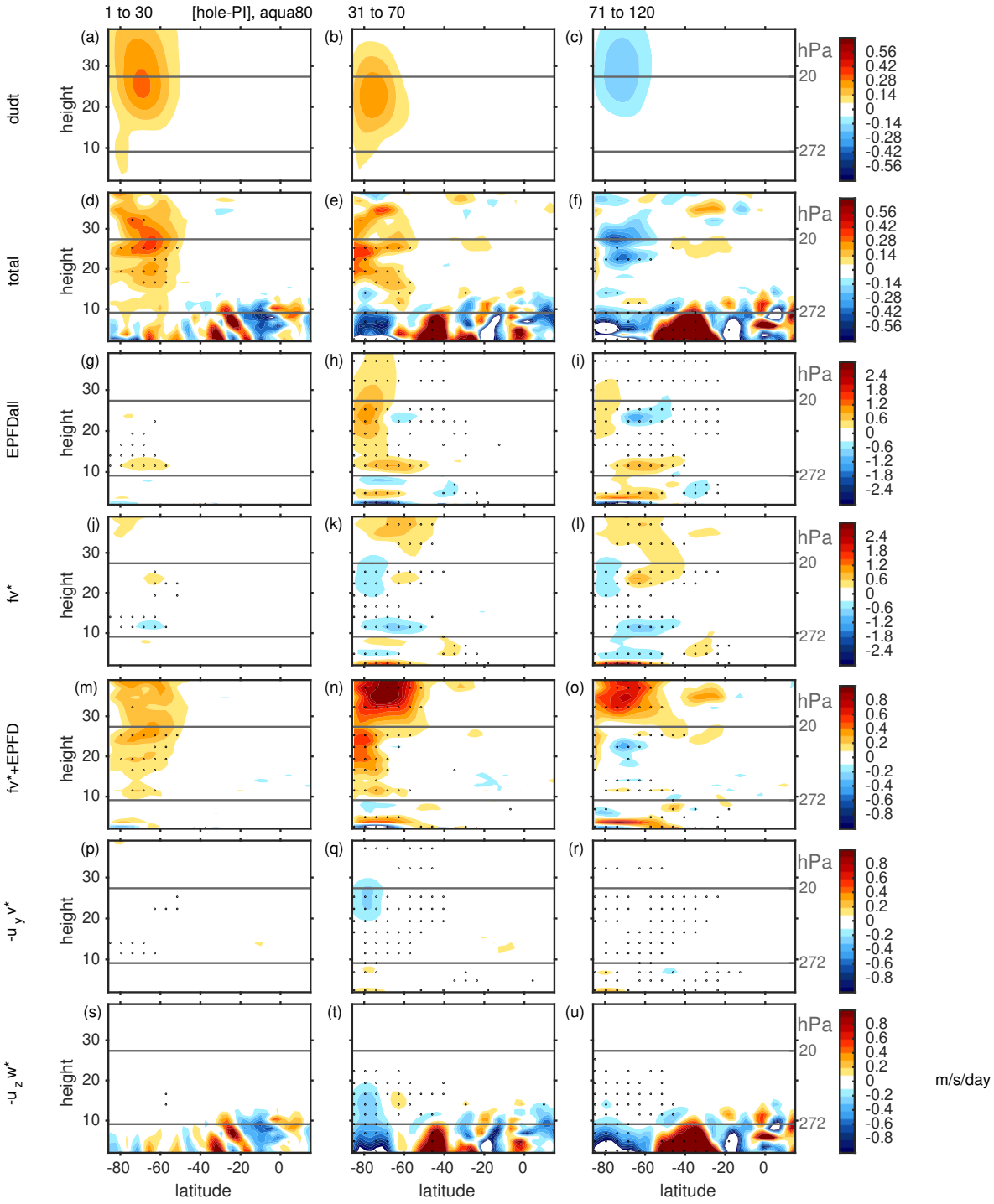

Fig. S6. TEM momentum budget for the [ozone hole-PI] aquaplanet runs, with "Antarctic" albedo equal to 0.8 in (left) days 1-30 after branching, i.e. October; (middle) days 31 to 70; (right) days 71 to 120. (a-c) total wind tendency; (d-f) sum of all terms; (g-i) eddy forcing terms (u'v' and u'w'); (j-l) coriolis torque; (m-o) sum of eddy forcing and coriolis torque; (p-r) gravity wave drag; (s-u) advection of mean zonal wind. Note that the color-bar for (g-i) and (j-l) differ from that in (m-o) due to the strong cancellation between eddy forcing and coriolis torque (as expected).

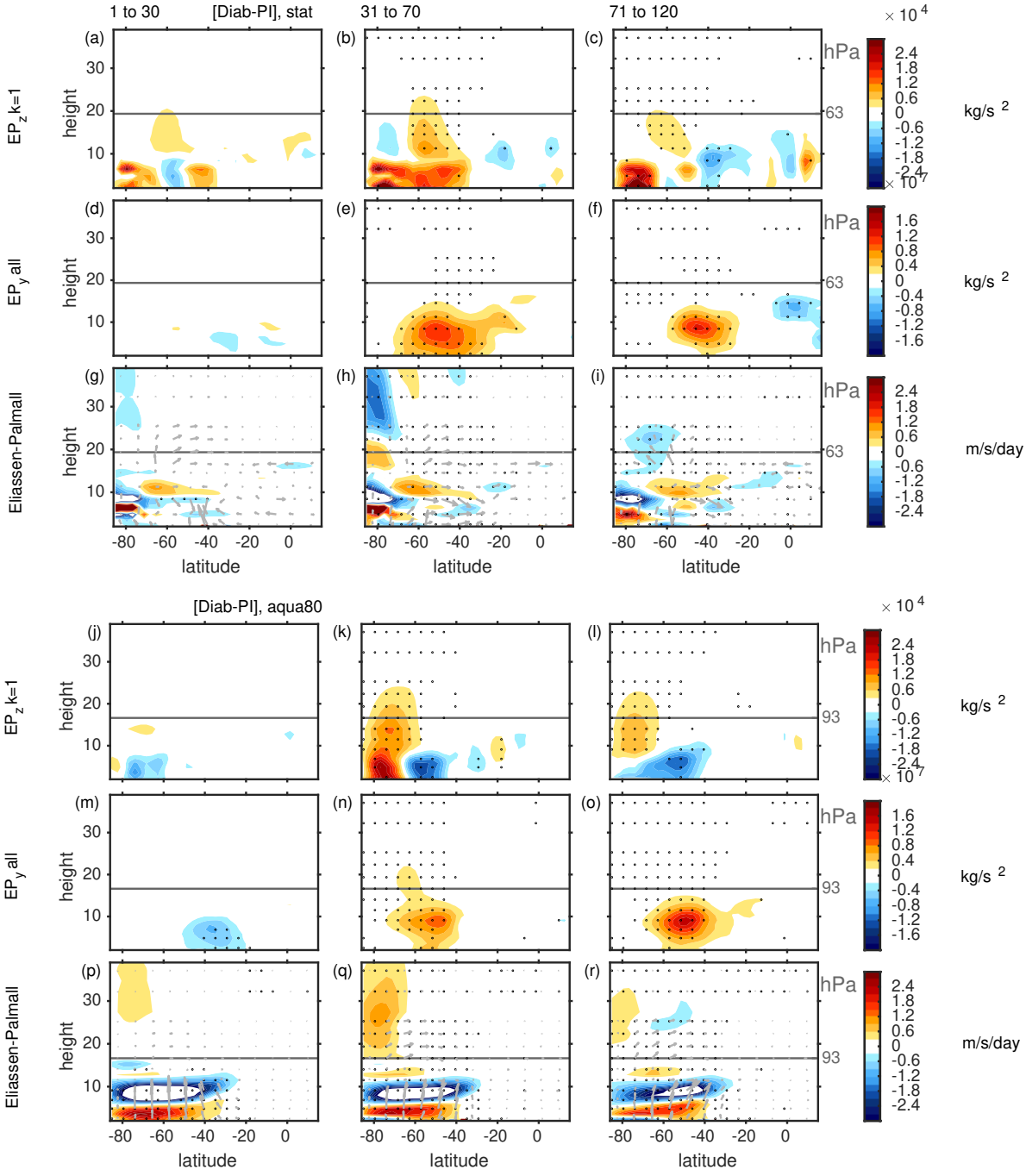

Fig. S7. As in Figure S3 but for the diabatic forcing experiments.

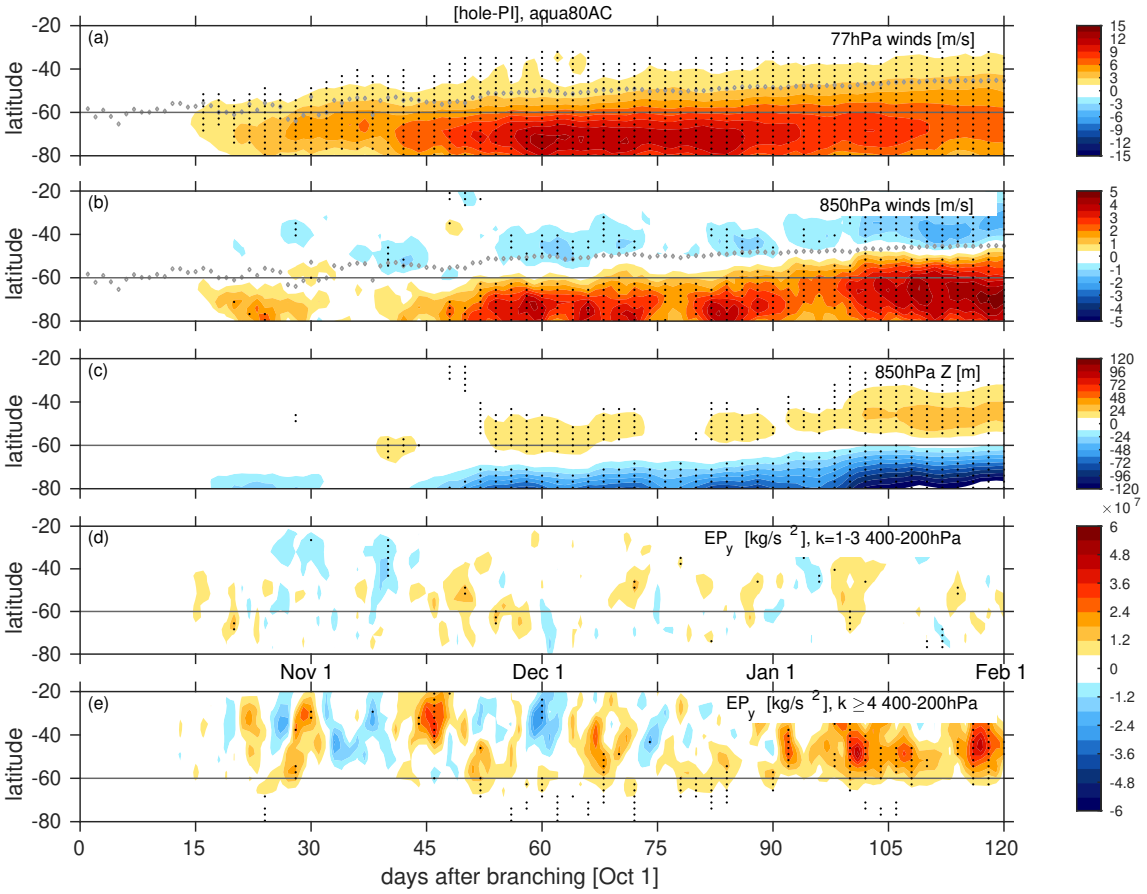

Fig. S8. As in Figure 6 of the main text but for a jet latitude 7° further poleward achieved by imposing a north-south gradient in midlatitude ocean heat transport following equation A8 of Garfinkel et al. (2020).

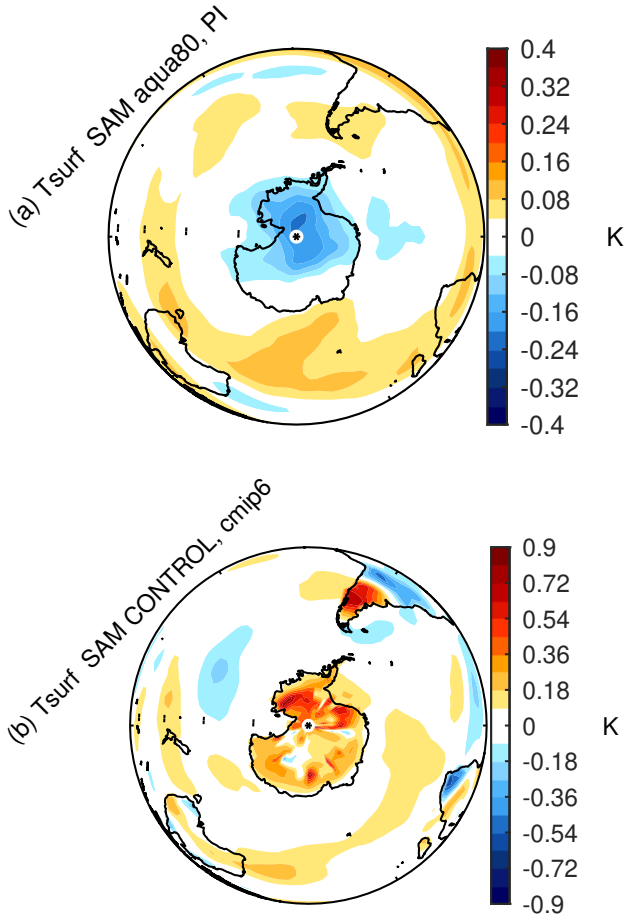

Fig. S9. Surface temperature anomalies associated with a 1 std dev anomaly of the SAM in STAT and in AQUA80. Note that surface temperature warming over South America are present as expected for both, however STAT does not simulate the expected surface cooling over Antarctica, consistent with the lack of an Antarctic cooling signal in response to ozone depletion. The colorbars differ for the top and bottom row.