Introduction

The supporting information contains figures showing the zonal mean zonal winds for the four model runs with heating wave 1 forcing; wave 1 and 2 components of vertical Eliassen-Palm (EP) flux and EP flux divergence for the eight model runs; changes in vertical EP flux and EP flux divergence between model runs with wave 1 heating; and time evolution of the polar vortex strength during 2000 days of the model runs. Movies showing the absolute vorticity at 10 hPa and 80 hPa around the sudden stratospheric warmings (SSWs) seen in Fig. 4 are uploaded separately, and can be found at https://doi.org/10.17605/OSF.IO/3VRME.

The calculations of EP flux were based on Edmon Jr. et al. (1980) and identical to those found in Lindgren et al. (2018). The vertical EP flux has been scaled by p_0/p, where $p_0 = 1000$ hPa. The scaling enables plotting of vertical EP flux for the full depth of the atmosphere in the same panel.

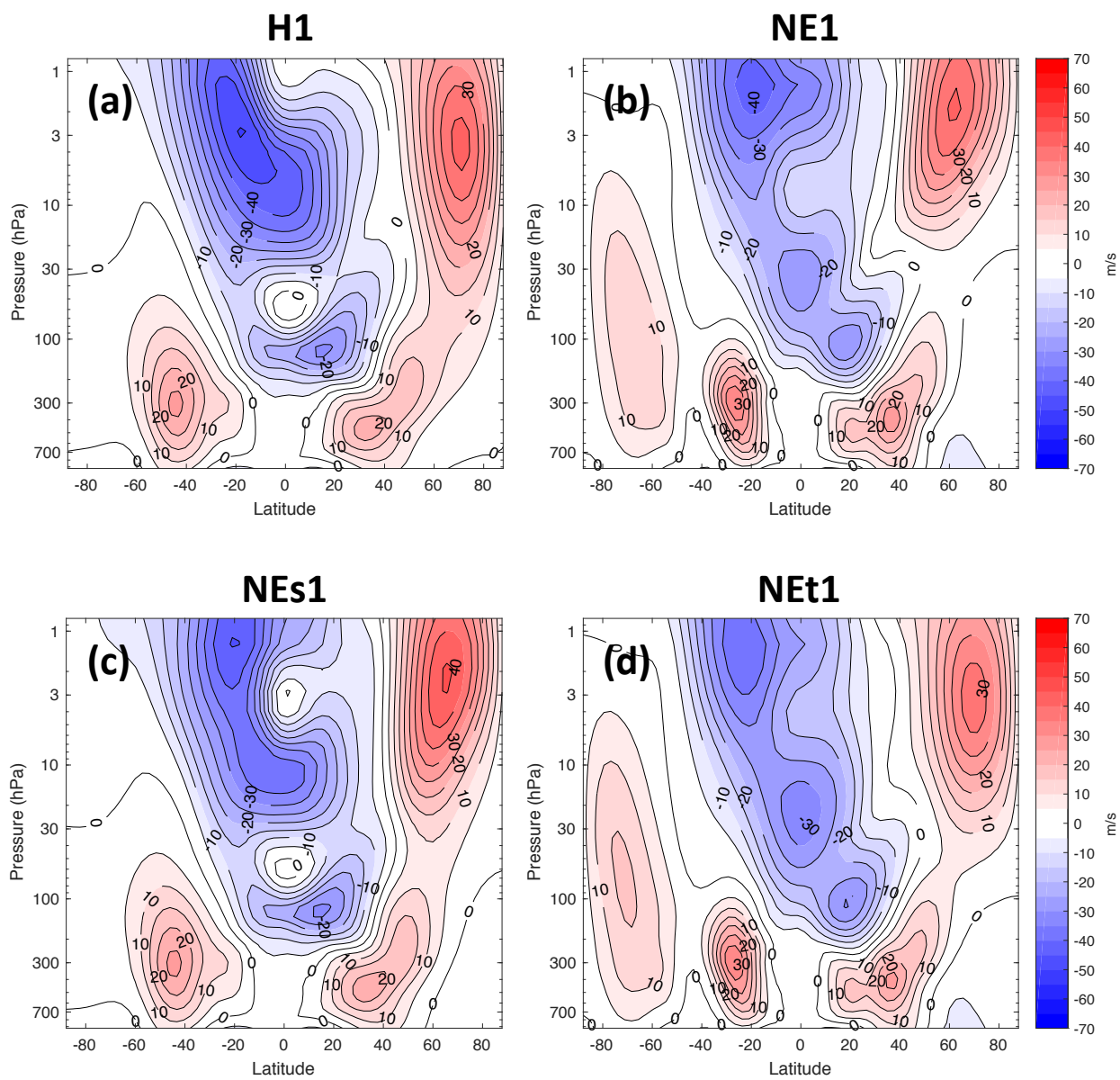

Figure S1. Zonal mean zonal winds for H1 (a), NE1 (b), NEs1 (c) and NEt1 (d). The contour interval is 5 m s^{-1}.

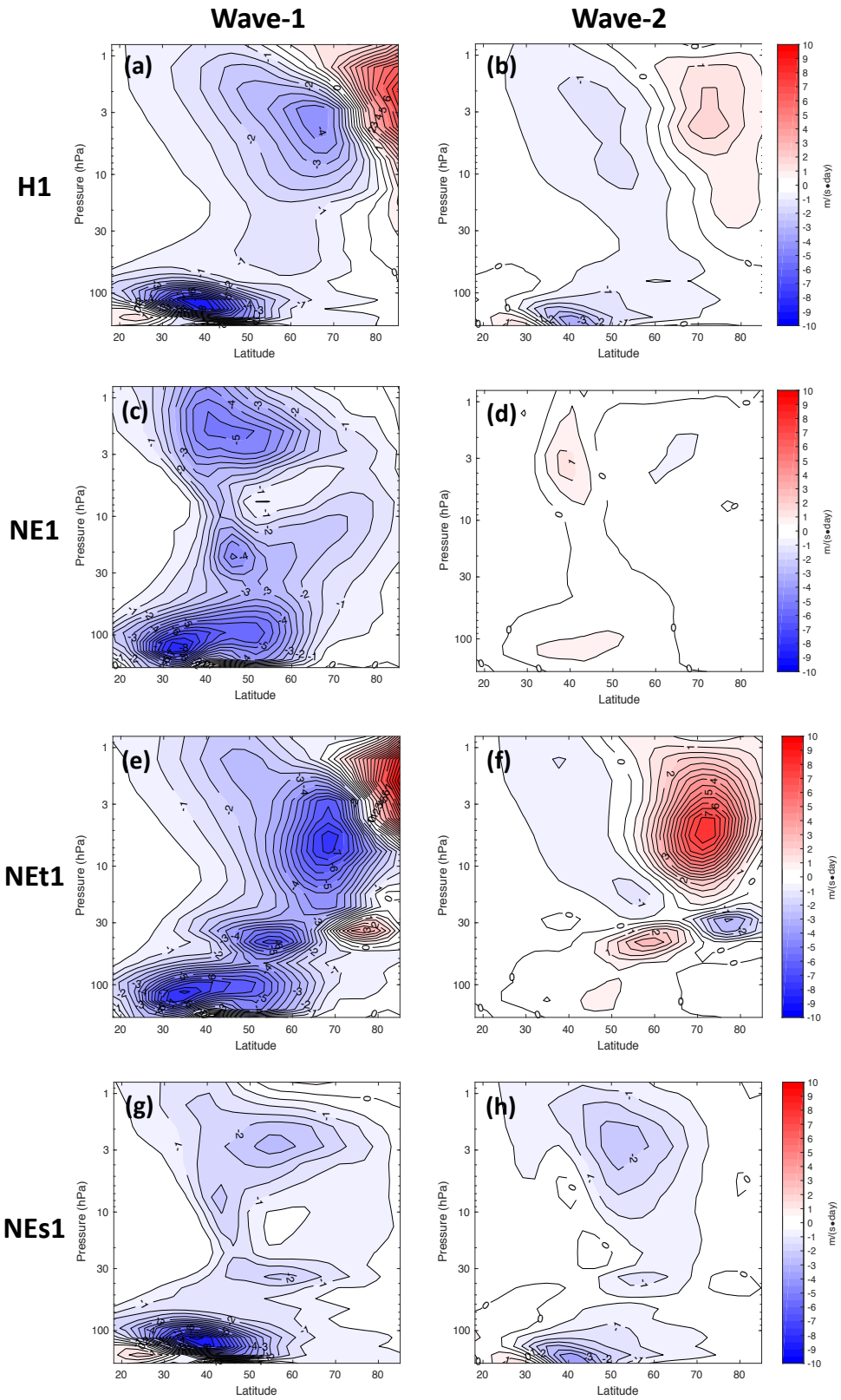

Figure S2. Divergence of EP flux for H1 (a and b), NE1 (c and d), NEt1 (e and f) and NEs1 (g and h). The left column shows the wave 1 components, while the right shows the wave 2 components. The contour interval is 0.5 m $(\mathrm{s{\cdot}day})^{-1}$.

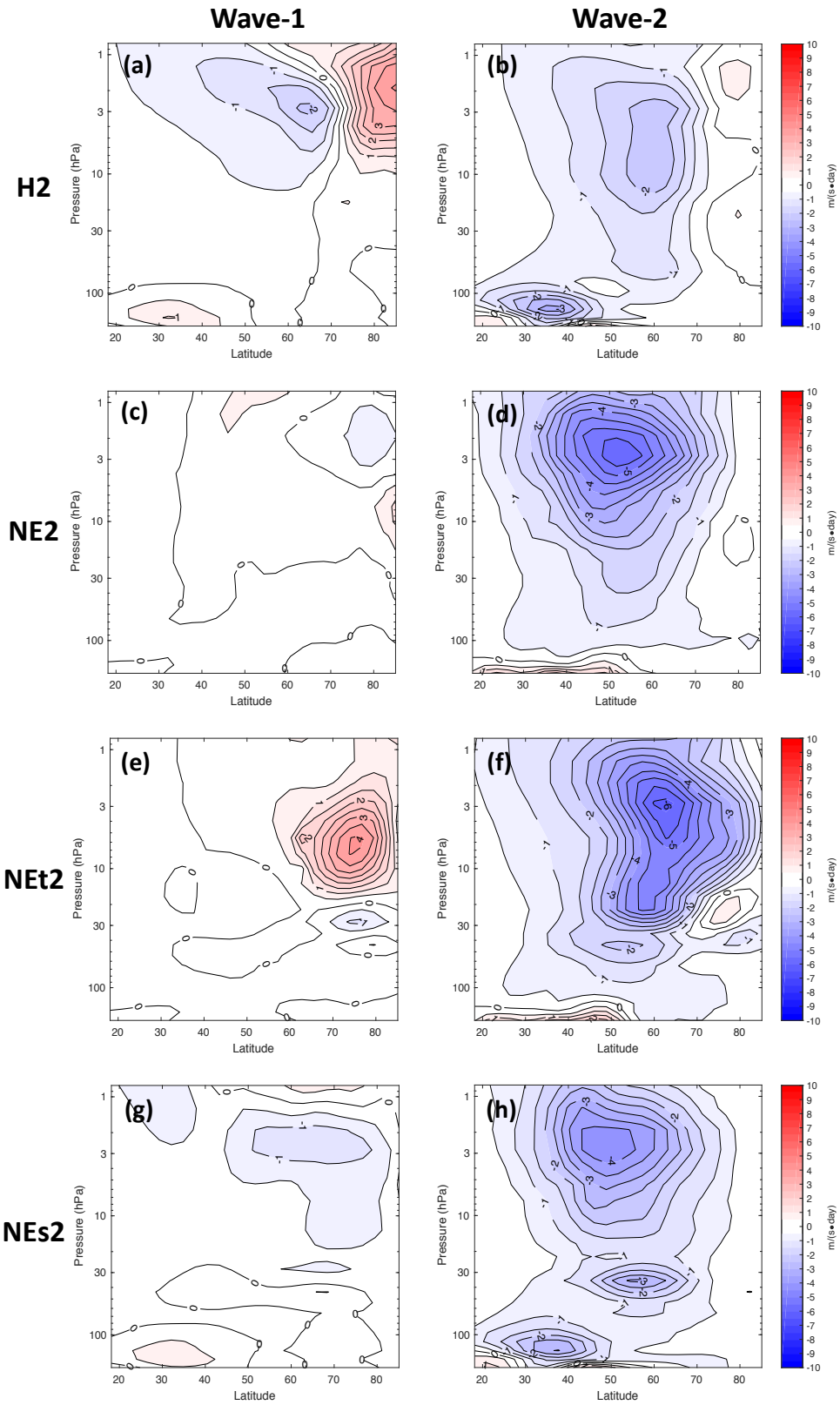

Figure S3. Divergence of EP flux for H2 (a and b), NE2 (c and d), NEt2 (e and f) and NEs2 (g and h). The left column shows the wave 1 components, while the right shows the wave 2 components. The contour interval is 0.5 m $(\mathrm{s{\cdot}day})^{-1}$.

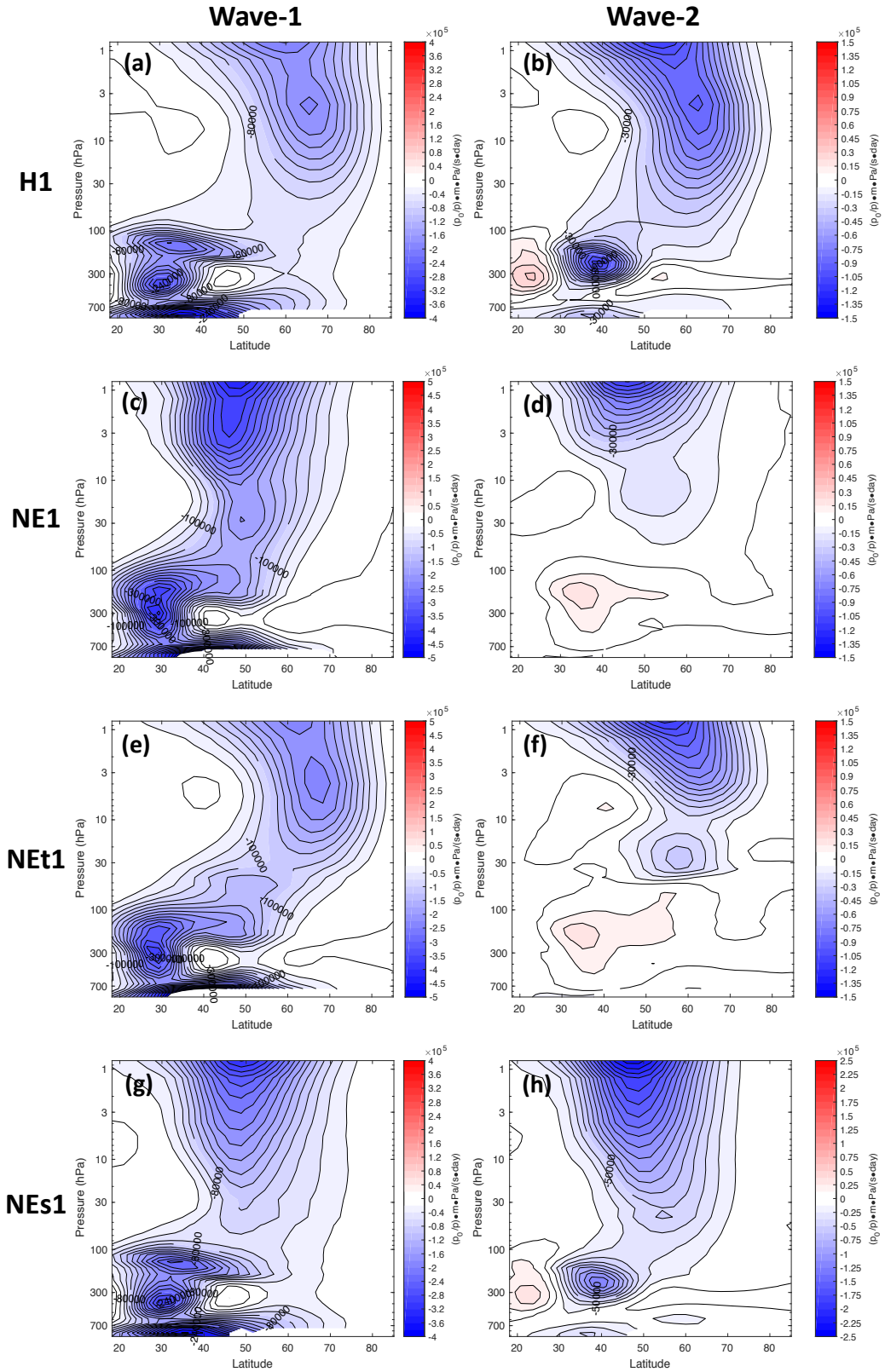

Figure S4. Pressure-scaled vertical EP flux for H1 (a and b), NE1 (c and d), NEt1 (e and f) and NEs1 (g and h). The left column shows the wave 1 components, while the right shows the wave 2 components. Notice the differences in color bar ranges and contour intervals.

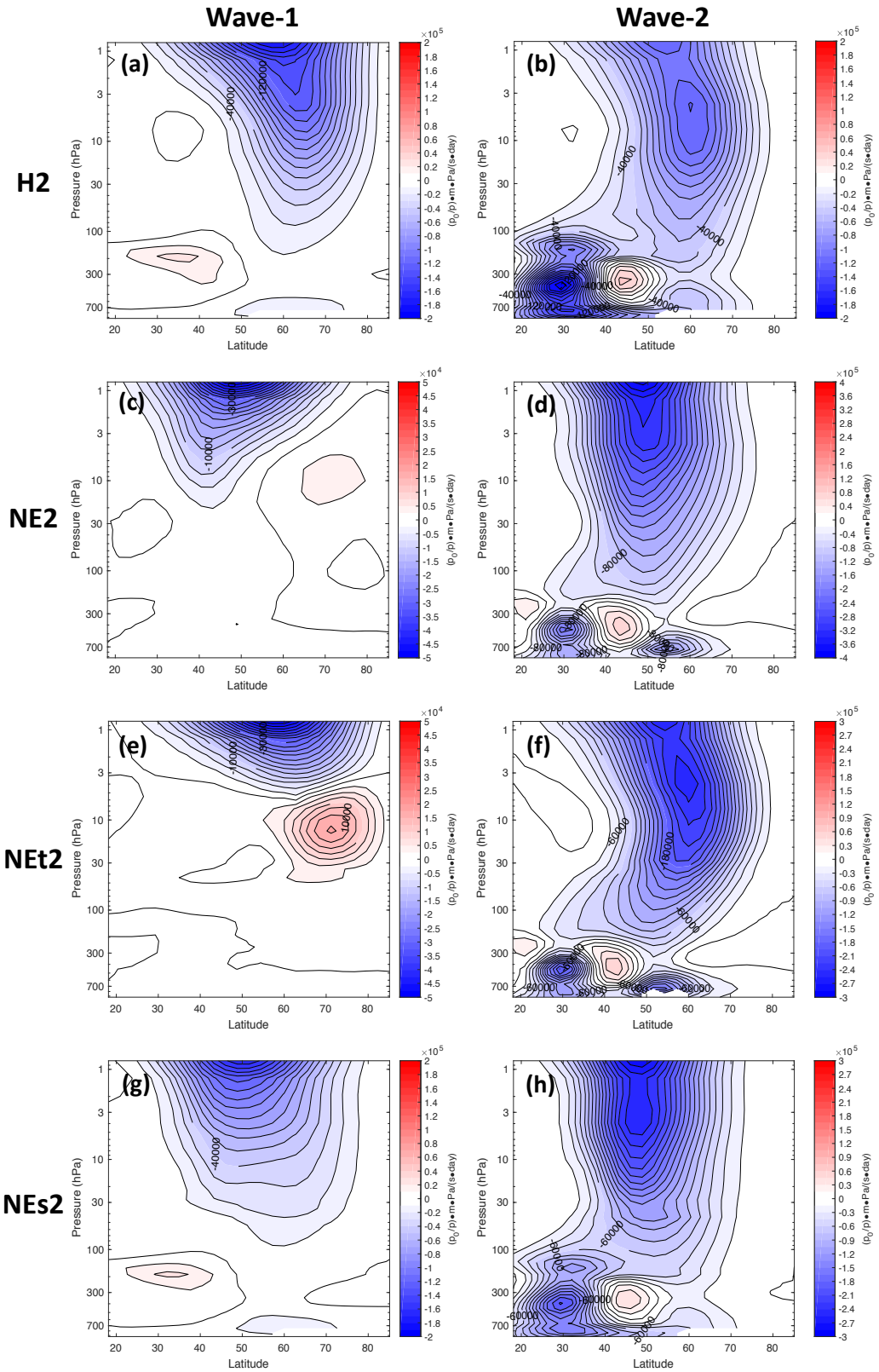

Figure S5. Pressure-scaled vertical EP flux for H2 (a and b), NE2 (c and d), NEt2 (e and f) and NEs2 (g and h). The left column shows the wave 1 components, while the right shows the wave 2 components. Notice the differences in color bar ranges and contour intervals.

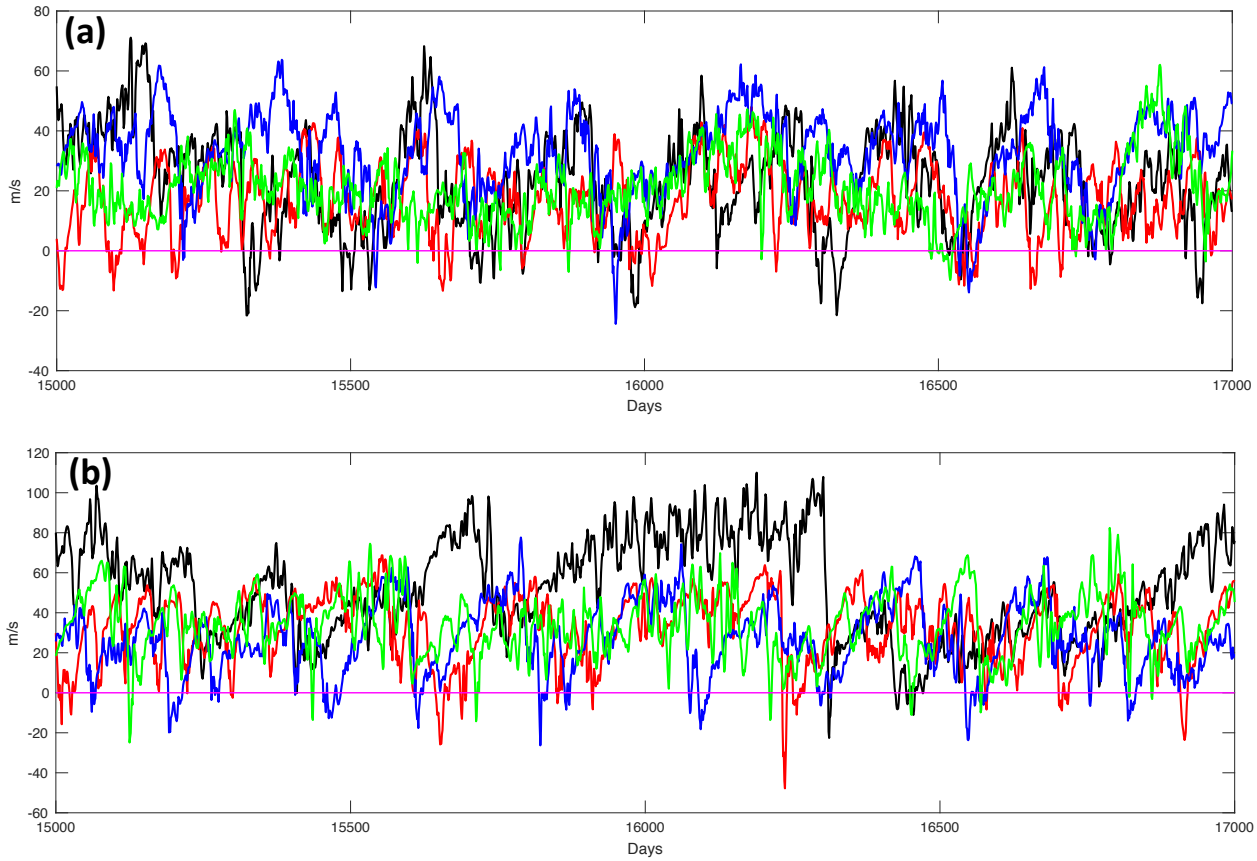

Figure S6. Zonal mean zonal wind at 10 hPa and 60° N for H1/H2 (black), NE1/NE2 (red), NEs1/NEs2 (blue) and NEt1/NEt2 (green) for model runs with wave 1 (a) and wave 2 (b) heating. The magenta line marks 0 m s^{-1}.

References

Edmon Jr., H. J., Hoskins, B. J., & McIntyre, M. E.: Eliassen-Palm cross sections for the troposphere. J. Atmos. Sci., 37 (12), 2600–2616, https://doi.org/10.1175/1520-0469(1980)037<2600:EPCSFT>2.0.CO;2, 1980.

Lindgren, E. A., Sheshadri, A., & Plumb, R. A.: Sudden Stratospheric Warming Formation in an Idealized General Circulation Model Using Three Types of Tropospheric Forcing. J. Geophys. Res. Atmos., 123 (18), 10125-10139, https://doi.org/10.1029/2018JD028537, 2018.