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Supplement of

A poleward storm track shift reduces mid-latitude heatwave frequency: insights from an idealized atmospheric model

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Supplementary Figures

This document contains supplementary Figures that are explained and referenced in the manuscript.

- Figures S1 and S2 indicate the zonal phase and group propagation of composite-mean temperature anomalies with respect to the 90th percentile at 45°N and 55°N.
- 5 – Figure S3 illustrates the linear relationship between the storm track position, circulation diagnostics, and heatwave metrics.
- Figure S4 shows an analysis of Hayashi spectra as in Figure 6 but for the Northern Hemisphere mid-latitudes.

Supplementary Tables

Table S1 with diagnostics for the 13 idealized experiments confirms the linearity of the circulation response.

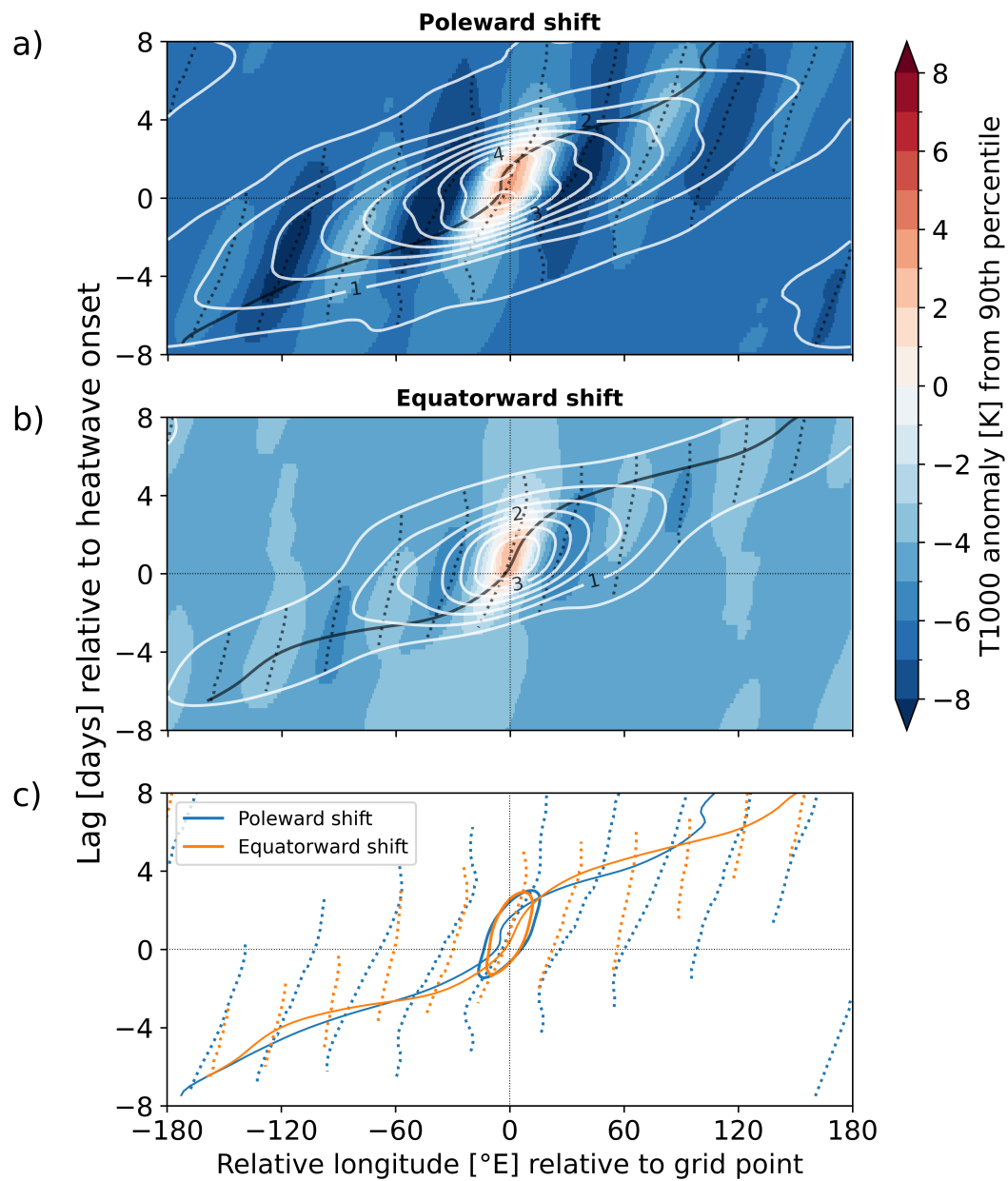


Figure S1. Same as Figure 4 but for heatwaves at 45°N in both experiments (exp4 and exp9).

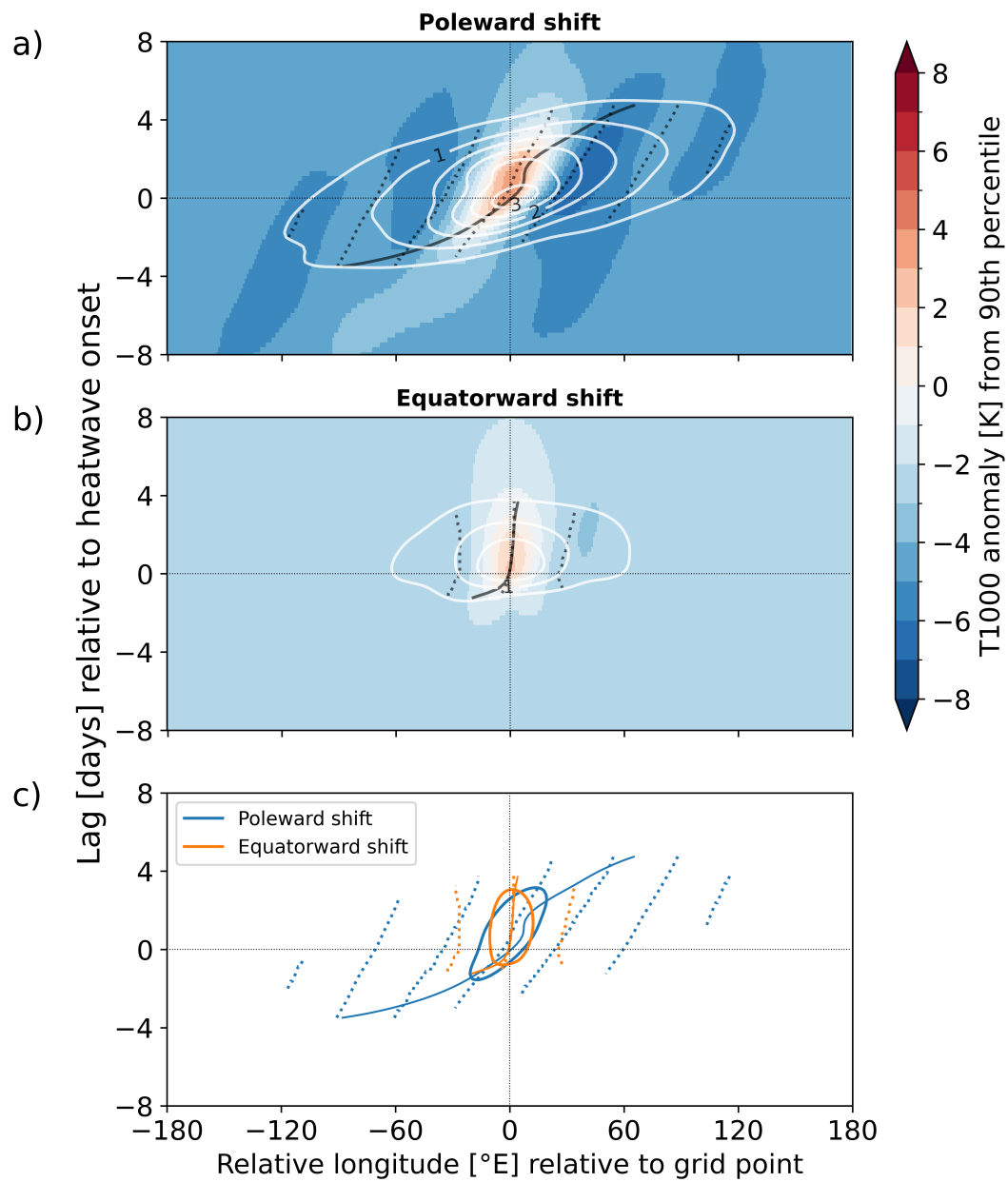


Figure S2. Same as Figure 4 but for heatwaves at 55°N in both experiments (exp4 and exp9).

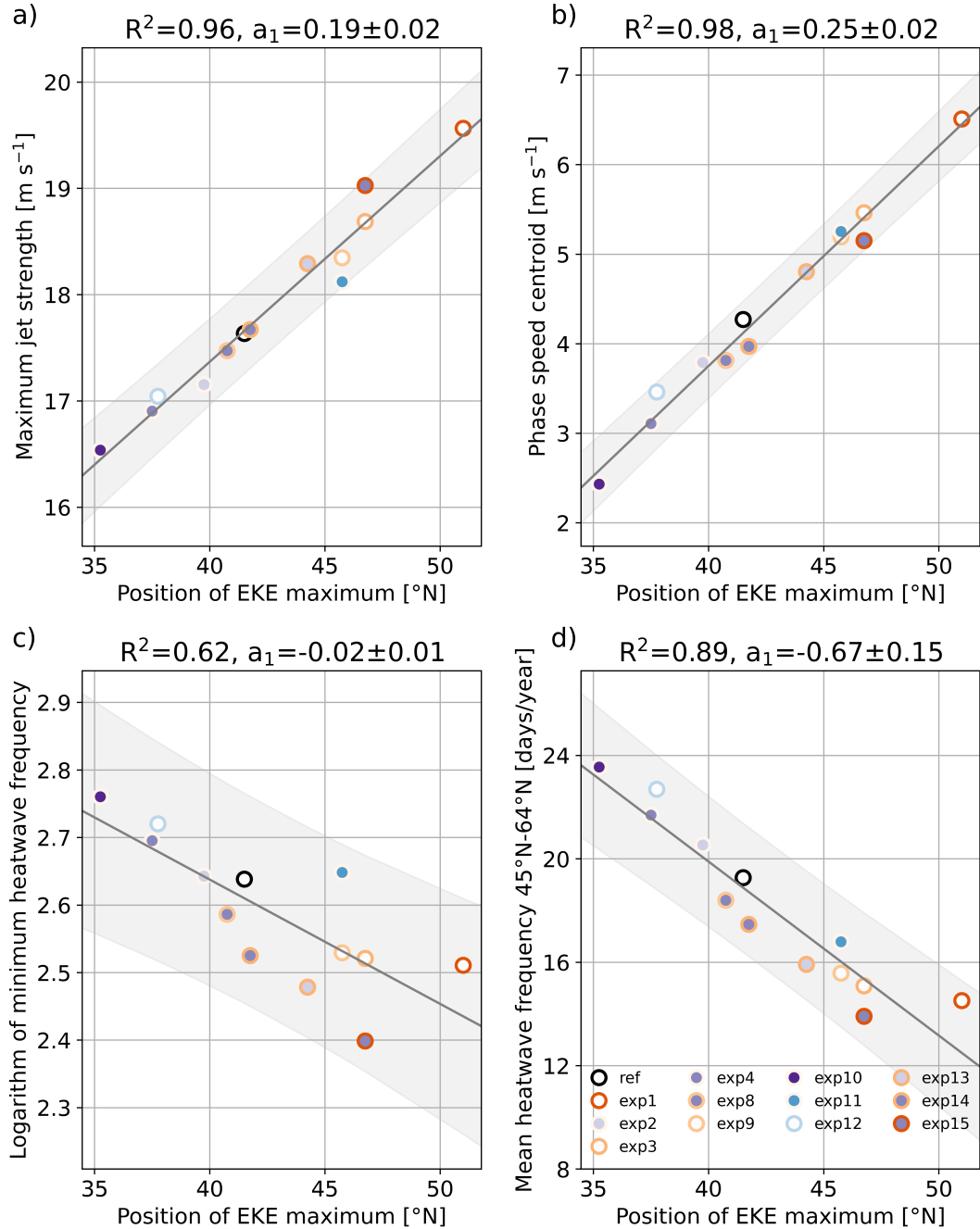


Figure S3. (a) The meridional maximum of mass-weighted vertically averaged, zonal-mean zonal wind, (b) the phase speed centroid of the meridional-mean (35°N-65°N) meridional wind variance spectra at 250 hPa, (c) the natural logarithm of meridional minimum heatwave frequency, and (d) the meridional-mean heatwave frequency between 45°N and 65°N plotted as a function of the position of the EKE maximum as in Figure 5.

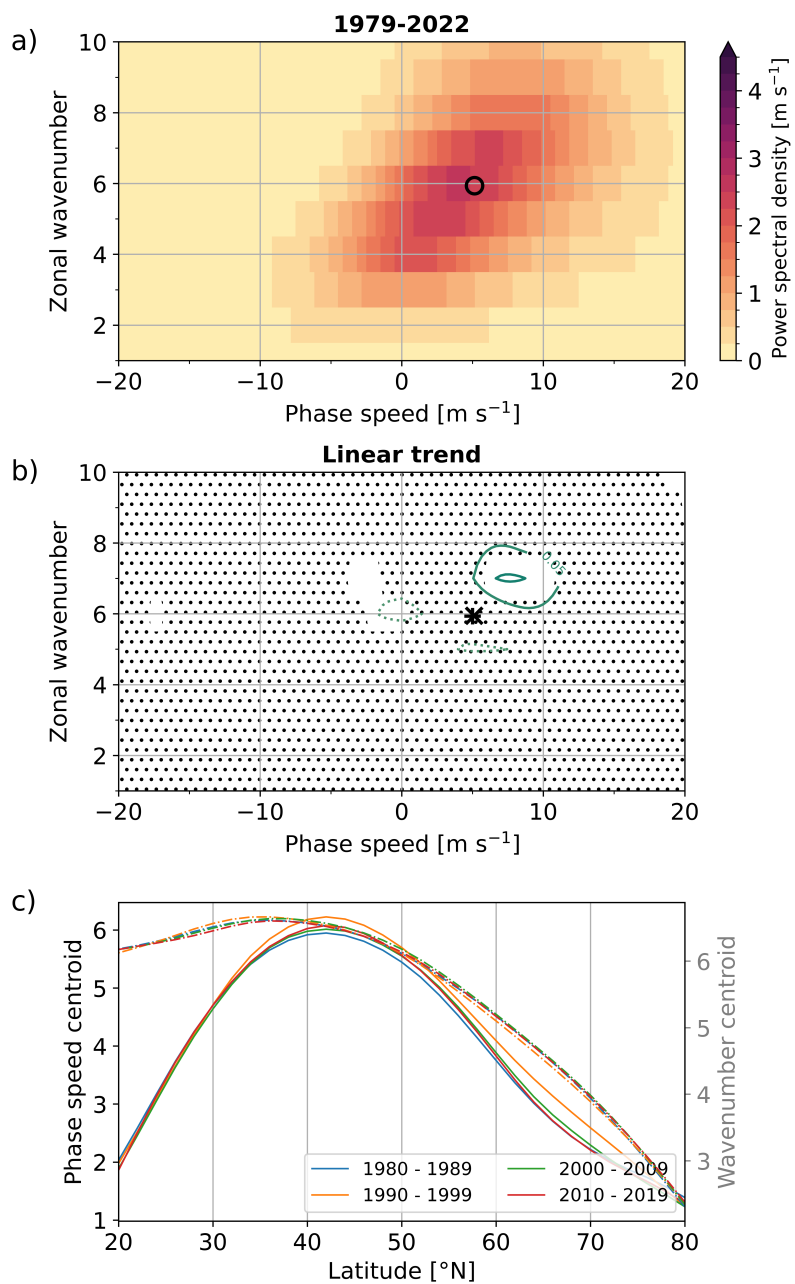


Figure S4. Same as Figure 6 but for the Northern Hemisphere.

Table S1. The meridional maximum of the climatological-mean EKE and vertically averaged zonal-mean zonal wind are referred to as storm track and jet. Their strength is evaluated at the position of the climatological mean as the climatological-mean value and the 95% confidence interval based resampling of year means. The uncertainty of the storm track and jet position is not considered here. The zonal phase speed and wavenumber centroid are given for climatological-mean meridional-mean (35°N-65°N) meridional wind power spectra at 250 hPa and as a 95% confidence interval based on a resampling of yearly-mean power spectra.

Experiment ID	storm track position [°N]	storm track strength [kJ / m ²]	jet position [°N]	jet strength [m/s]	phase speed centroid [m/s]	wavenumber centroid
ref	41.5	538, [531, 545]	41	17.6, [17.4, 17.8]	4.27, [4.14, 4.38]	6.24, [6.22, 6.27]
exp1	51.0	498, [493, 504]	51	19.6, [19.4, 19.7]	6.51, [6.44, 6.61]	5.30, [5.27, 5.32]
exp2	39.75	516, [511, 521]	39	17.2, [16.9, 17.3]	3.79, [3.67, 3.88]	6.42, [6.40, 6.45]
exp3	46.75	537, [532, 541]	47	18.7, [18.4, 18.9]	5.46, [5.40, 5.54]	5.79, [5.77, 5.81]
exp4	37.5	491, [485, 498]	36	16.9, [16.7, 17.1]	3.11, [2.95, 3.20]	6.62, [6.60, 6.64]
exp8	40.75	503, [498, 508]	40	17.5, [17.4, 17.6]	3.81, [3.72, 3.90]	6.39, [6.37, 6.41]
exp9	45.75	540, [536, 544]	46	18.3, [18.0, 18.6]	5.19, [5.10, 5.30]	5.88, [5.86, 5.90]
exp10	35.25	460, [455, 465]	34	16.5, [16.4, 16.7]	2.43, [2.30, 2.50]	6.77, [6.76, 6.78]
exp11	45.75	576, [570, 583]	45	18.1, [17.9, 18.3]	5.25, [5.19, 5.33]	5.76, [5.73, 5.78]
exp12	37.75	532, [525, 538]	36	17.0, [16.8, 17.2]	3.46, [3.29, 3.55]	6.44, [6.43, 6.47]
exp13	44.25	527, [522, 532]	44	18.3, [18.0, 18.5]	4.80, [4.71, 4.92]	6.05, [6.03, 6.07]
exp14	41.75	506, [501, 511]	41	17.7, [17.5, 17.8]	3.97, [3.88, 4.07]	6.30, [6.28, 6.32]
exp15	46.75	489, [484, 493]	47	19.0, [18.9, 19.1]	5.15, [5.06, 5.29]	5.76, [5.72, 5.78]