Supplementary Material for
Atmospheric Circulation Response to Short-Term Arctic Warming in an Idealized Model

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This supplementary document contains additional material for Atmospheric Circulation Response to Short-Term Arctic Warming in an Idealized Model:

- Figure S1 shows two years of internal variability from the control run.
- Figure S2 shows the decorrelation times for different heights.
- Figure S3 shows the annular mode decomposition of the model’s control variability.
- Figure S4 to S7 are equivalent to Figure 5 to 8 in the main text, but for an asymmetric perturbation as described in the methods section.
Figure S1: Two years of unperturbed model variability. (top) Zonal wind between 50°N and 75°N normalized by the $\sigma$-dependent standard deviation (see main-text Fig. 1b). (bottom) Same as (top) but for potential temperature between 75°N and 90°N.
Figure S2: Estimated decorrelation times for the mid-latitude zonal wind (top, 50°N and 75°N) and the potential temperature over the pole (bottom, 75°N and 90°N) at different $\sigma$-levels.
EOF decomposition of the GCM internal variability

Figure S 3: Annular mode from the control run variability over 10 years. The annular modes were derived via singular value decomposition (SVD) of the 5-day-mean zonal-mean geopotential height (GPH) field. The GPH field is weighted by the square-root of the cosine of latitude and the sigma-level before performing the SVD. The upper two panels show the correlation with PC1 of (a) the zonal mean GPH and (b) the zonal-mean zonal wind. Coefficients of the regressions on the same fields are shown in the lower two panels (c, d). The climatological zonal mean wind is in black contours in (b) and (d). The first two principal components (e, f) account for about 60% and 17% of the total variance of the fields.
Figure S4: Same as main-text Figure 5, but for the responses to an asymmetric perturbation.
Figure S5: Same as main-text Figure 6, but for the responses to an asymmetric perturbation.
Figure S6: Same as main-text Figure 7, but for the responses to an asymmetric perturbation.
Figure S7: Same as main-text Figure 8, but for the responses to an asymmetric perturbation.