

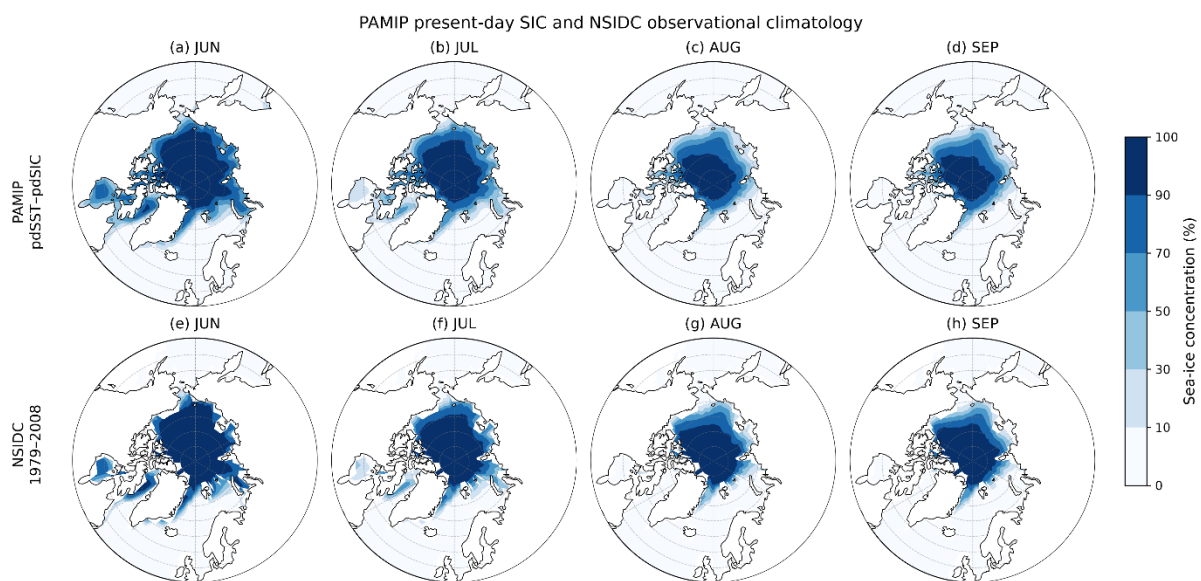


Fig. S1. Comparison of prescribed PAMIP present-day Arctic sea-ice concentration with observations. Panels (a–d) show the five-model mean sea-ice concentration (SIC) in the PAMIP pdSST–pdSIC experiment for June, July, August and September 2000, respectively. Panels (e–h) show the corresponding NOAA/NSIDC SIC climatology for 1979–2008. Shading denotes SIC (%).

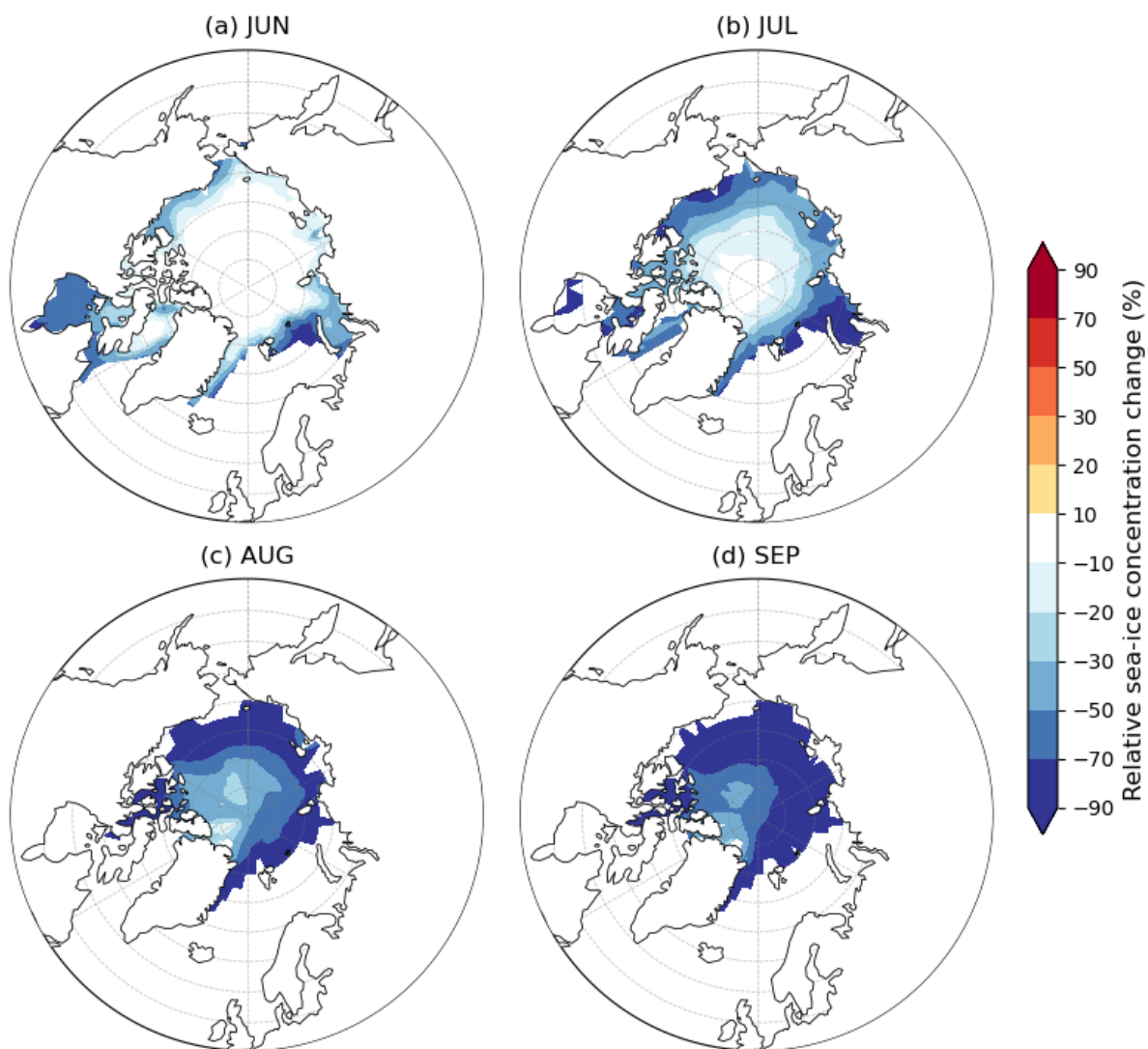


Fig. S2. Monthly relative changes in Arctic sea-ice concentration (SIC) from June to September under prescribed Arctic sea-ice loss. Relative changes are expressed as $((\text{pdSST-futArcSIC} - \text{pdSST-pdSIC}) / \text{pdSST-pdSIC}) \times 100$ and are shown only where present-day SIC is at least 10%.

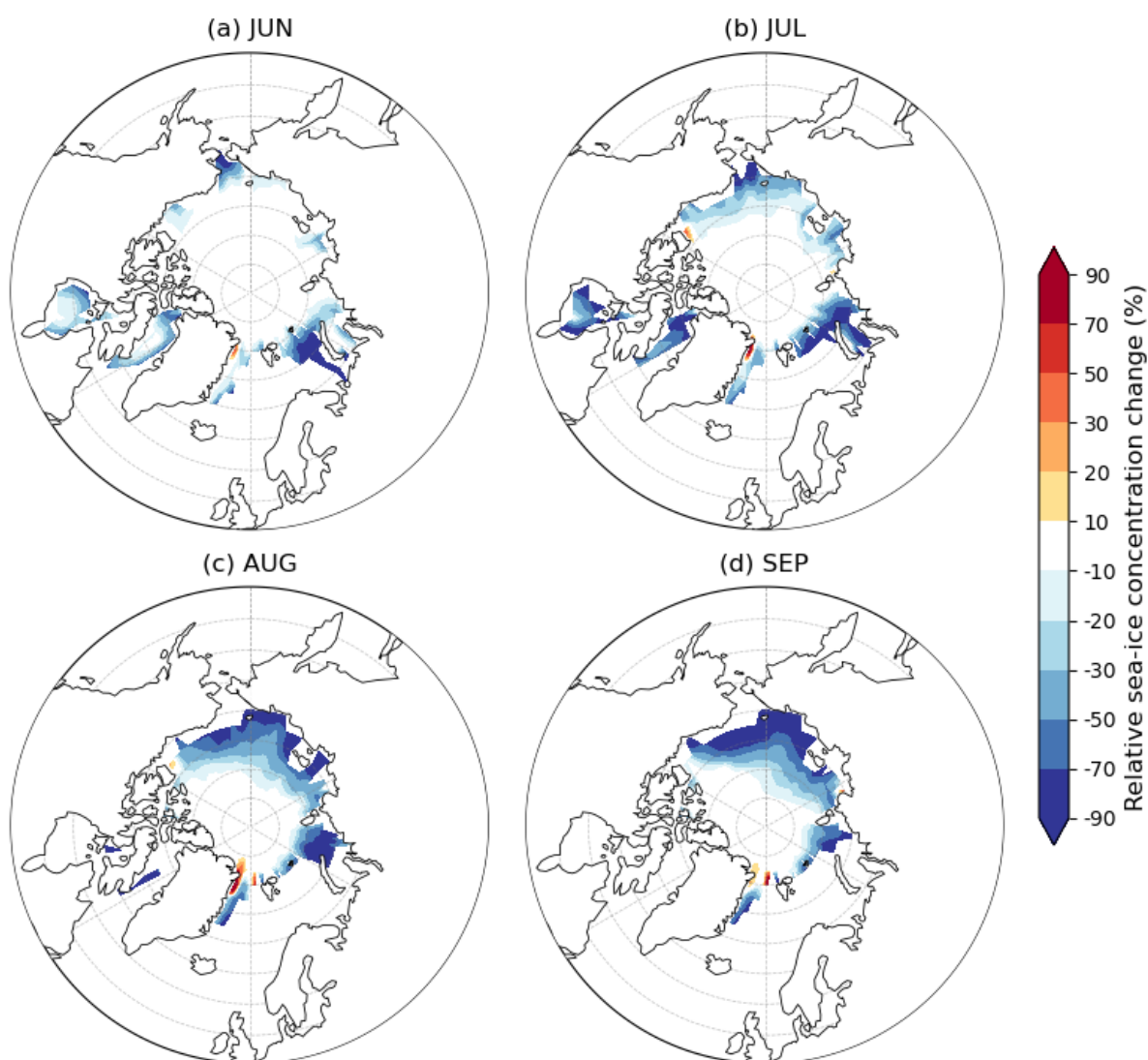


Fig. S3. Monthly relative changes in observed Arctic sea-ice concentration (SIC) from June to September over 1979-2008. Relative changes are calculated from the fitted linear trends and are shown only where the fitted 1979 SIC is at least 10%.

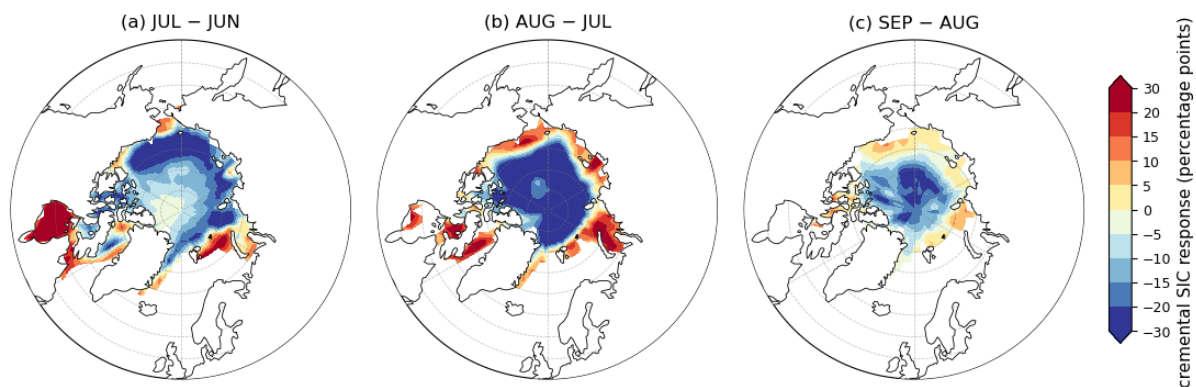


Fig. S4. Month-to-month increments in the prescribed Arctic sea-ice concentration response. Shading shows the difference between consecutive monthly SIC responses (Δ SIC; pdSST-futArcSIC minus pdSST-pdSIC) for (a) July minus June, (b) August minus July, and (c) September minus August. Negative values indicate a strengthening of the prescribed sea-ice-loss response relative to the preceding month, whereas positive values indicate a weakening of the response.

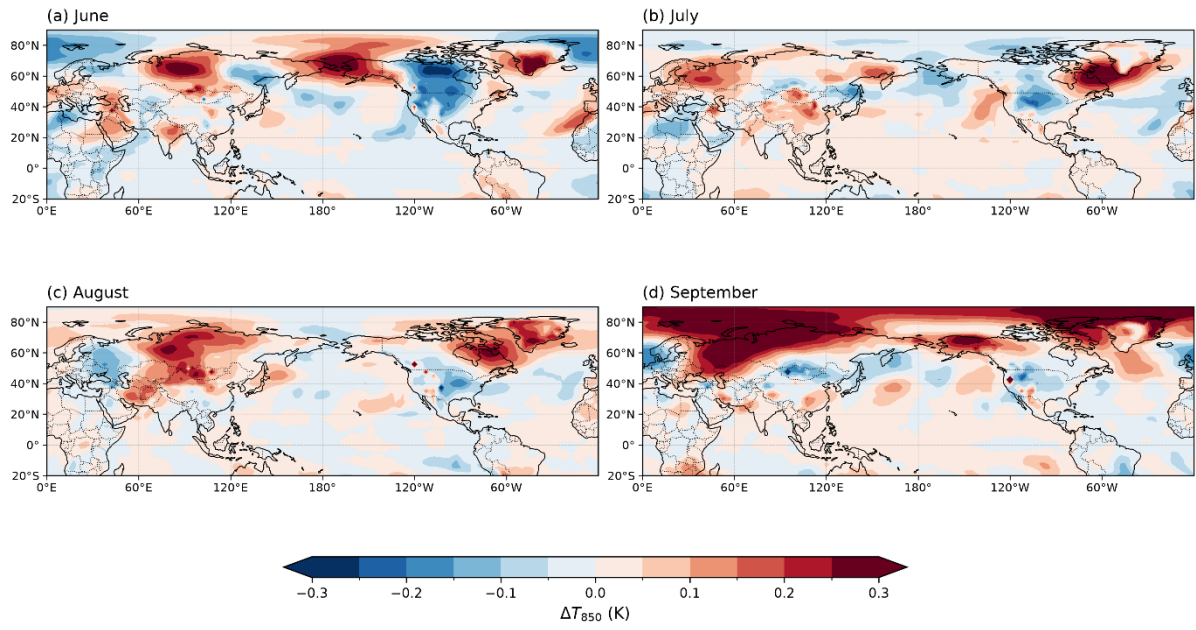


Fig. S5. Seasonal evolution of the lower-tropospheric temperature response to Arctic sea-ice loss. Shading shows the eight-model multi-model-mean 850-hPa air temperature response (ΔT_{850} ; pdSST–futArcSIC minus pdSST–pdSIC; K) for (a) June, (b) July, (c) August, and (d) September.

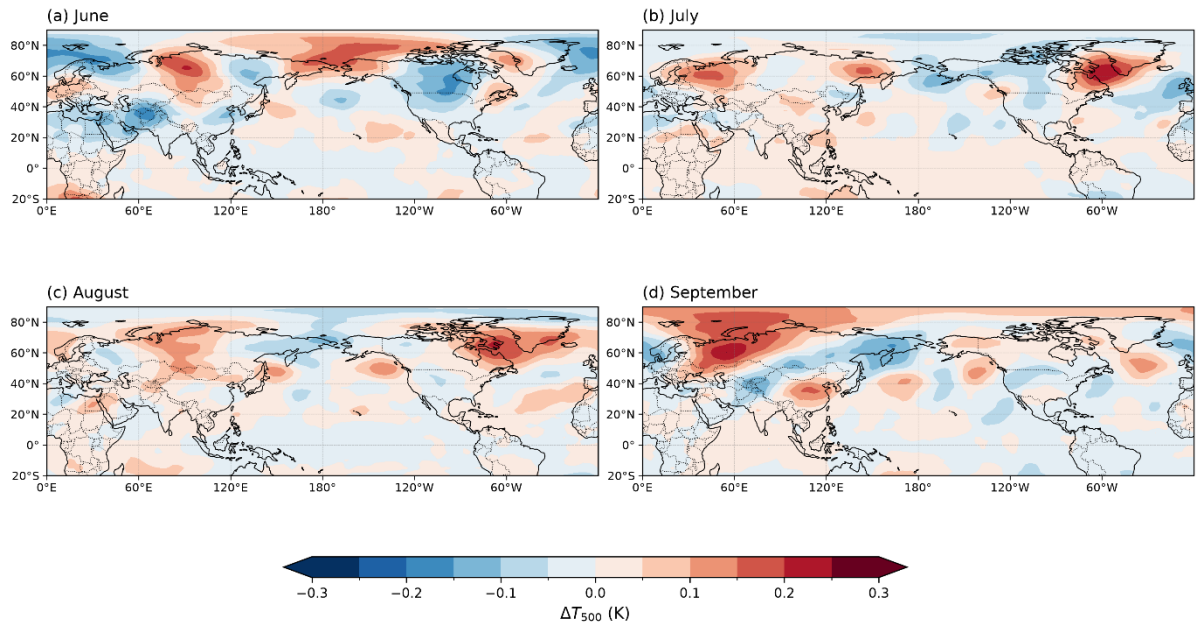


Fig. S6. Seasonal evolution of the mid-tropospheric temperature response to Arctic sea-ice loss. Shading shows the eight-model multi-model-mean 500-hPa air temperature response (ΔT_{500} ; pdSST–futArcSIC minus pdSST–pdSIC; K) for (a) June, (b) July, (c) August, and (d) September.

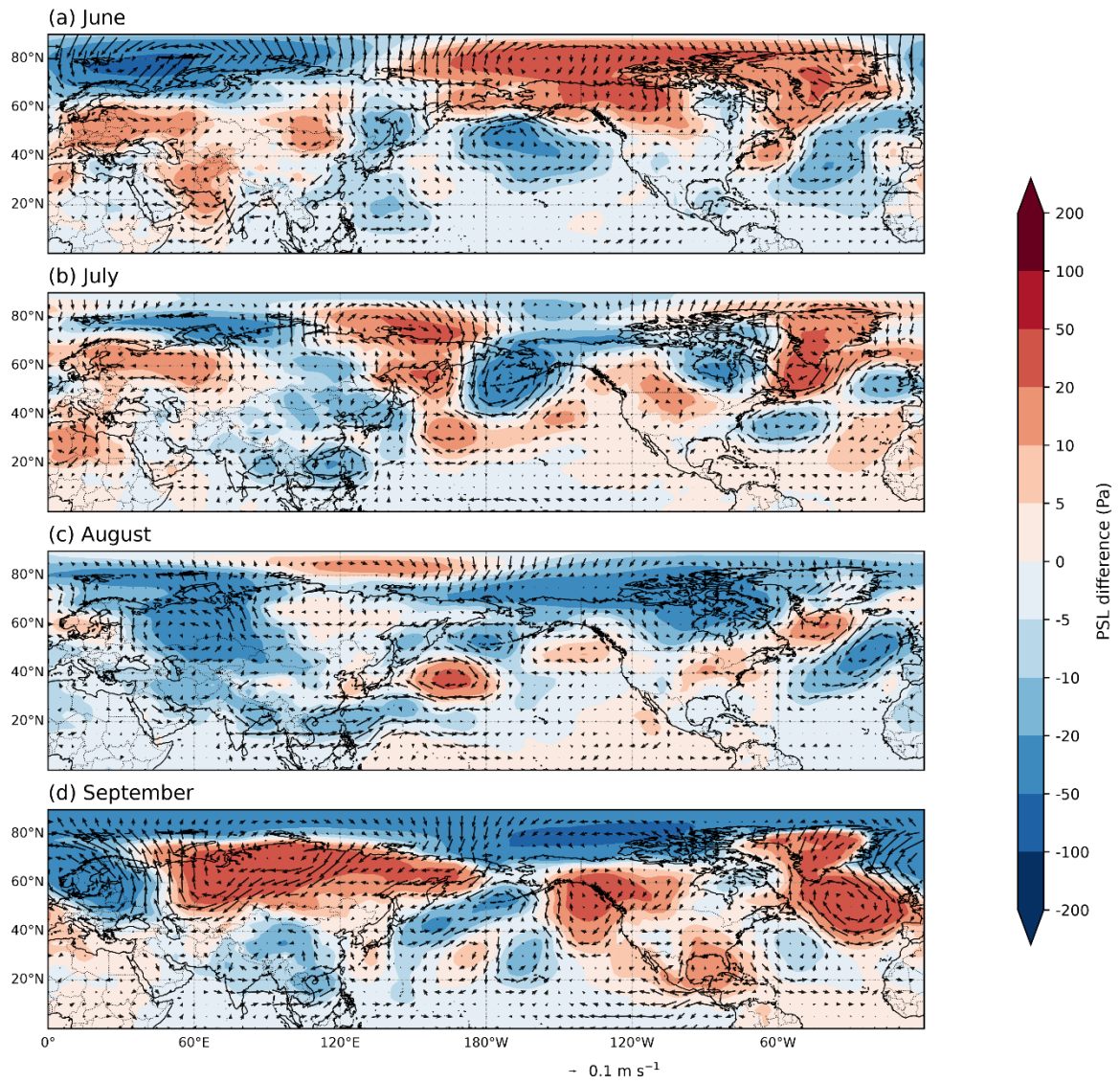


Fig. S7. Seasonal evolution of the lower-tropospheric circulation response to Arctic sea-ice loss. Shading shows the eight-model multi-model-mean sea-level pressure response (ΔPSL ; pdSST-futArcSIC minus pdSST-pdSIC ; Pa) for (a) June, (b) July, (c) August, and (d) September. Black vectors show the corresponding 850-hPa horizontal wind response (m s^{-1}).

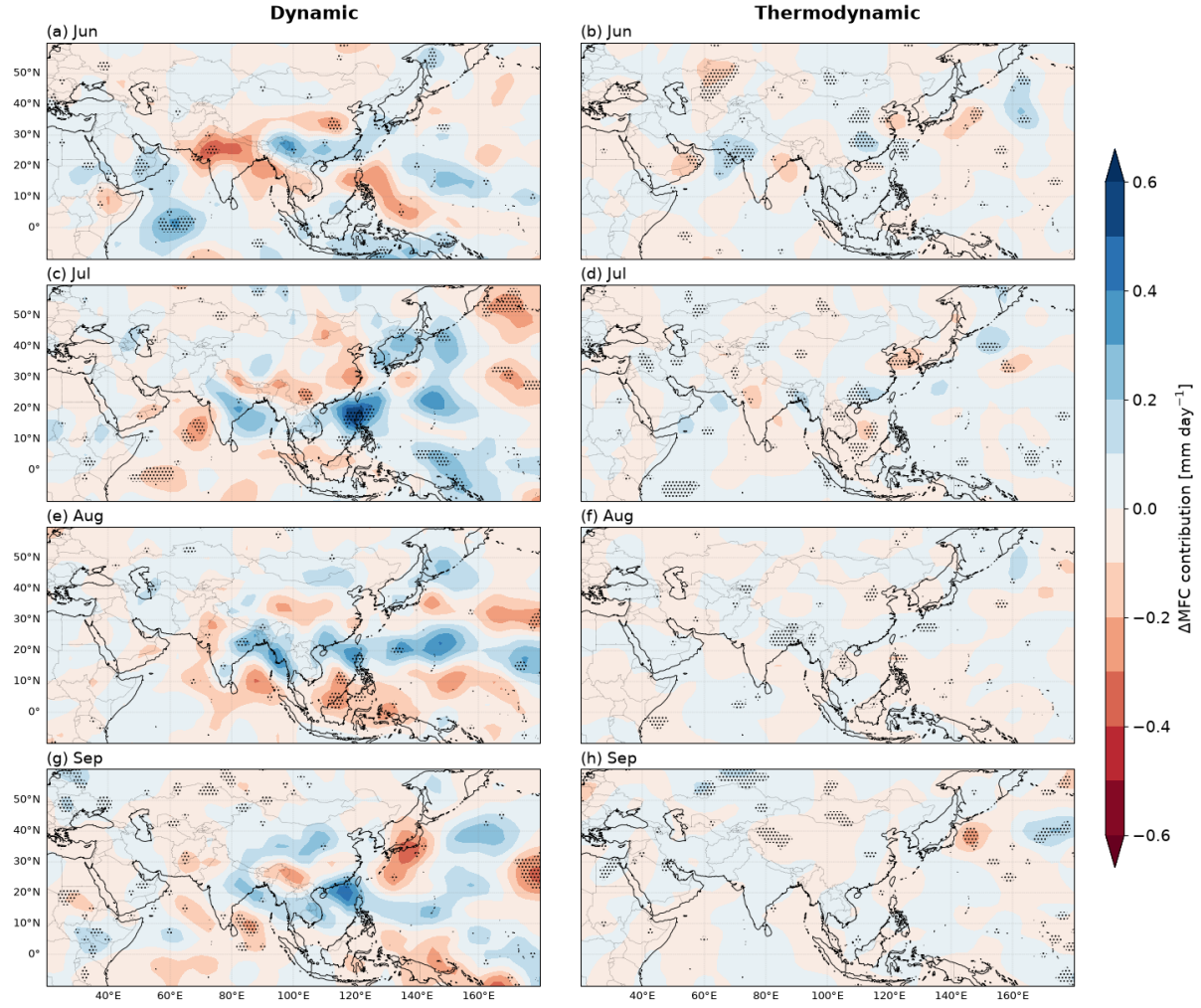


Fig. S8. Dynamic and thermodynamic contributions to the moisture-flux convergence response to projected Arctic sea-ice loss. Shading shows the eight-model multi-model-mean dynamic (left column; a, c, e, g) and thermodynamic (right column; b, d, f, h) contributions to the moisture-flux convergence response (ΔMFC ; pdSST-futArcSIC minus pdSST-pdSIC ; mm day^{-1}) for June, July, August, and September, respectively. The dynamic term represents changes in moisture-flux convergence associated with circulation anomalies acting on the pdSST-pdSIC climatological specific-humidity field, whereas the thermodynamic term represents changes associated with specific-humidity anomalies acting on the climatological circulation. Positive values indicate enhanced moisture convergence or reduced divergence, while negative values indicate enhanced moisture divergence or reduced convergence. Stippling indicates regions where at least seven of the eight models agree on the sign of the response. The same colour scale is used for both components to facilitate direct comparison.

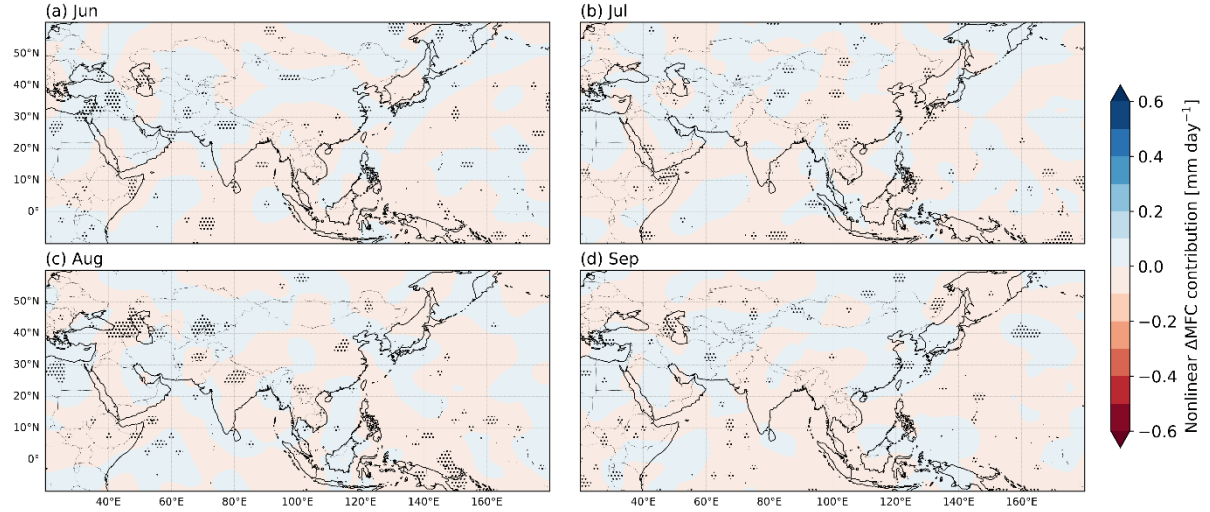


Fig. S9. Nonlinear contribution to the moisture-flux convergence response to projected Arctic sea-ice loss. Shading shows the eight-model multi-model-mean nonlinear contribution to the vertically integrated moisture-flux convergence response (ΔMFC ; pdSST-futArcSIC minus pdSST-pdSIC ; mm day^{-1}) for (a) June, (b) July, (c) August, and (d) September. The nonlinear term represents the contribution arising from the product of the specific-humidity and horizontal-wind responses between the pdSST-futArcSIC and pdSST-pdSIC experiments. Positive values indicate enhanced moisture convergence or reduced divergence, while negative values indicate enhanced moisture divergence or reduced convergence. Stippling indicates regions where at least 7 of the 8 models agree on the sign of the response. The same colour scale as in Fig. S8 is used to facilitate comparison with the dynamic and thermodynamic contributions.

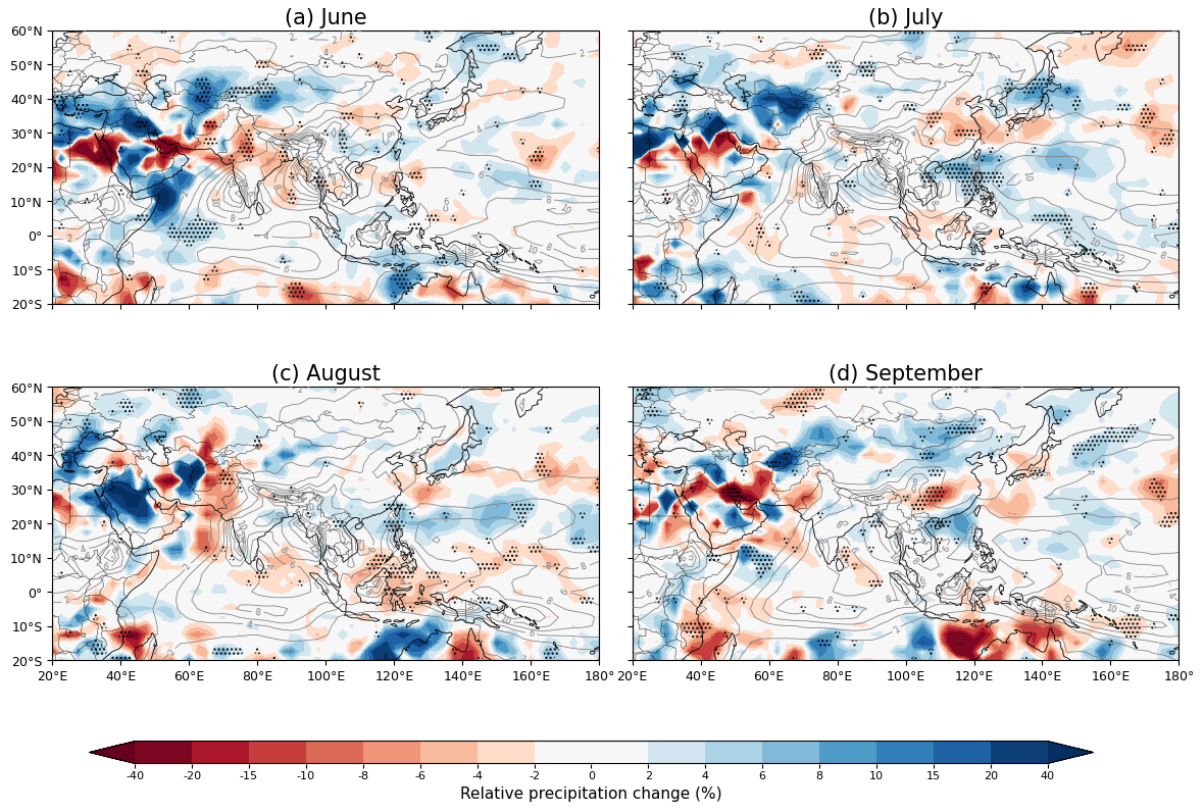


Fig. S10. Relative precipitation change (%) between the pdSST–futArcSIC and pdSST–pdSIC experiments for (a) June, (b) July, (c) August, and (d) September. Shading shows $100 \times (\text{futArcSIC} - \text{pdSIC}) / \text{pdSIC}$. Gray contours indicate the pdSST–pdSIC precipitation climatology at 2, 4, 6, and 8 mm day⁻¹.

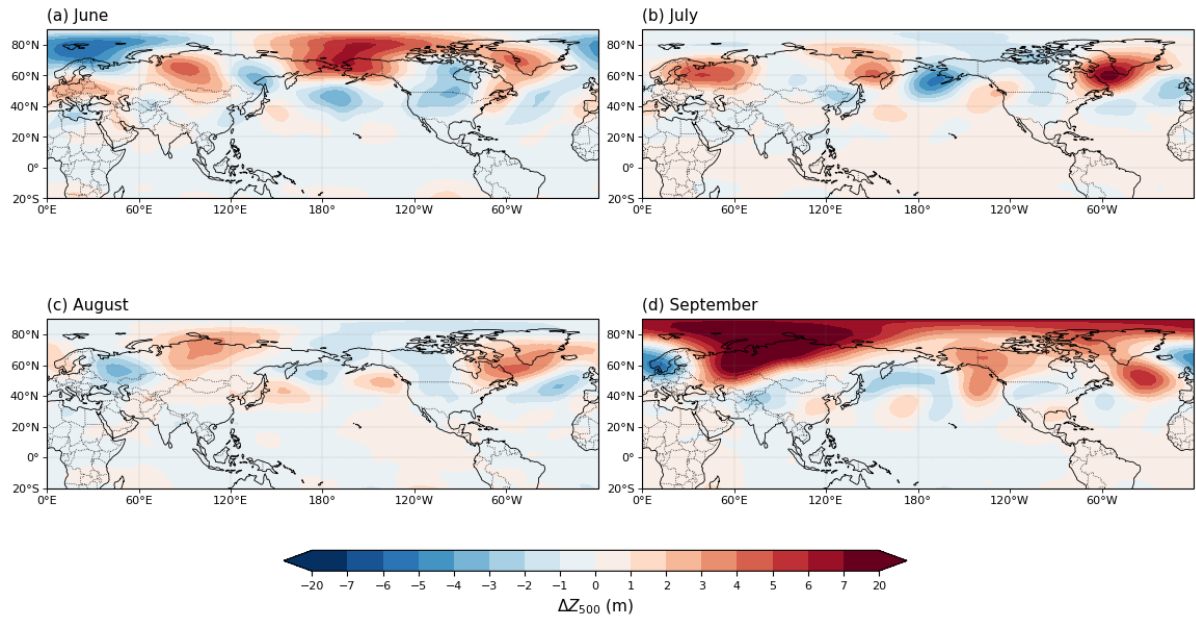


Fig. S11. Seasonal evolution of the mid-tropospheric geopotential height response to Arctic sea-ice loss. Shading shows the eight-model multi-model-mean 500-hPa geopotential height response (ΔZ_{500} ; pdSST–futArcSIC minus pdSST–pdSIC; m) for (a) June, (b) July, (c) August, and (d) September.

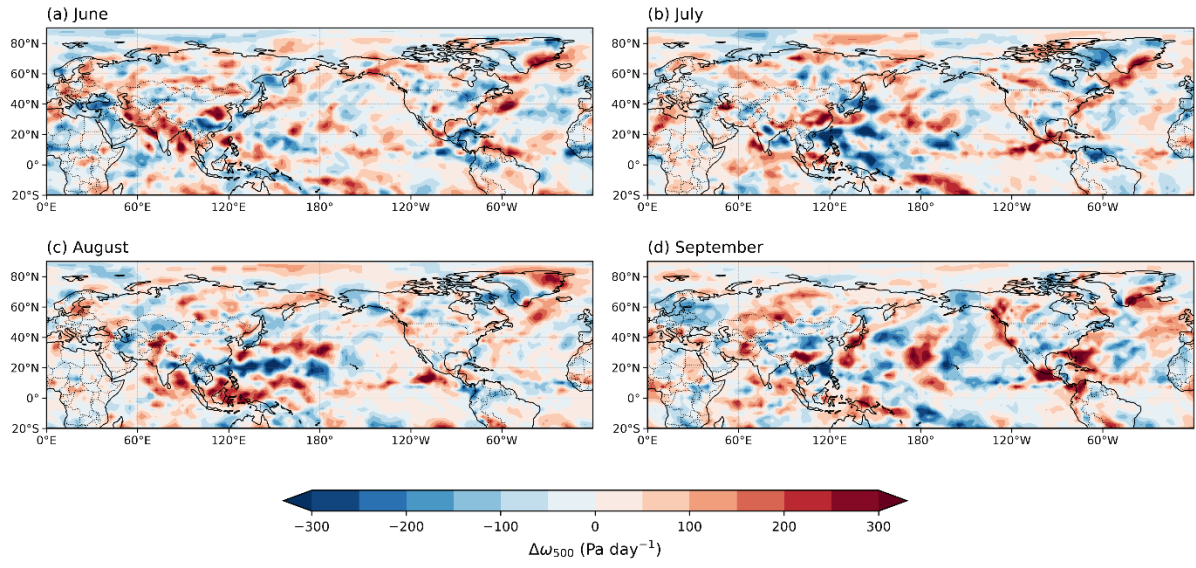


Fig. S12. Seasonal evolution of the mid-tropospheric vertical-motion response to Arctic sea-ice loss. Shading shows the eight-model multi-model-mean 500-hPa pressure-velocity response ($\Delta\omega_{500}$; pdSST–futArcSIC minus pdSST–pdSIC; Pa day⁻¹) for (a) June, (b) July, (c) August, and (d) September.

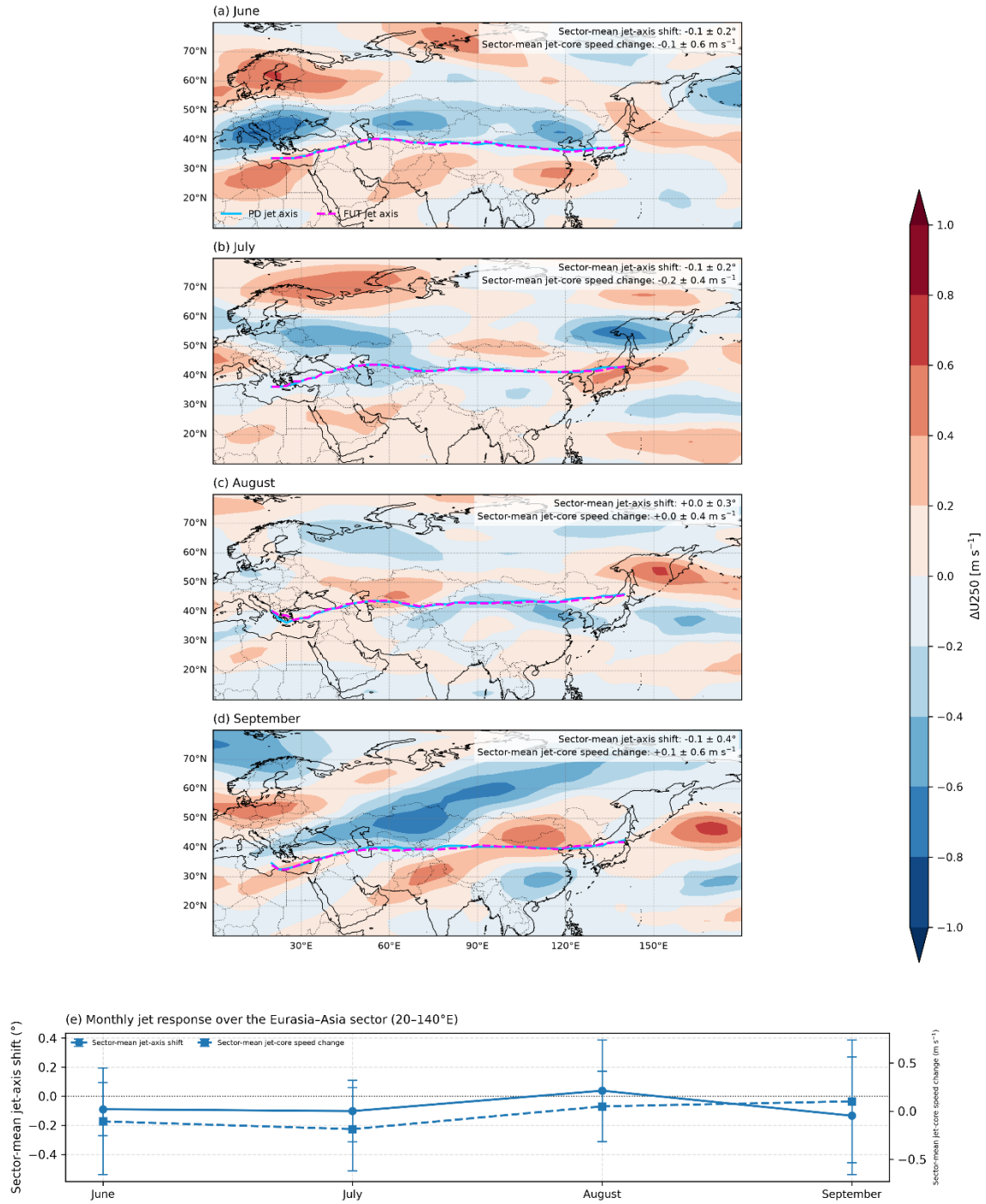


Fig. S13. Direct upper-tropospheric jet response to projected Arctic sea-ice loss. Shading shows the eight-model multi-model-mean 250-hPa zonal-wind response (AU250; pdSST–futArcSIC minus pdSST–pdSIC; m s⁻¹) for (a) June, (b) July, (c) August and (d) September. Cyan and magenta lines show the eight-model mean jet-axis latitude at each longitude in the pdSST–pdSIC and pdSST–futArcSIC experiments, respectively. For each model and experiment, the jet axis is defined independently at each longitude as the latitude of maximum U250 within 20°–60°N. Values in each panel show the eight-model mean ±1 inter-model standard deviation of the sea-ice-loss-induced changes in sector-mean jet-axis latitude and sector-mean jet-core speed over 20°E–140°E. Panel (e) summarises these monthly jet responses, with error bars indicating ±1 inter-model standard deviation. Note that the vertical scales in panel (e) are much smaller than those in Fig. 7c, reflecting the substantially smaller direct jet response compared with the climatological seasonal evolution.