Supplemental Material

SUPPLEMENTARY INFORMATION

Supplementary Figures for Dai and Tan, "On the role of the Eastern Pacific teleconnection in ENSO impacts on wintertime weather over East Asia and North America"

This document includes the Supplementary Figures that are referred to in the main text.

On the role of the Eastern Pacific teleconnection in ENSO impacts on wintertime weather over East Asia and North America

Ying Dai[a] and Benkui Tan[*]

Department of Atmospheric and Oceanic Sciences, School of Physics, Peking University, Beijing, China

[a] Current affiliation: Max Planck Institute for Meteorology, Hamburg, Germany.

Corresponding author address: Benkui Tan, Department of Atmospheric and Oceanic Sciences, School of Physics, Peking University, Yiheyuan Road 5, Beijing 100871, China.

E-mail: bktan@pku.edu.cn

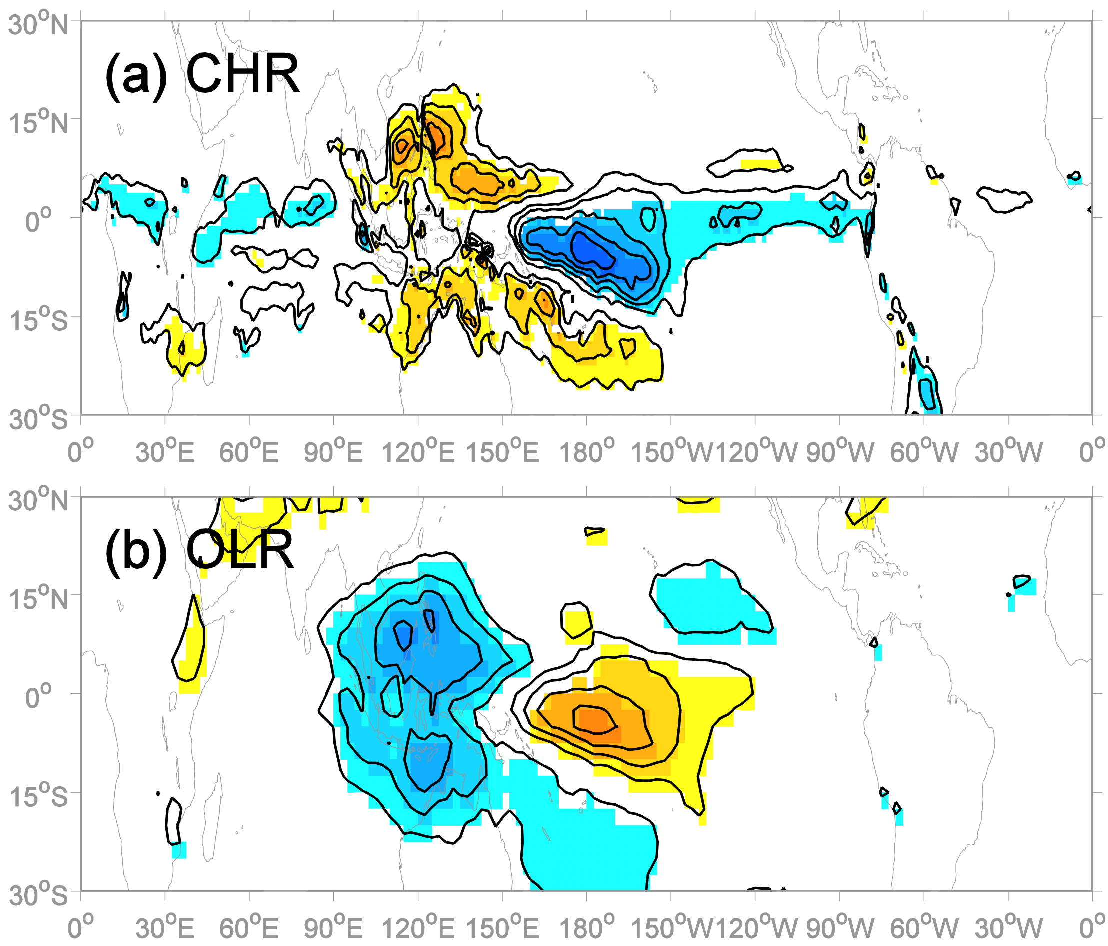


Figure S1. The two-week mean (over the period from day -13 to day 0) of the lagged-regressions of unfiltered daily (a) 250 hPa convective heating rate (CHR) and (b) outgoing longwave radiation (OLR) anomalies against the EP index spanning 1979/80-2014/15. For CHR anomalies, contours start from ±0.1 K day^{-1} with an interval of 0.1 K day^{-1} and zero lines are omitted. For OLR anomalies, contours start from ±2 W m^{-2} with an interval of 2 W m^{-2} and zero lines are omitted. Warm (cold) shadings indicate positive (negative) anomalies that are statistically significant at the $p < 0.01$ level as determined with a two-tailed Student's *t* test.

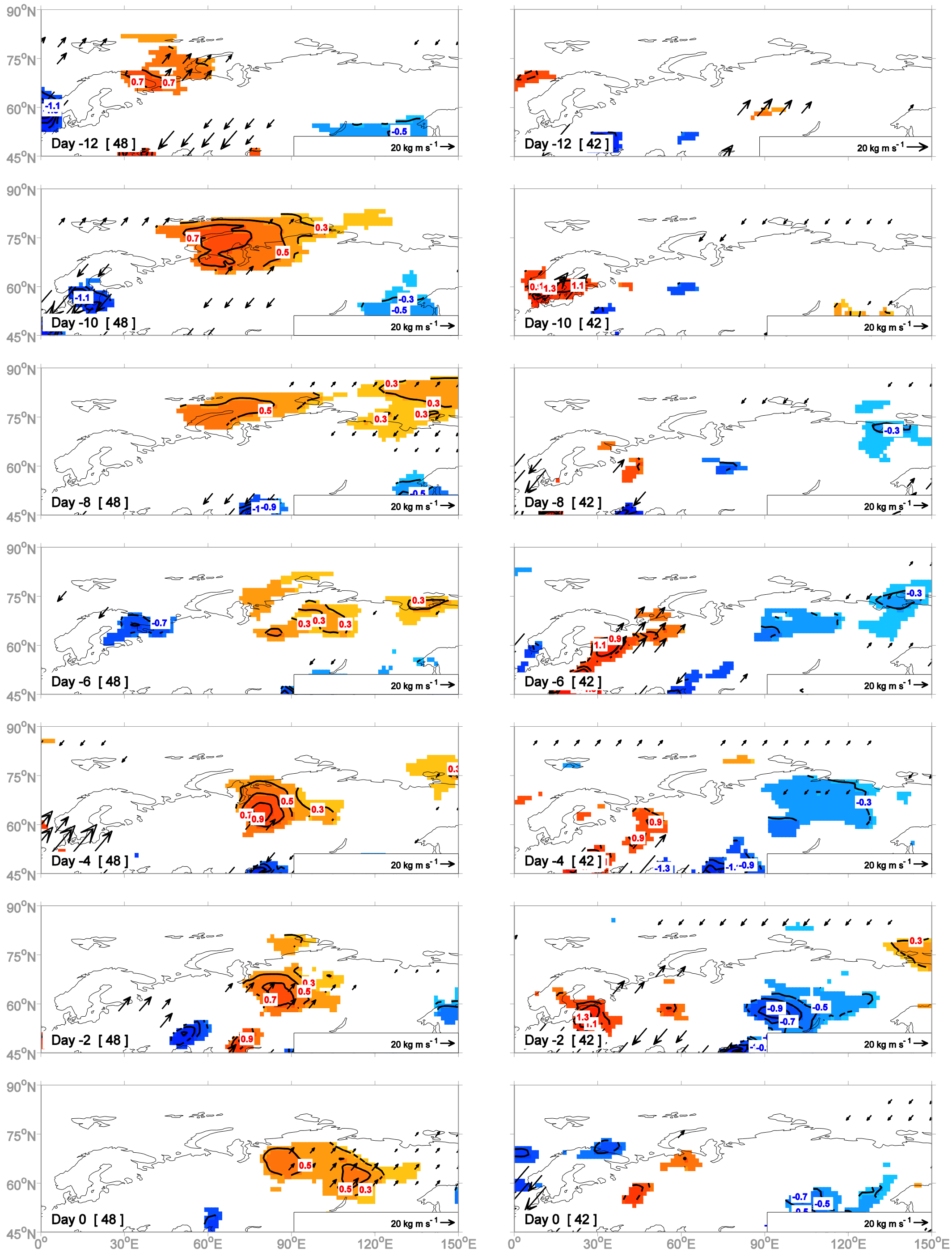


Figure S2. Lagged-composites of anomalous total column precipitable water (TCPW) fields for non-convective (left panels) positive EP events and (right panels) negative EP events, respectively. Composites are performed for the period from lag day -12 to day 0 with a time interval of 2 days. Contours start from ±0.1 kg m^{-2} with an interval of 0.2 kg m^{-2} and zero lines are omitted. Red (blue) shadings indicate positive (negative) anomalies that are statistically significant at the $p < 0.10$ level on a two-tailed Monte-Carlo test. Arrows represent anomalous total column horizontal water vapor fluxes that are statistically significant at the $p < 0.10$ level for at least one component on a two-tailed Monte-Carlo test. Scaling for fluxes is given at bottom-right corner for each panel (units: kg m s^{-1}).

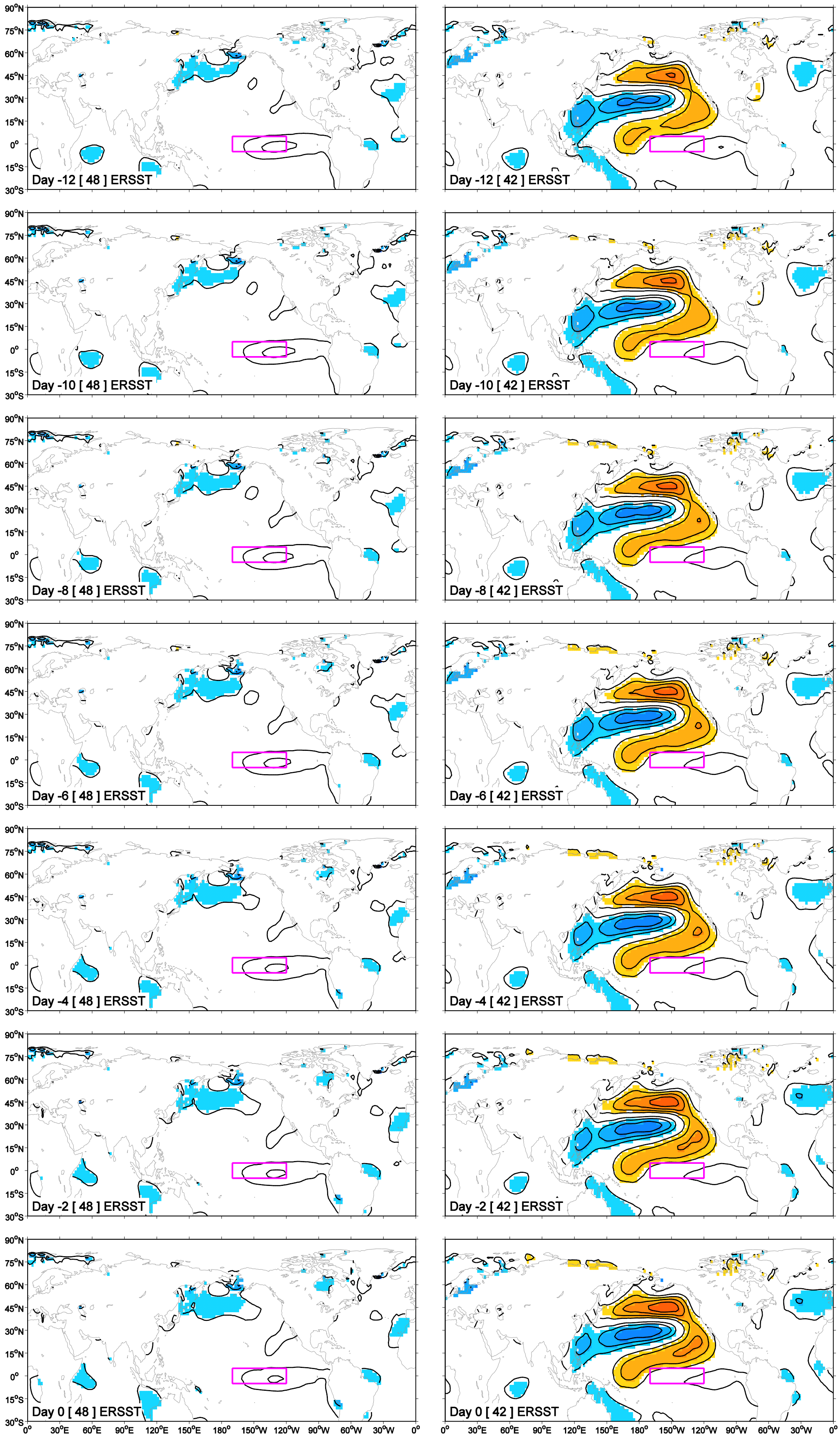
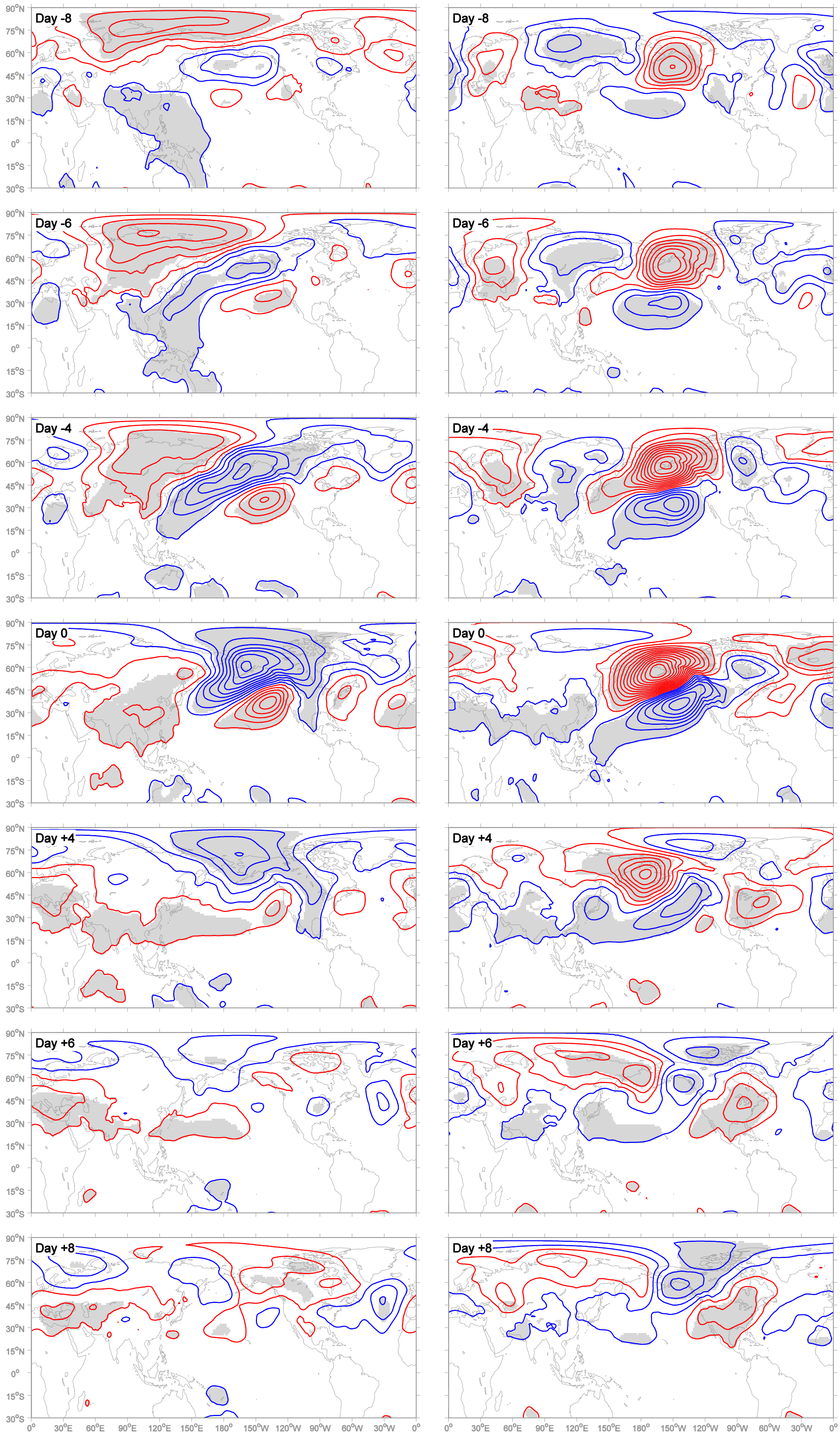

Day -12 [48] ERSST
Day -12 [42] ERSST
Day -10 [48] ERSST
Day -10 [42] ERSST
Day -8 [48] ERSST
Day -8 [42] ERSST
Day -6 [48] ERSST
Day -6 [42] ERSST
Day -4 [48] ERSST
Day -4 [42] ERSST
Day -2 [48] ERSST
Day -2 [42] ERSST
Day 0 [48] ERSST
Day 0 [42] ERSST
90°N
75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
0°
30°E
60°E
90°E
120°E
150°E
180°
150°W
120°W
90°W
60°W
30°W
0°

Figure S3. Lagged-composites of anomalous SST fields for non-convective (left panels) positive EP events and (right panels) negative EP events, respectively. Composites are performed for the period from lag day -12 to day 0 with a time interval of 2 days. Contours start from ±0.1 K with an interval of 0.1 K and zero lines are omitted. Red (blue) shadings indicate positive (negative) anomalies that are statistically significant at the $p < 0.10$ level on a two-tailed Monte-Carlo test. The magenta rectangular box over the tropical Pacific (5°S-5°N, 120°-170°W) denotes the Niño-3.4 region. For the entire 57-winter period (1958/59-2014/15), daily SST anomalies are constructed from linear interpolation of the monthly ERSST.v4 data.



Day -8
Day -8
Day -6
Day -6
Day -4
Day -4
Day 0
Day 0
Day +4
Day +4
Day +6
Day +6
Day +8
Day +8

53

Figure S4. Lagged-composites of anomalous geopotential height at 850 hPa based on based on the non-convective (left panels) positive EP events and (right panels) negative EP events from day -8 to day +8 with the lag days labeled in upper-left corner of each panel. Red (blue) contours denote positive (negative) anomalies. Contours start from ±5 m with an interval of 10 m for right column. Grey shadings indicate anomalies that are statistically significant at the $p < 0.10$ level as determined with a two-tailed Monte-Carlo test.

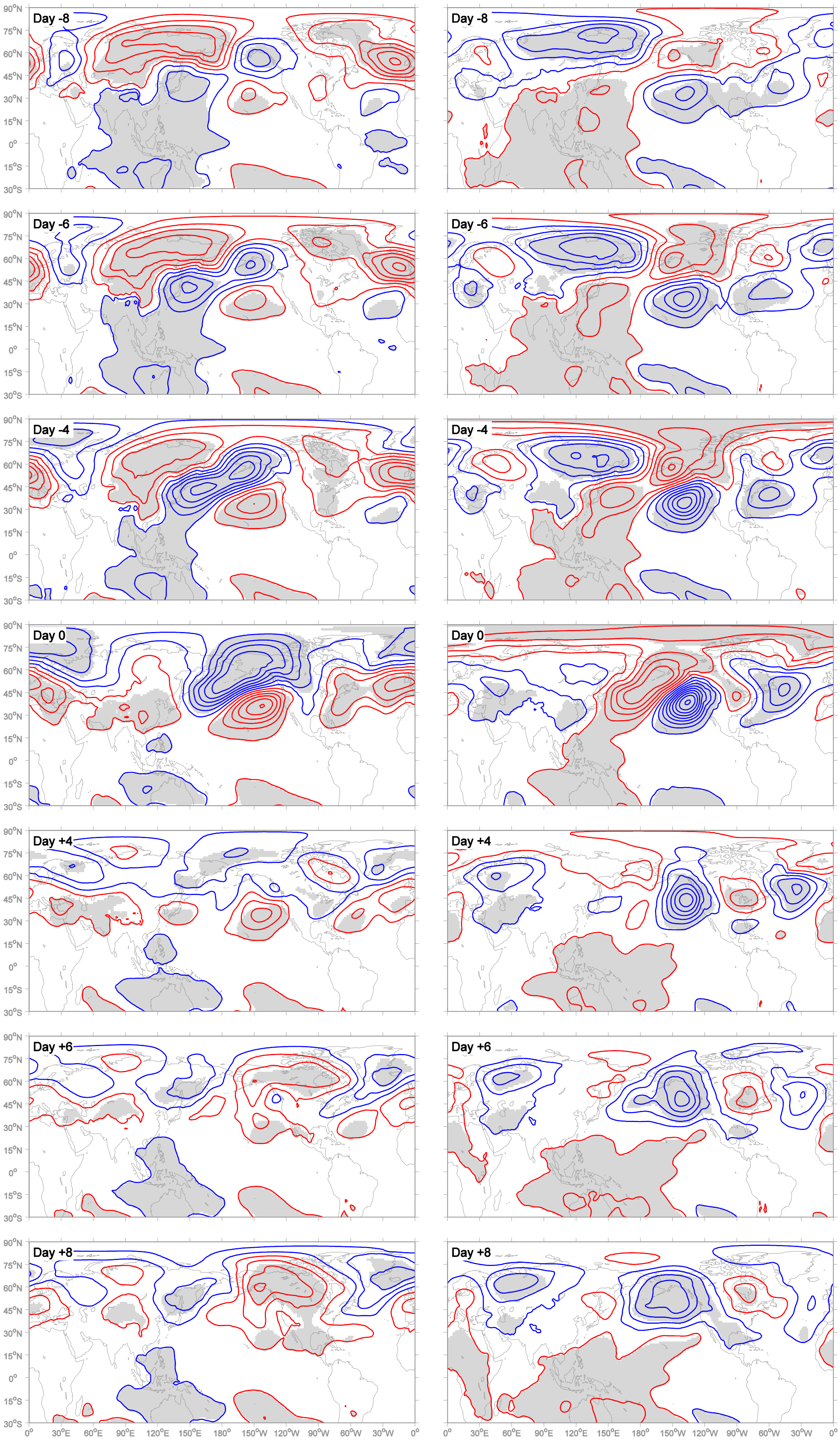
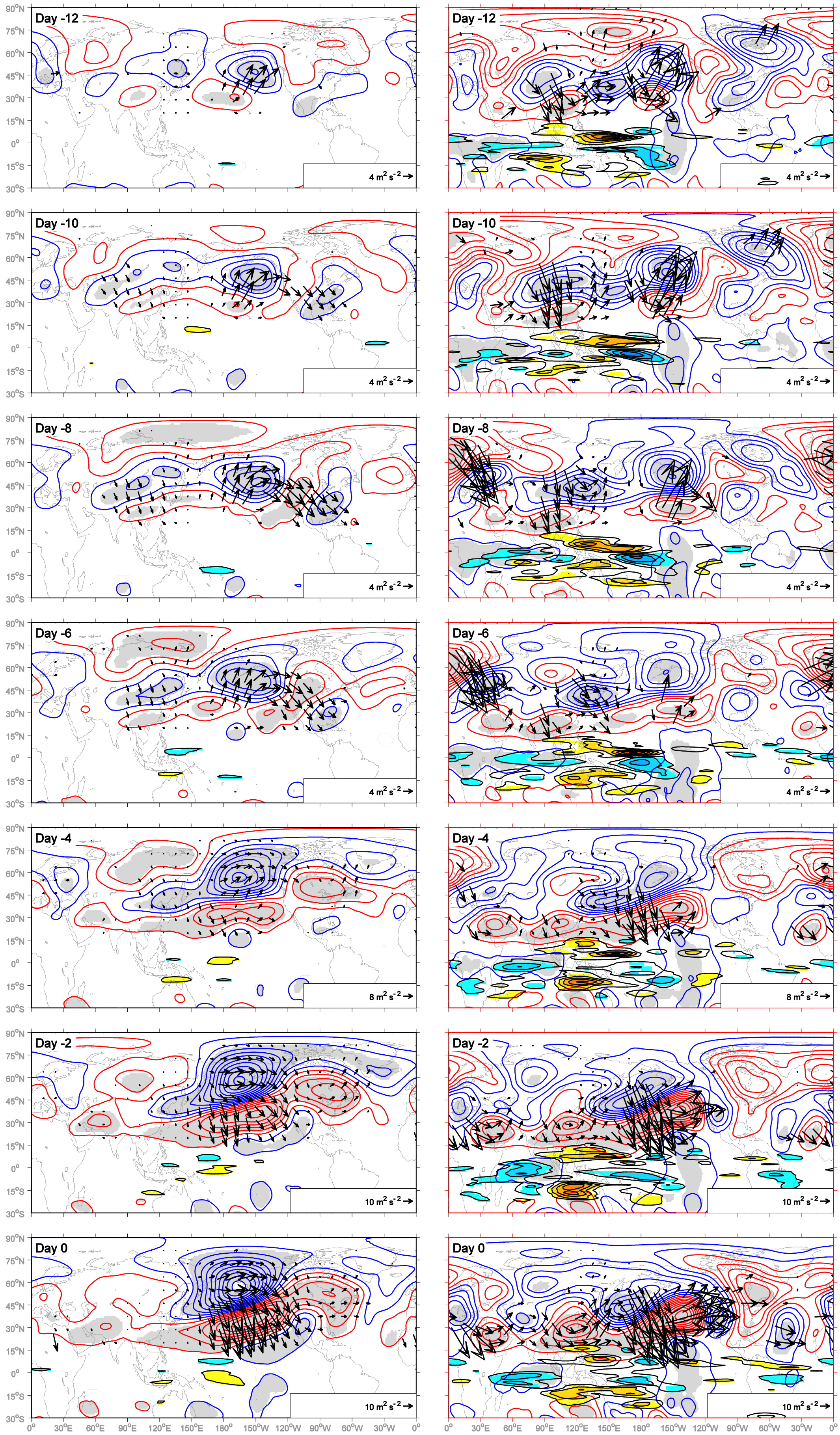

Day -8
Day -8
Day -6
Day -6
Day -4
Day -4
Day 0
Day 0
Day +4
Day +4
Day +6
Day +6
Day +8
Day +8
90°N
75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
0°
30°E
60°E
90°E
120°E
150°E
180°
150°W
120°W
90°W
60°W
30°W
0°

Figure S5. Same as Fig. S4 except for the convective EP events.



Day -12
Day -10
Day -8
Day -6
Day -4
Day -2
Day 0
4 m2 s-2
8 m2 s-2
10 m2 s-2
90°N
75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
0°
30°E
60°E
90°E
120°E
150°E
180°
150°W
120°W
90°W
60°W
30°W

Figure S6. Lagged-composites of anomalous 250 hPa geopotential height based on (left) non-convective EP/neutral events and (right) convective EP/neutral events (subtracting negative EP/neutral from positive EP/neutral composites) from day -12 to day 0 with the lag days labeled in upper-left corner of each panel. Red (blue) contours denote positive (negative) anomalies. Contours start from ±20 m with an interval of 40 m. Grey shadings indicate anomalies that are statistically significant at the $p < 0.10$ level as determined with a two-tailed Monte-Carlo test. Black contours indicate anomalous convective heating rates. Contours start from ±1.0 K day^{-1} with an interval of 1.0 K day^{-1}. Warm (cold) shadings indicate positive (negative) anomalies that are statistically significant at the $p < 0.10$ level as determined with a two-tailed Monte-Carlo test. Arrows represent wave activity fluxes that are statistically significant at the $p < 0.10$ level at least for one component on a two-tailed Monte-Carlo test. Scaling for wave activity fluxes is given at bottom-right corner for each panel (units: $m^2\ s^{-2}$).

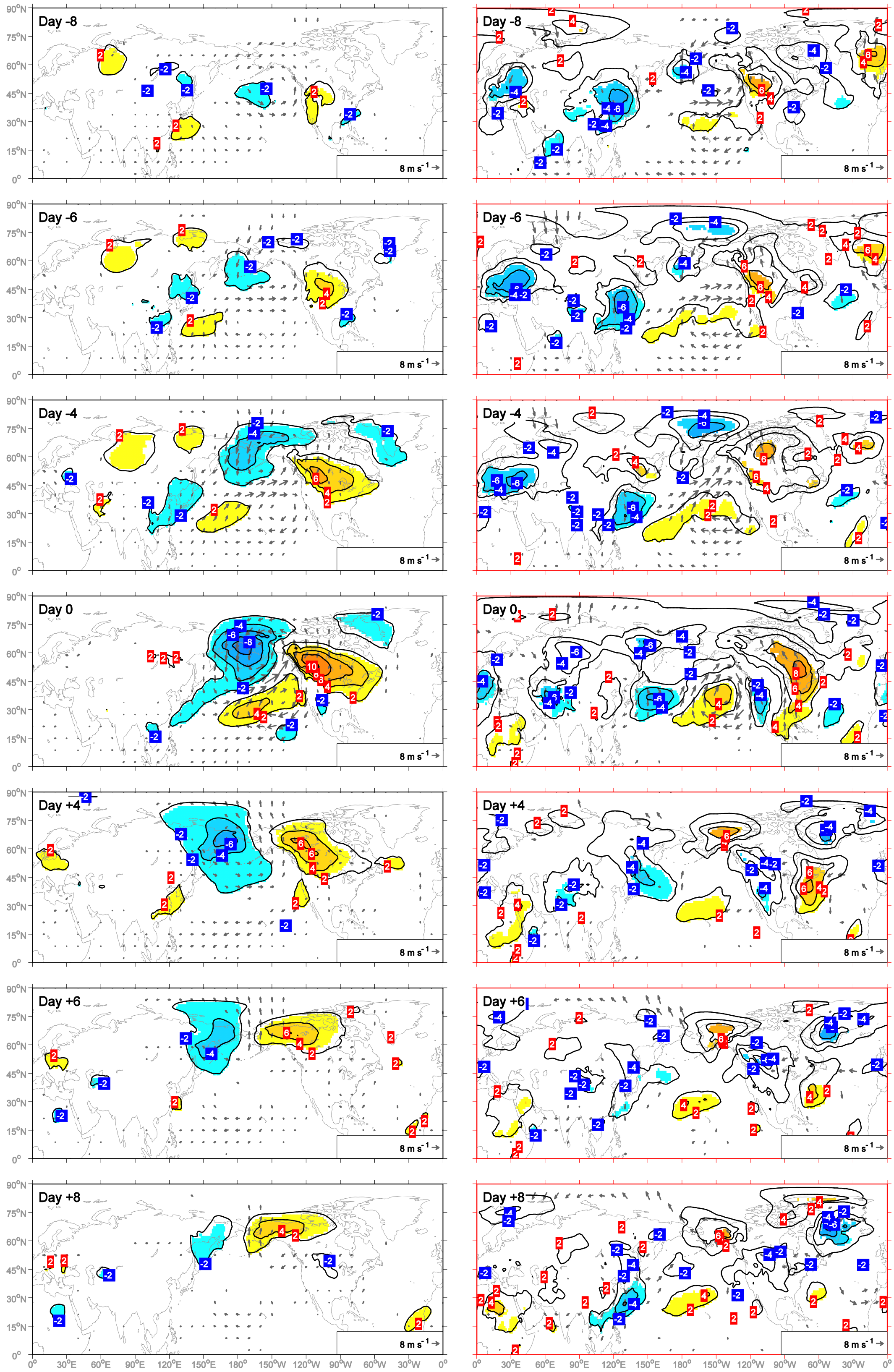


Figure S7. Lagged-composites of anomalous 850 hPa air temperature (contours and shading) based on (left) non-convective EP/neutral events and (right) convective

EP/neutral events (subtracting negative EP/neutral from positive EP/neutral composites) from day -8 to day +8 with the lag days labeled in upper-left corner of each panel. Contours start from ±2.0 K with an interval of 2.0 K. Warm (cold) shadings indicate positive (negative) anomalies that are statistically significant at the $p < 0.10$ level as determined with a two-tailed Monte-Carlo test. Arrows represent anomalous 850 hPa winds that are statistically significant at the $p < 0.10$ level for at least one component on a two-tailed Monte-Carlo test. Scaling for winds is given at bottom-right corner for each panel (units: m s^{-1}).

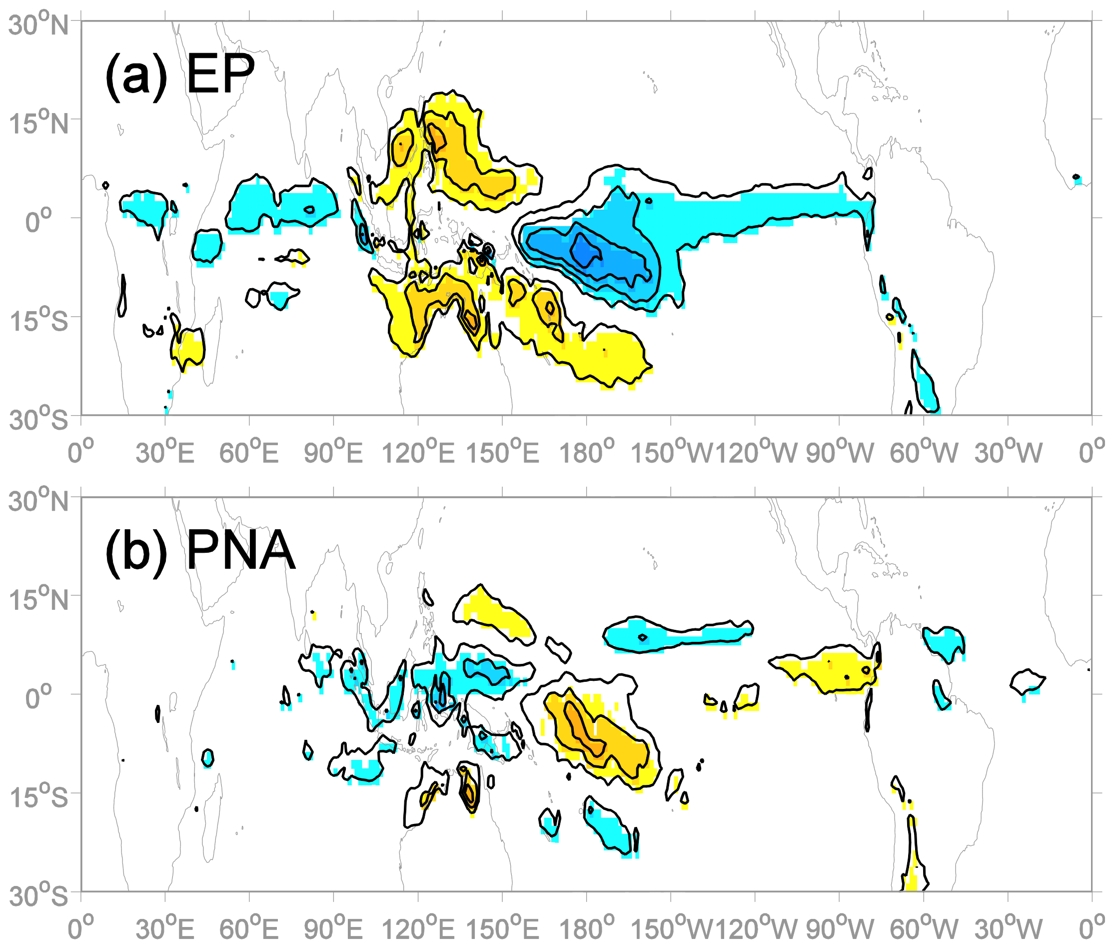


Figure S8. Two-week mean (over the period from day -13 to day 0) of lagged-regressions of unfiltered daily 250 hPa convective heating rate anomalies against (a) the EP index and (b) the PNA index. Contours start from ±0.1 K day^{-1} with an interval of 0.1 K day^{-1} and zero lines are omitted. Warm (cold) shadings indicate positive (negative) anomalies that are statistically significant at the $p < 0.01$ level as determined with a two-tailed Student's *t* test. The PNA pattern in this study refers to the first Empirical Orthogonal Function (EOF) of the daily non-standardized anomaly fields of 250 hPa zonal wind for the extended winters (November-March) from 1958/59 through 2014/15 over the North Pacific (0°-88.75°N, 120°E-105°W). The daily 250 hPa zonal wind anomaly fields are projected onto the PNA pattern, and the obtained time series is normalized and used as the daily PNA index.