

Supplement of

Variability of the Wintertime Jet Stream over Australia and its Role in Extreme Precipitation Events

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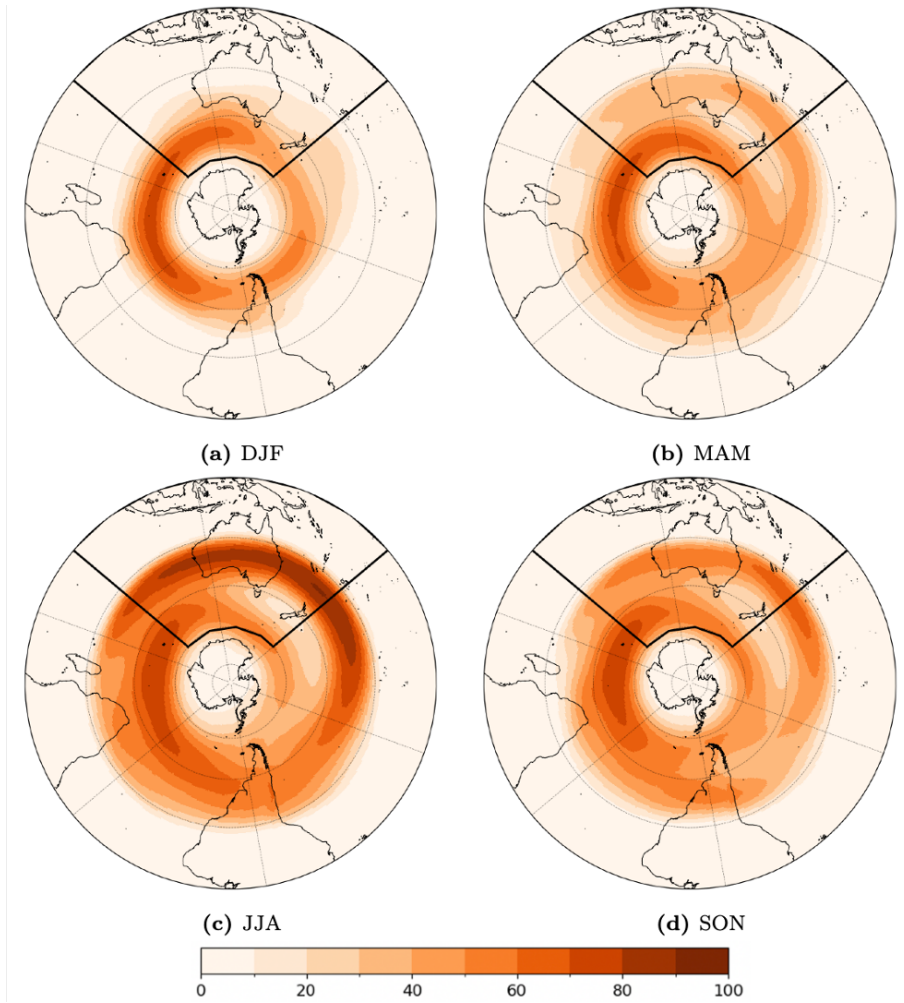


Figure S1. Climatologies of the jet frequency in the Southern Hemisphere for a) DJF, b) MAM, c) JJA and, d) SON. The shading shows the percentage of 6-hourly time steps with a jet object occurring at the respective location for the period from 1980 to 2022. The black box shows the Australian sector used in the clustering.

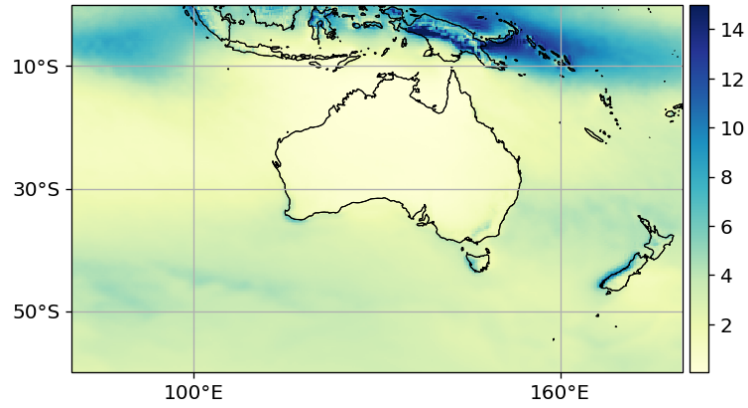


Figure S2. Climatology of the daily precipitation for the winter months (JJA). Hourly precipitation from ERA5 accumulated from 00 to 23 UTC. The shading shows the precipitation in mm day^{-1} .

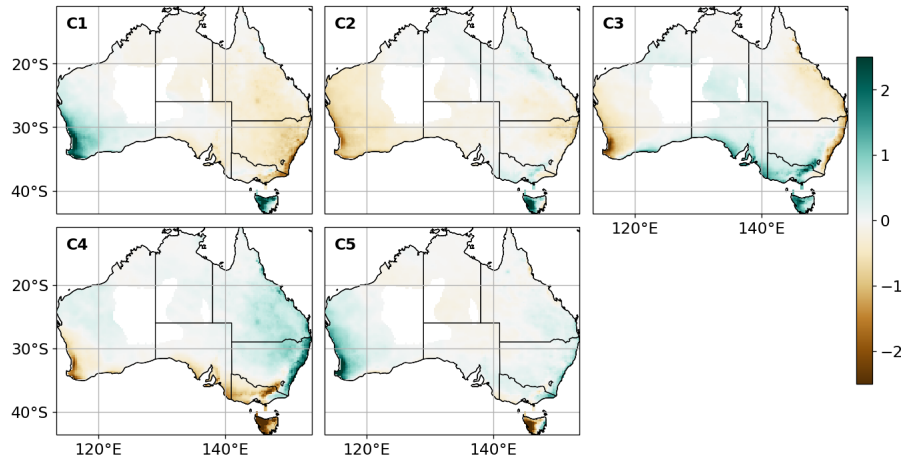


Figure S3. Precipitation anomaly shown for each cluster using AGCD precipitation data, which better demonstrates the precipitation over land compared with ERA5. The shading shows the precipitation anomaly (in mm day^{-1}).

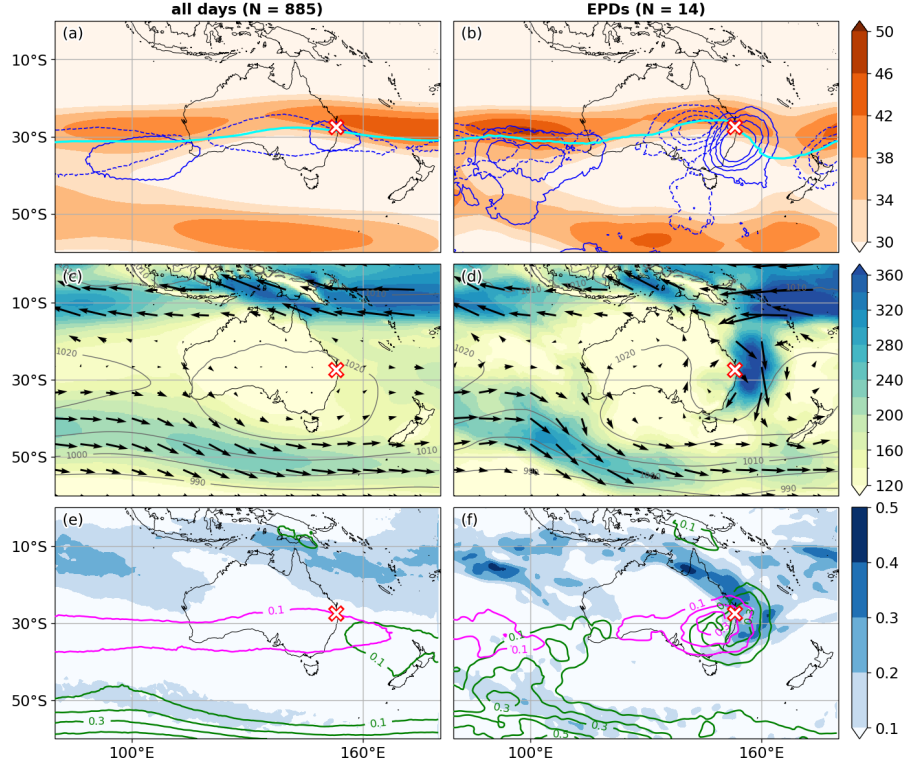


Figure S4. All-day composite ($N = 885$; a, c, e) and Brisbane EPD-only composite for daily events ($N = 14$; b, d, f) for cluster C4. (a) and (b) show the wind speed (VEL) in ms^{-1} in the shading, and the contours show the -2 PVU contour at 330 K (cyan) and $QG\omega$ at 500 hPa in Pa s^{-1} (blue) at $\pm (0.02, 0.04, 0.06, 0.08)$ with solid contours for negative values (upward forcing) and dashed contours for positive values (downward forcing). The shading in (c) and (d) shows the magnitude of the IVT (in kg ms^{-1}), the arrows show the IVT as vectors and the grey contours the mean sea level pressure. (e) and (f) show the frequency of fronts in the shading, and the coloured contours the frequencies of cyclones (green) and PV streamers at 330 K (magenta) with intervals of 0.1 . The contours of the weather feature frequencies in the EPD-only composite (f) are quite noisy due to the small number of days included in the composite. Therefore, a weak smoothing filter was applied to the three fields (frequency of cyclones, fronts and PV streamers) in the EPDs. The cross marks the location of Brisbane.

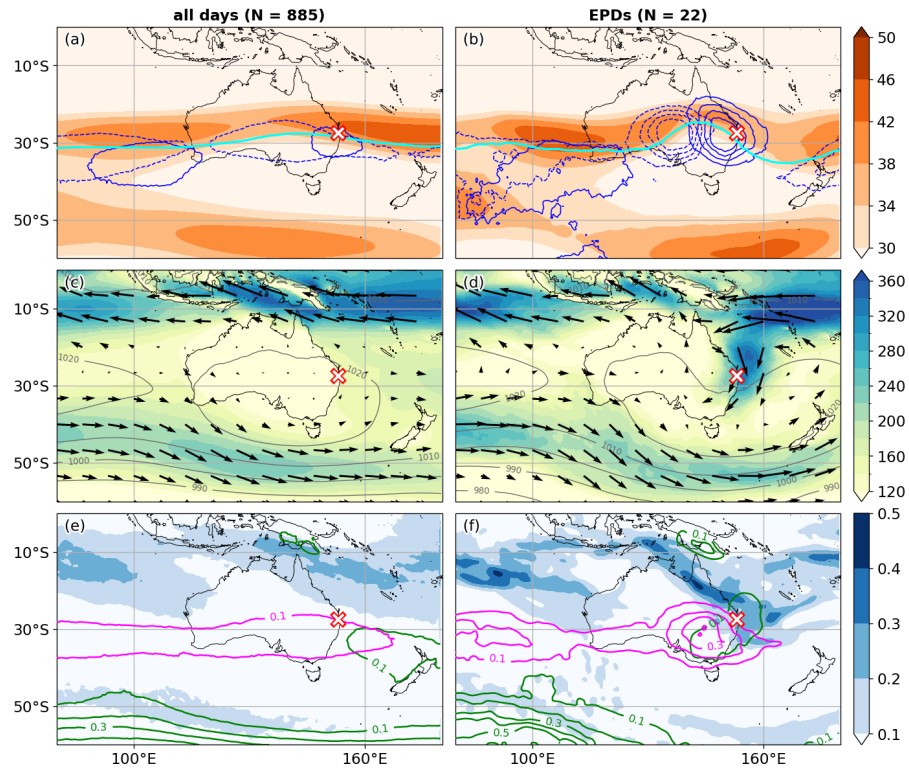


Figure S5. As Fig. S4 but for 3-day events, Brisbane and C4.

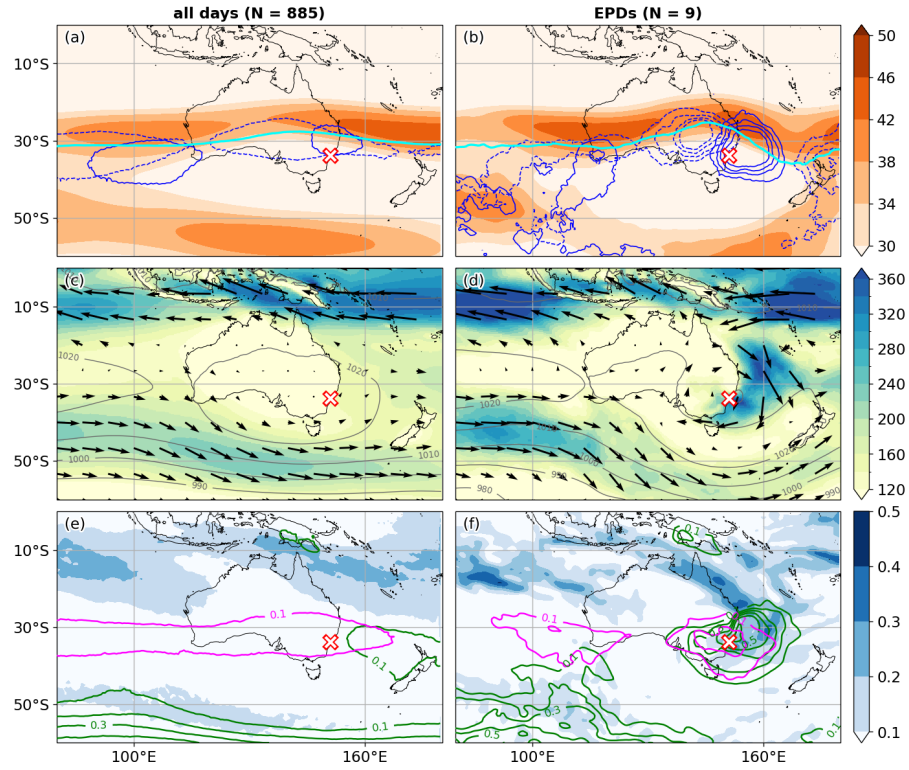


Figure S6. As Fig. S4 but for daily events, Sydney and C4.

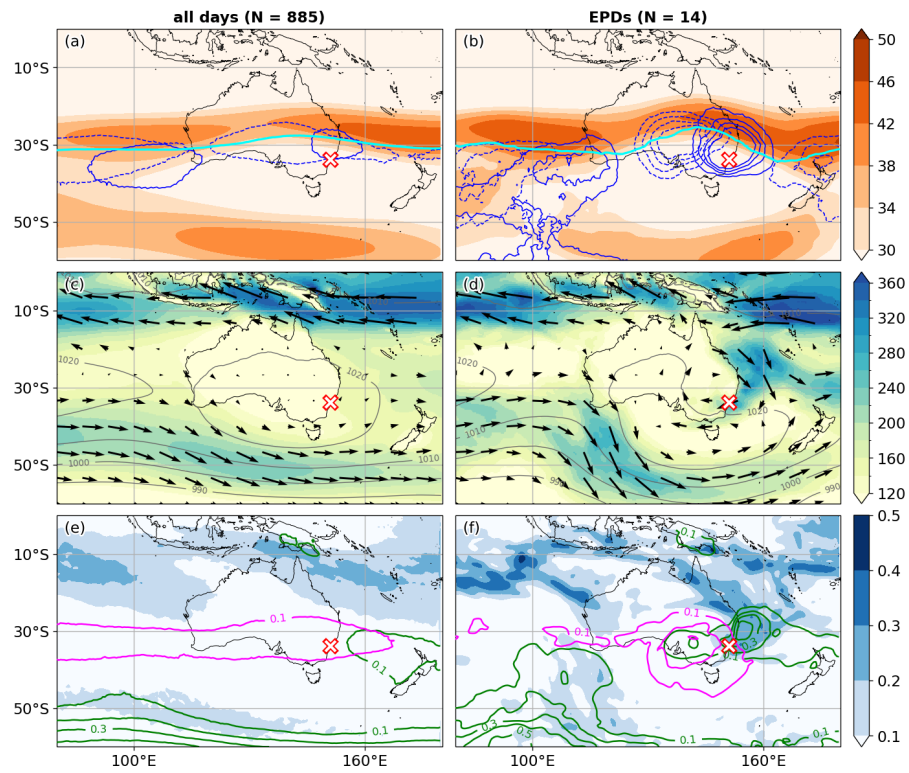


Figure S7. As Fig. S4 but for 3-day events, Sydney and C4.

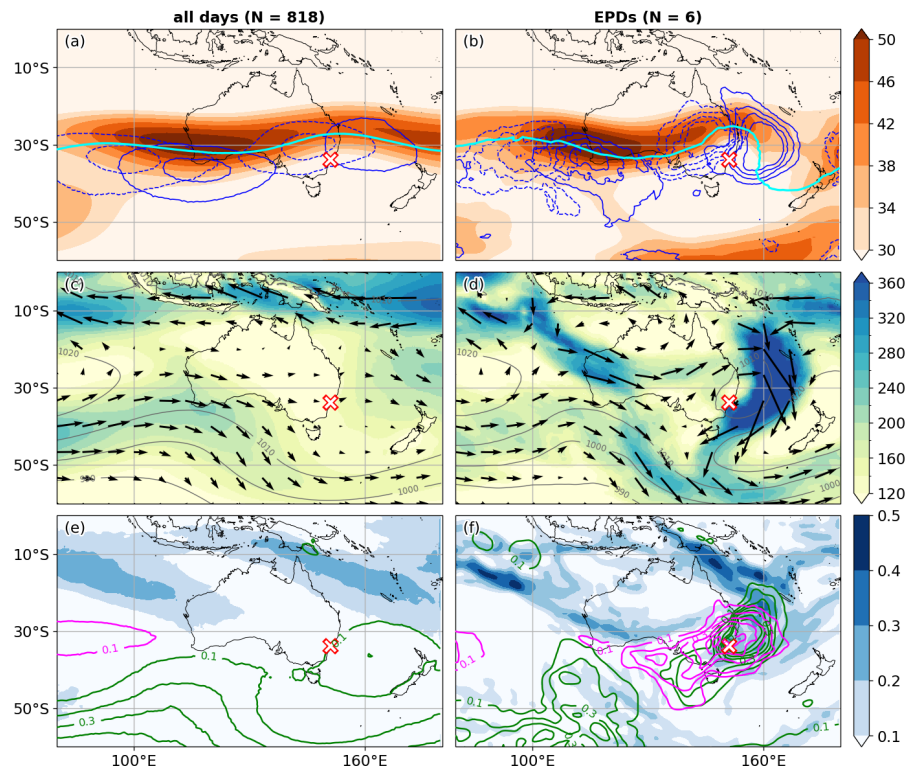


Figure S8. As Fig. S4 but for daily events, Sydney and C5.

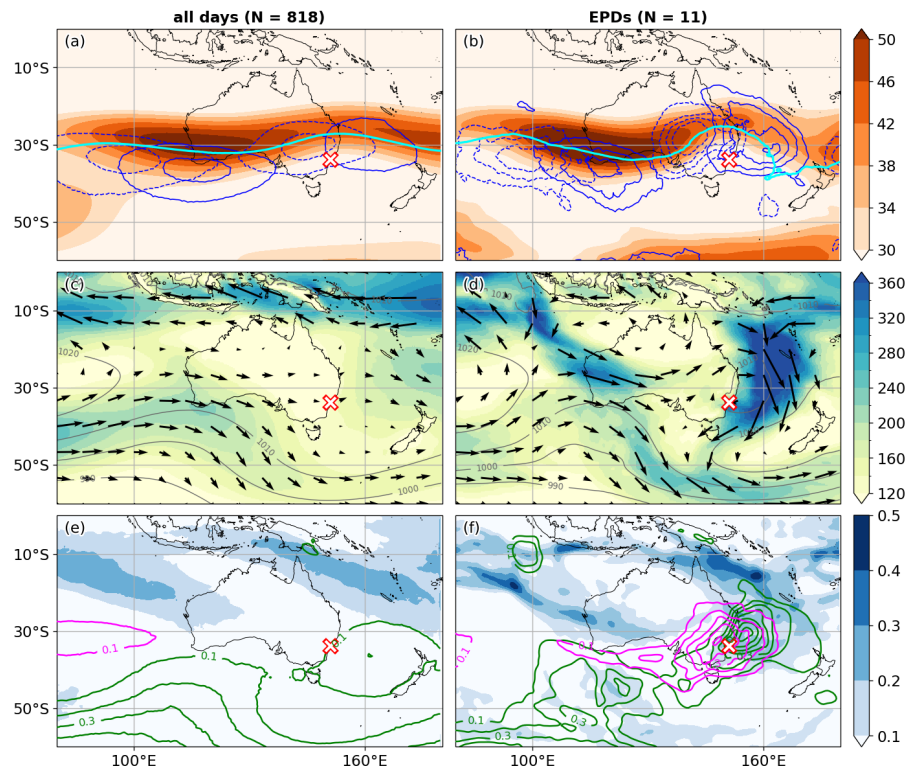


Figure S9. As Fig. S4 but for 3-day events, Sydney and C5.

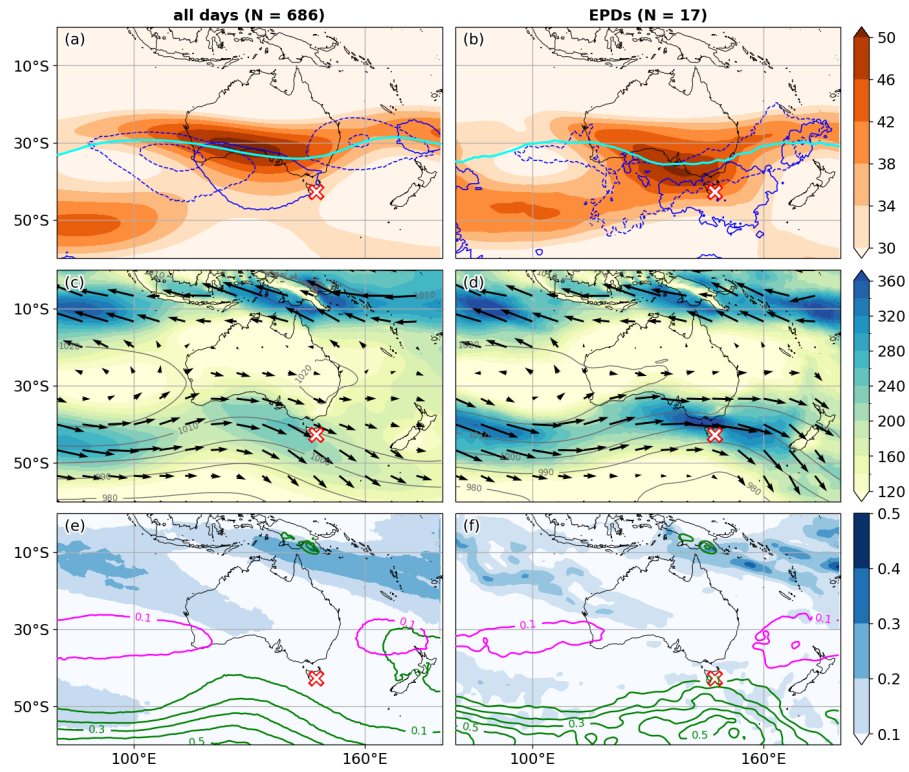


Figure S11. As Fig. S4 but for 3-day events, Hobart and C1.

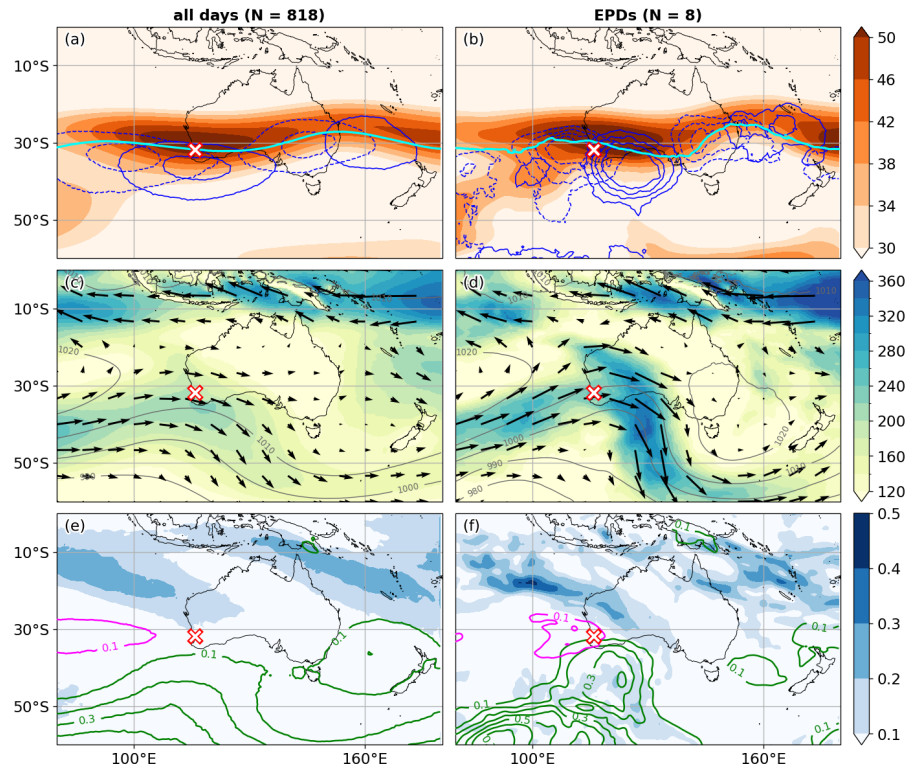


Figure S12. As Fig. S4 but for daily events, Perth and C5.

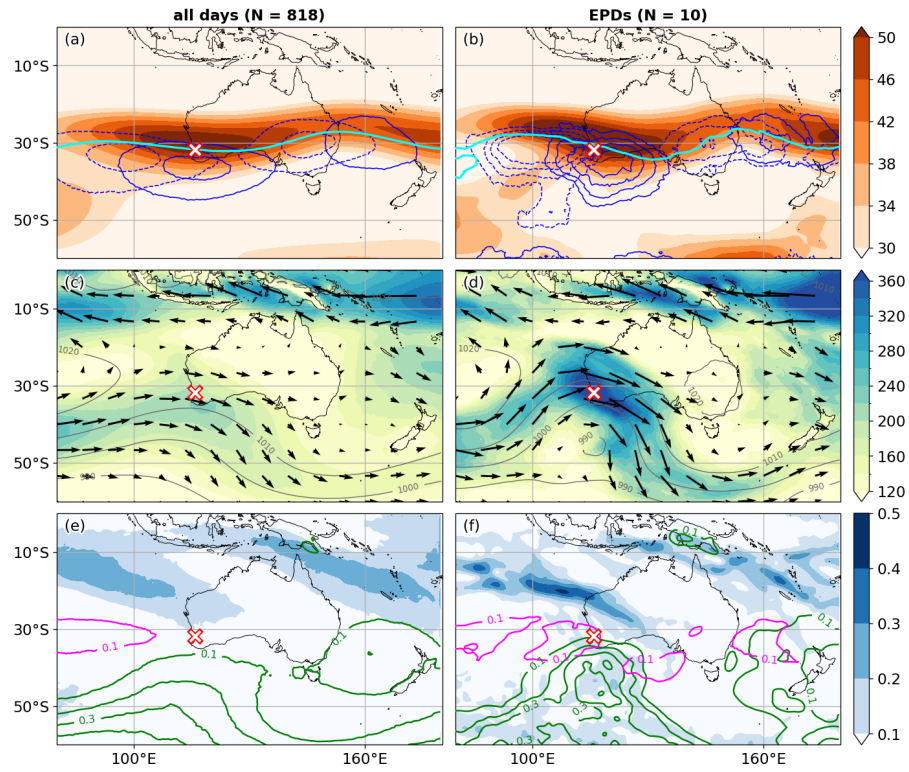


Figure S13. As Fig. S4 but for 3-day events, Perth and C5.

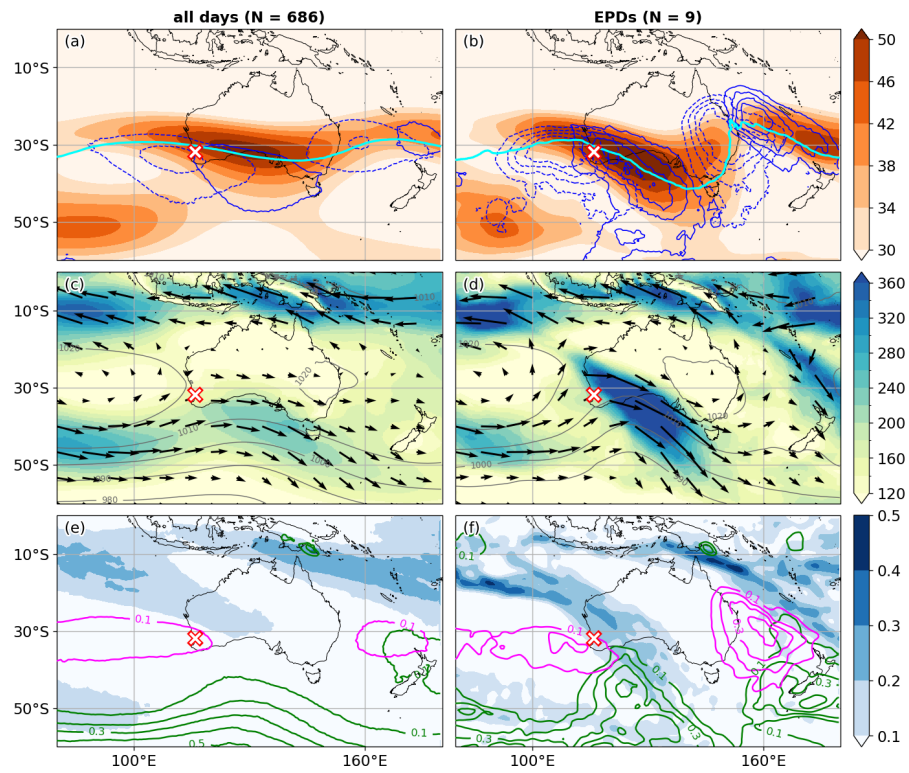


Figure S14. As Fig. S4 but for daily events, Perth and C1.

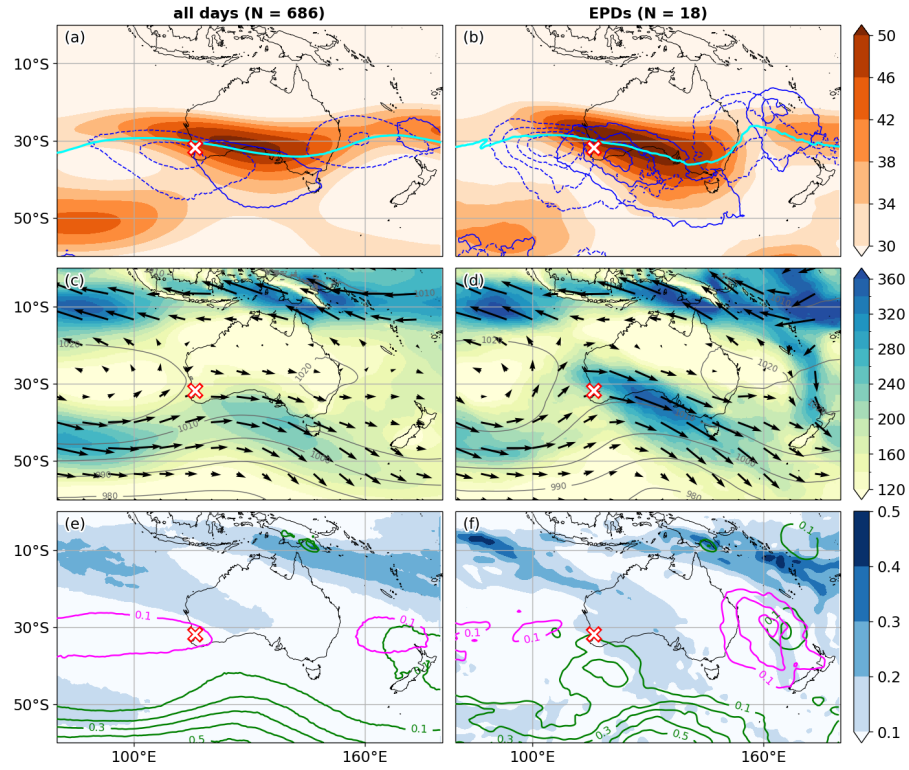


Figure S15. As Fig. S4 but for 3-day events, Perth and C1.

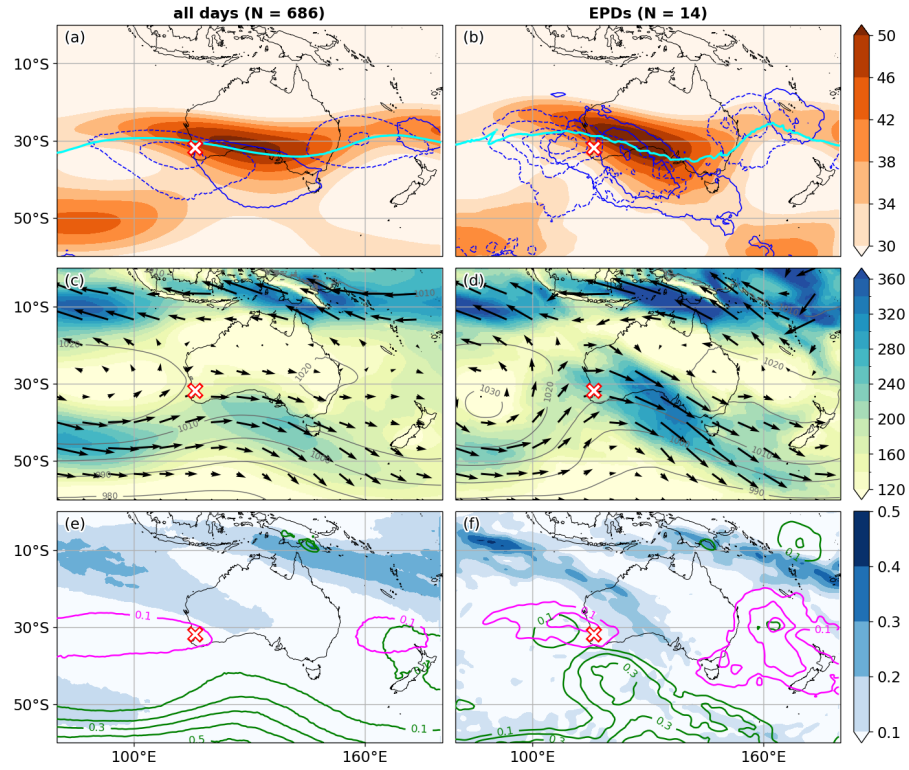


Figure S16. As Fig. S4 but for 5-day events, Perth and C1.

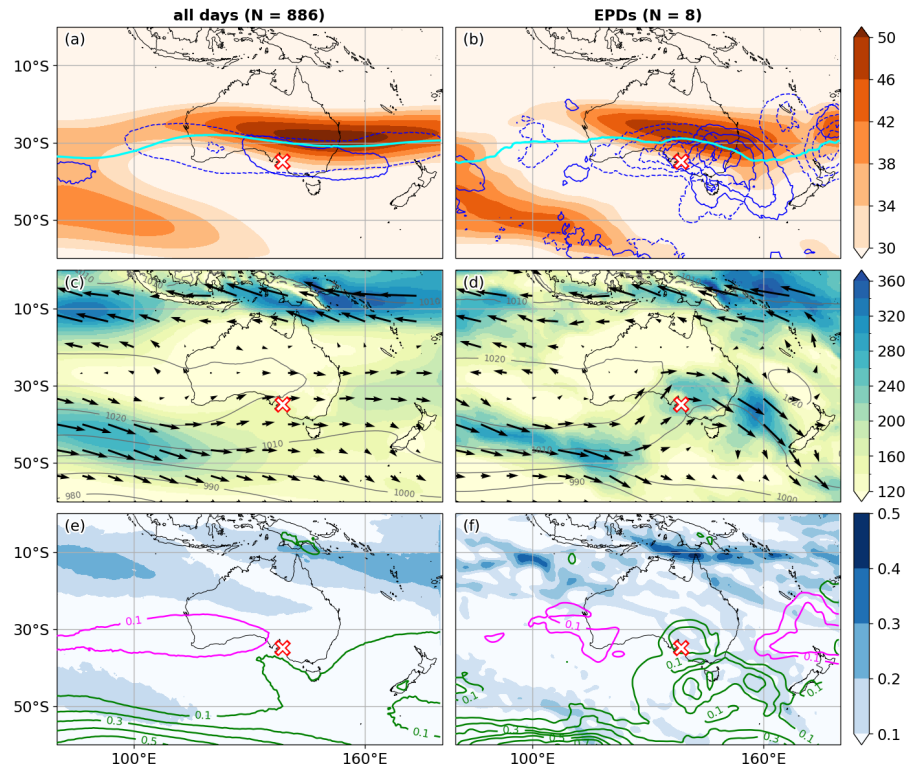


Figure S17. As Fig. S4 but for daily events, Adelaide and C3.

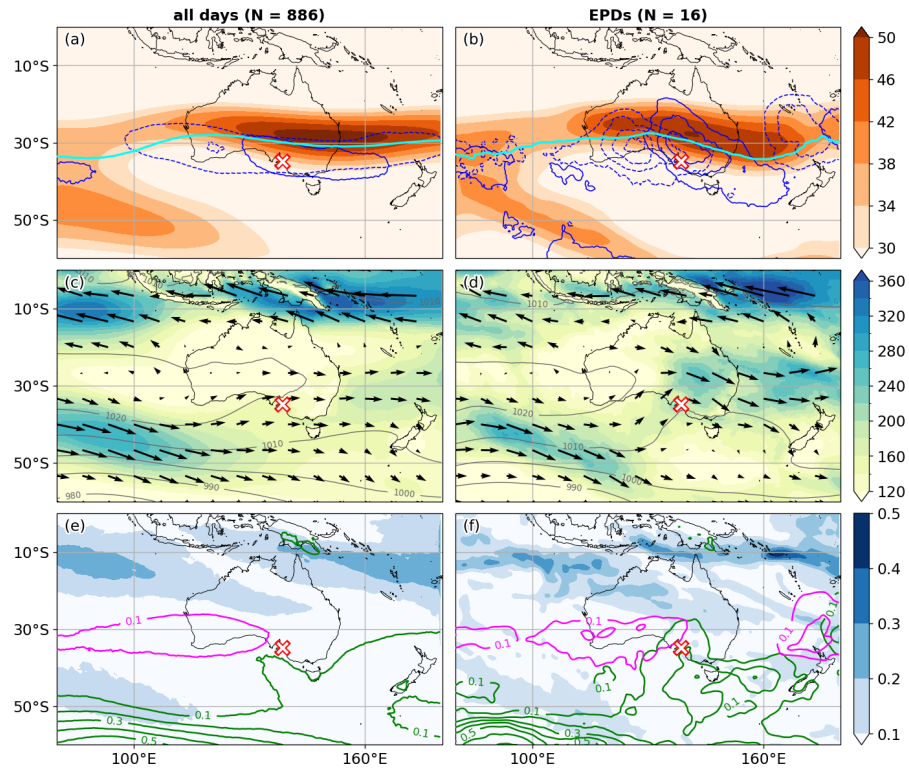


Figure S18. As Fig. S4 but for 3-day events, Adelaide and C3.

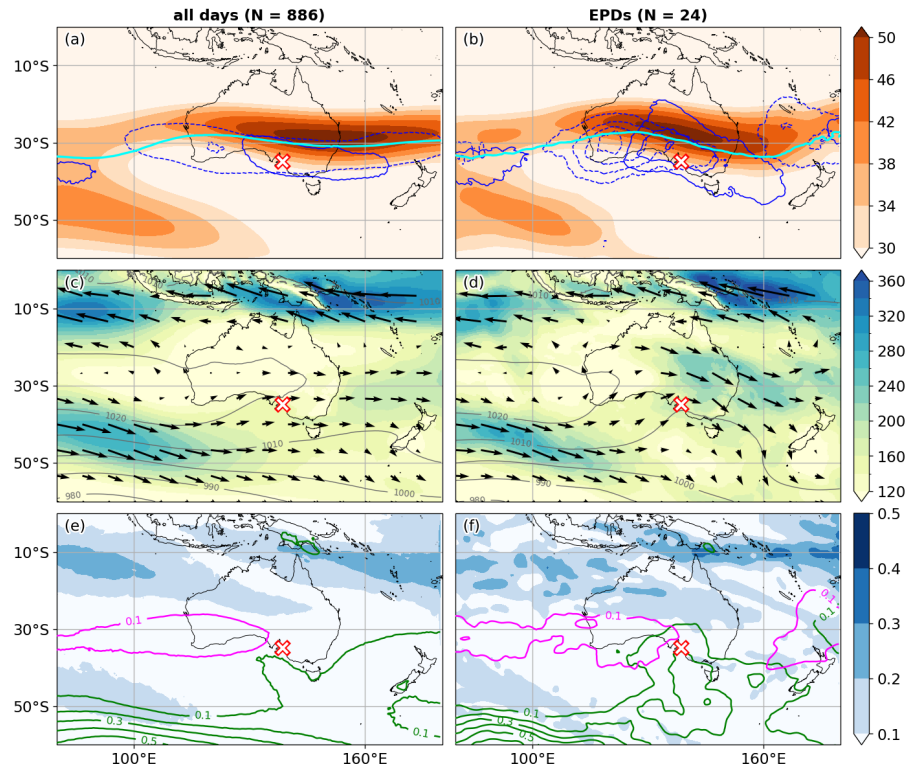


Figure S19. As Fig. S4 but for 5-day events, Adelaide and C3.

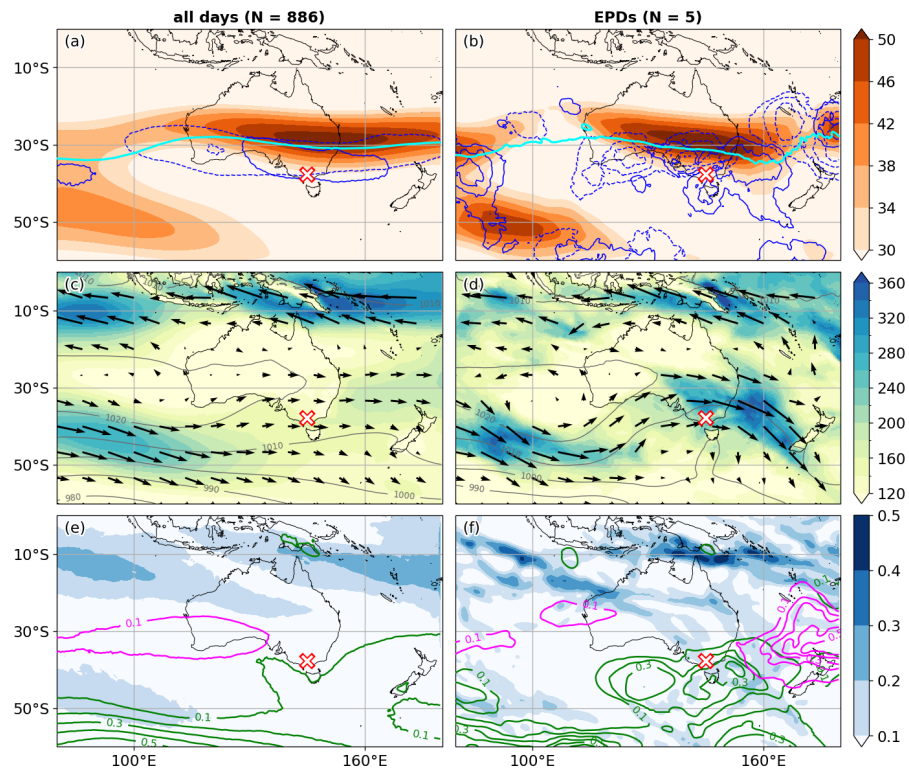


Figure S20. As Fig. S4 but for daily events, Melbourne and C3.

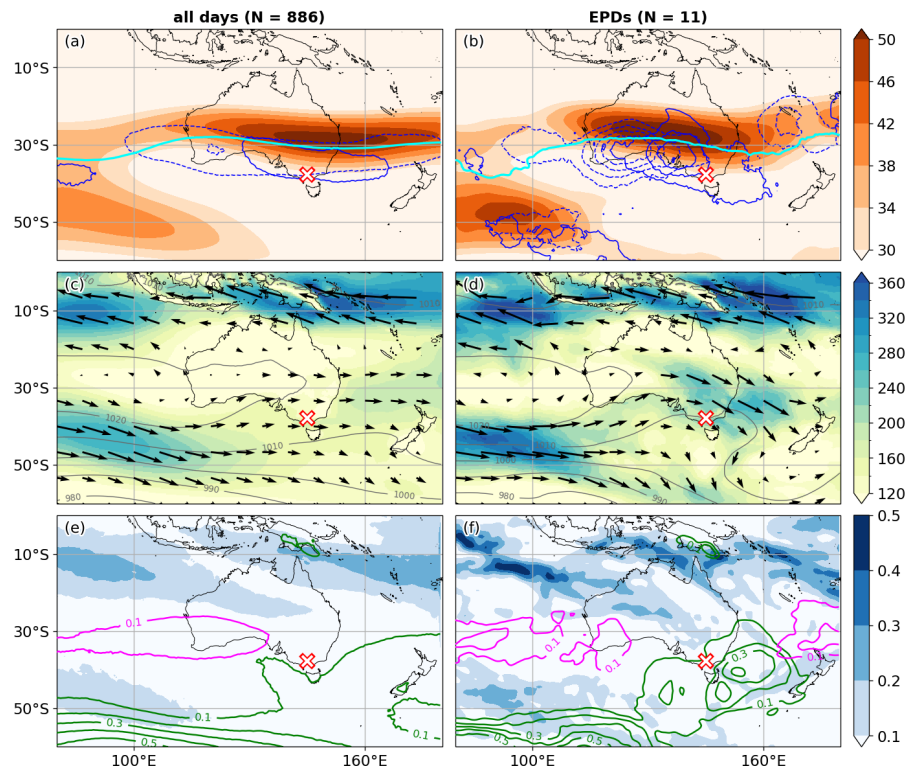


Figure S21. As Fig. S4 but for 3-day events, Melbourne and C3.

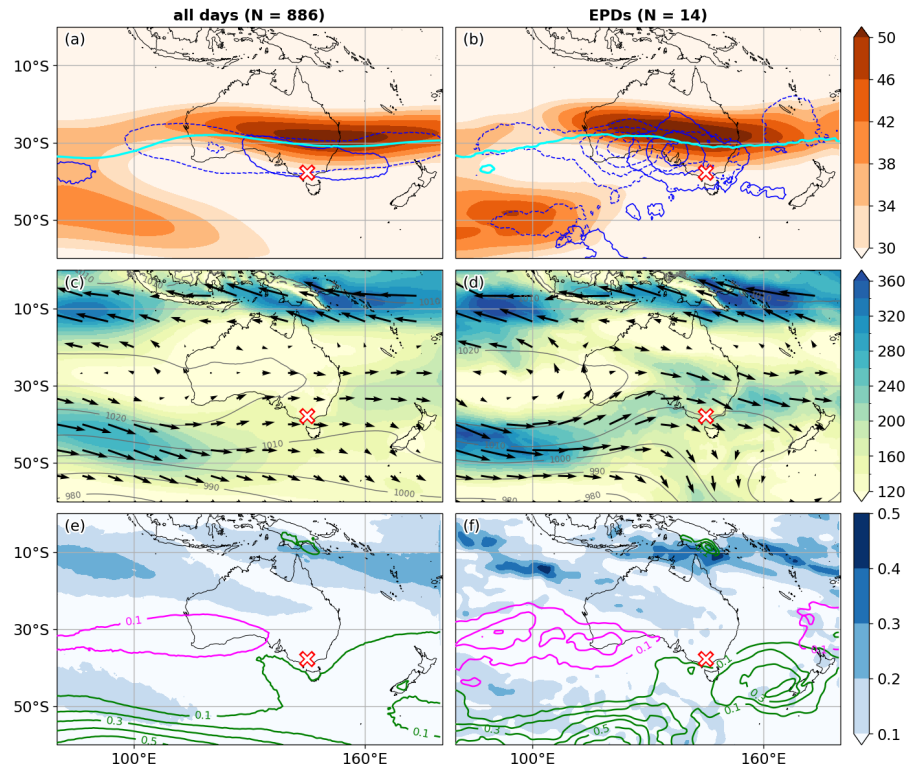


Figure S22. As Fig. S4 but for 5-day events, Melbourne and C3.

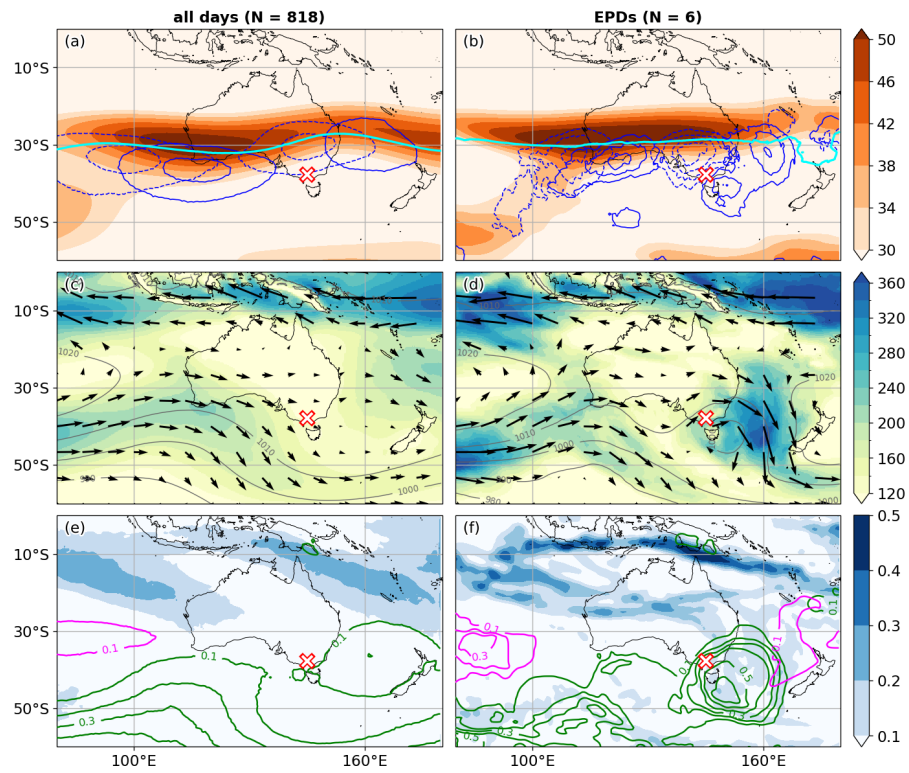


Figure S23. As Fig. S4 but for daily events, Melbourne and C5.

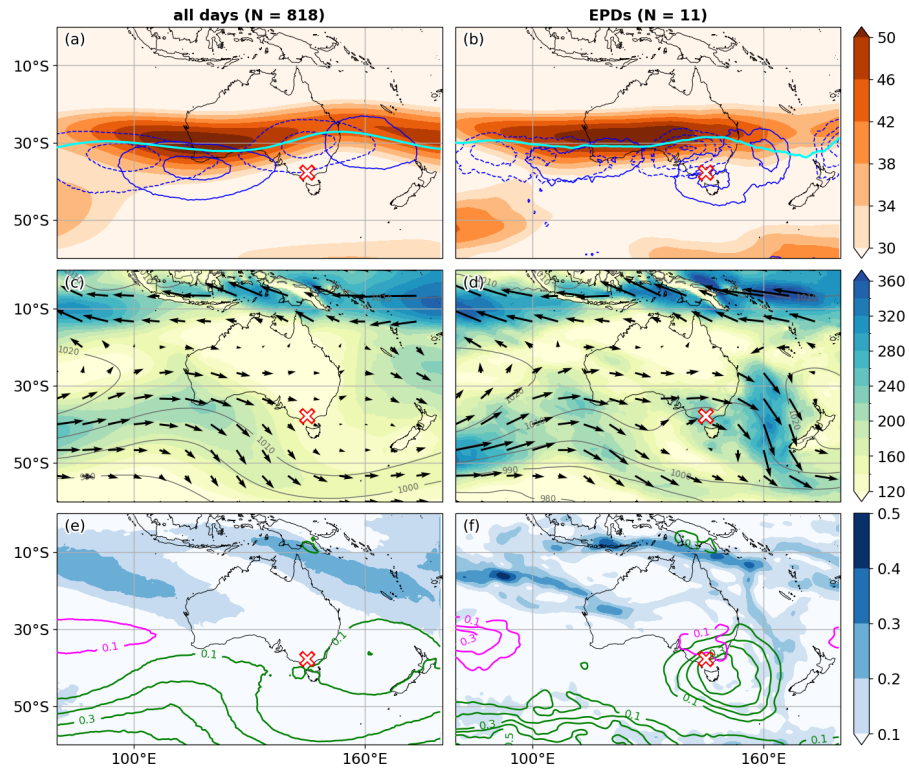


Figure S24. As Fig. S4 but for 3-day events, Melbourne and C5.

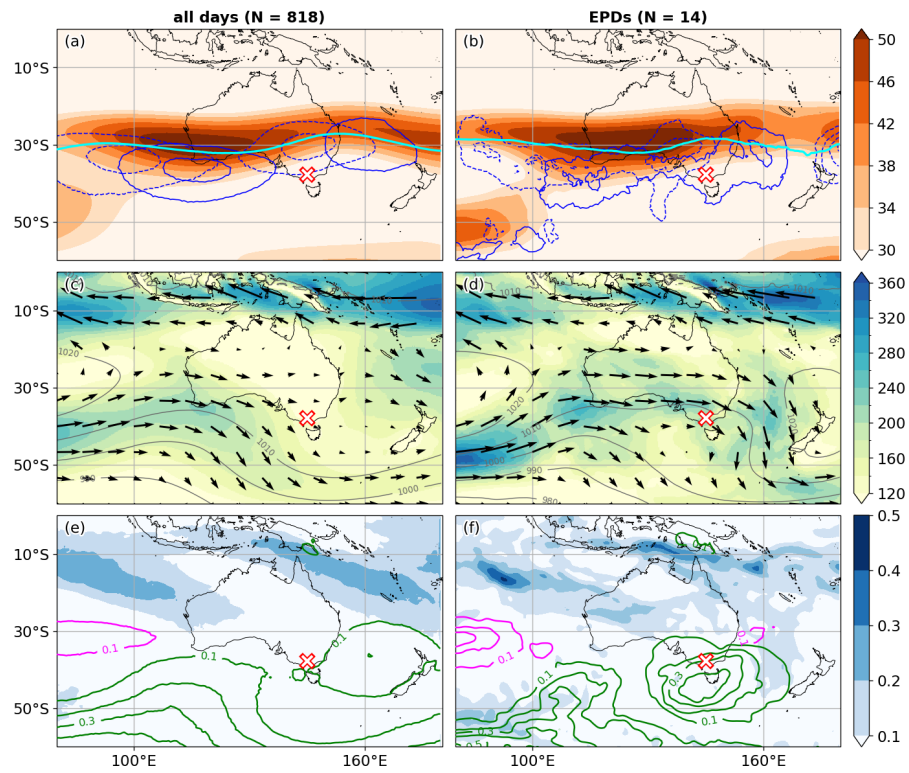


Figure S25. As Fig. S4 but for 5-day events, Melbourne and C5.