

Supplement

Composite Hovmöller diagrams for individual ET clusters

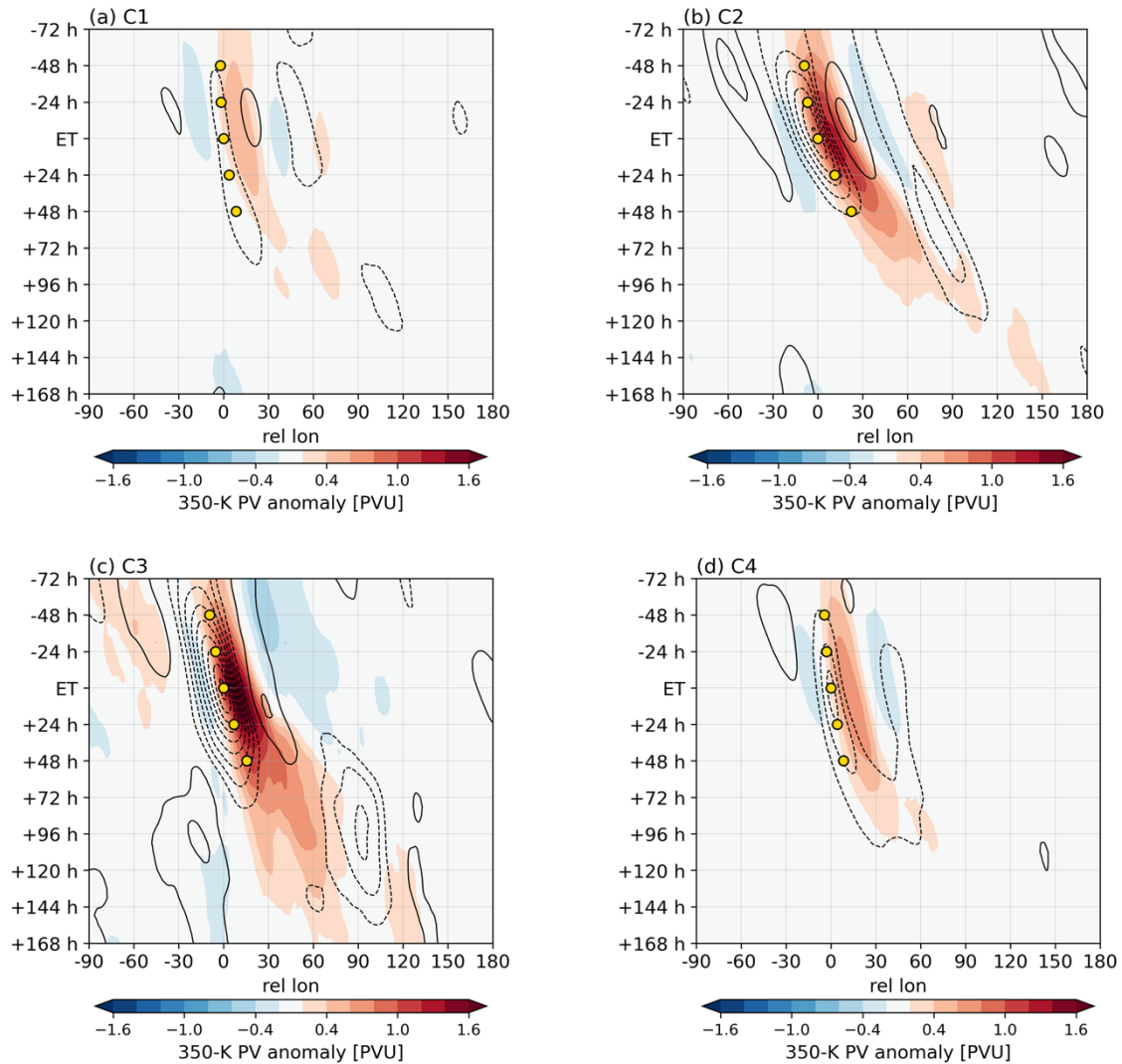
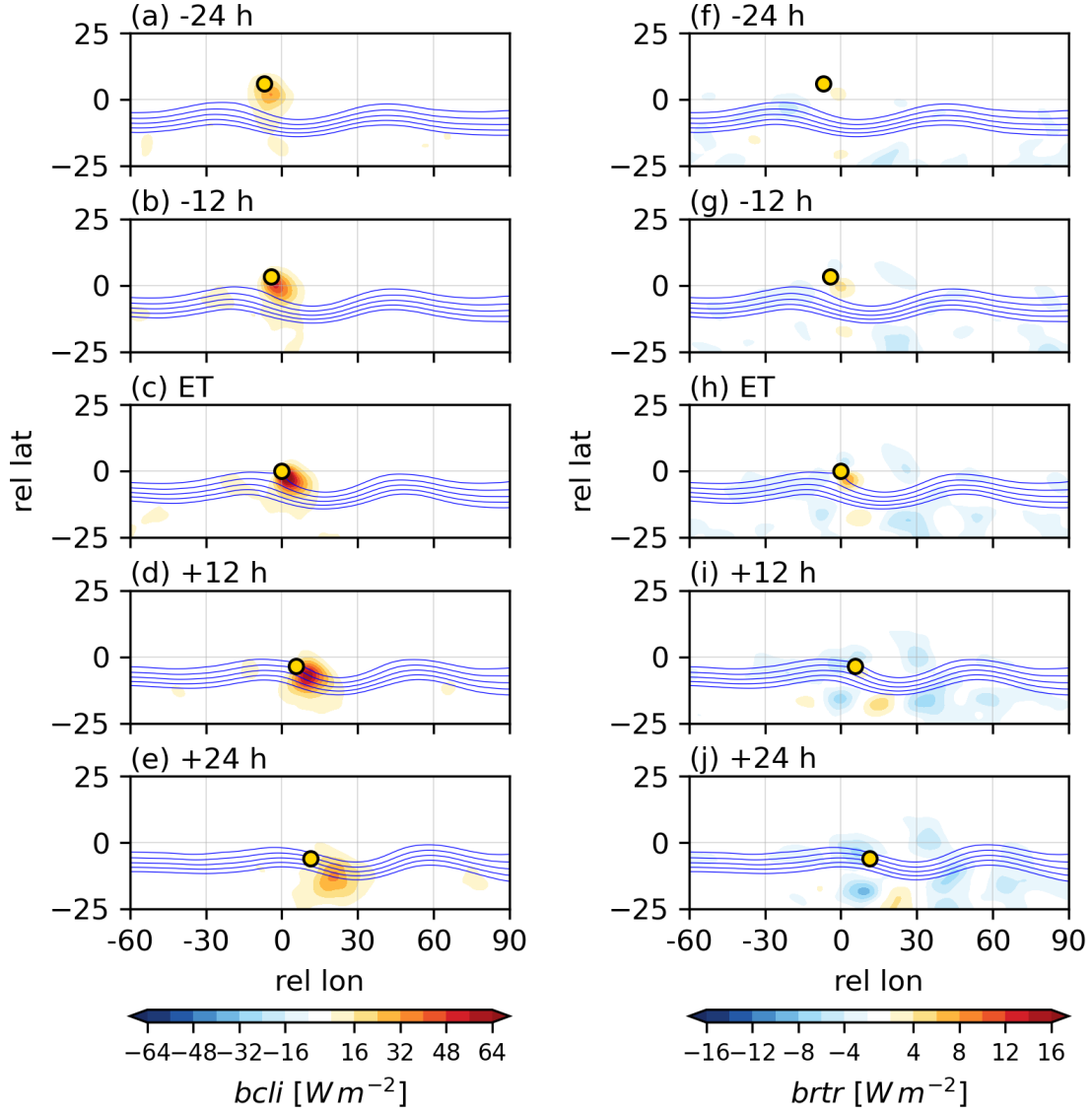


Figure S1: ET-relative composite Hovmöller diagrams of 350-K PV anomaly (shaded as per the colorbar) and MSLP anomaly (black contours) for the four ET clusters. PV and MSLP anomalies are calculated relative to the 30-day running mean. Yellow dots mark the cyclone position.



15 Figure S2: Lead-lag composites of (a-e) baroclinic conversion $bcli$ and (f-j) barotropic conversion $brtr$ for C2. $bcli$ and $brtr$ are shaded as per the colorbar. 500-hPa geopotential height is marked by blue contours (every 5 dam starting from 550 dam). Yellow dots mark the cyclone position.

Eddy kinetic energy budget: barotropic conversion for C3

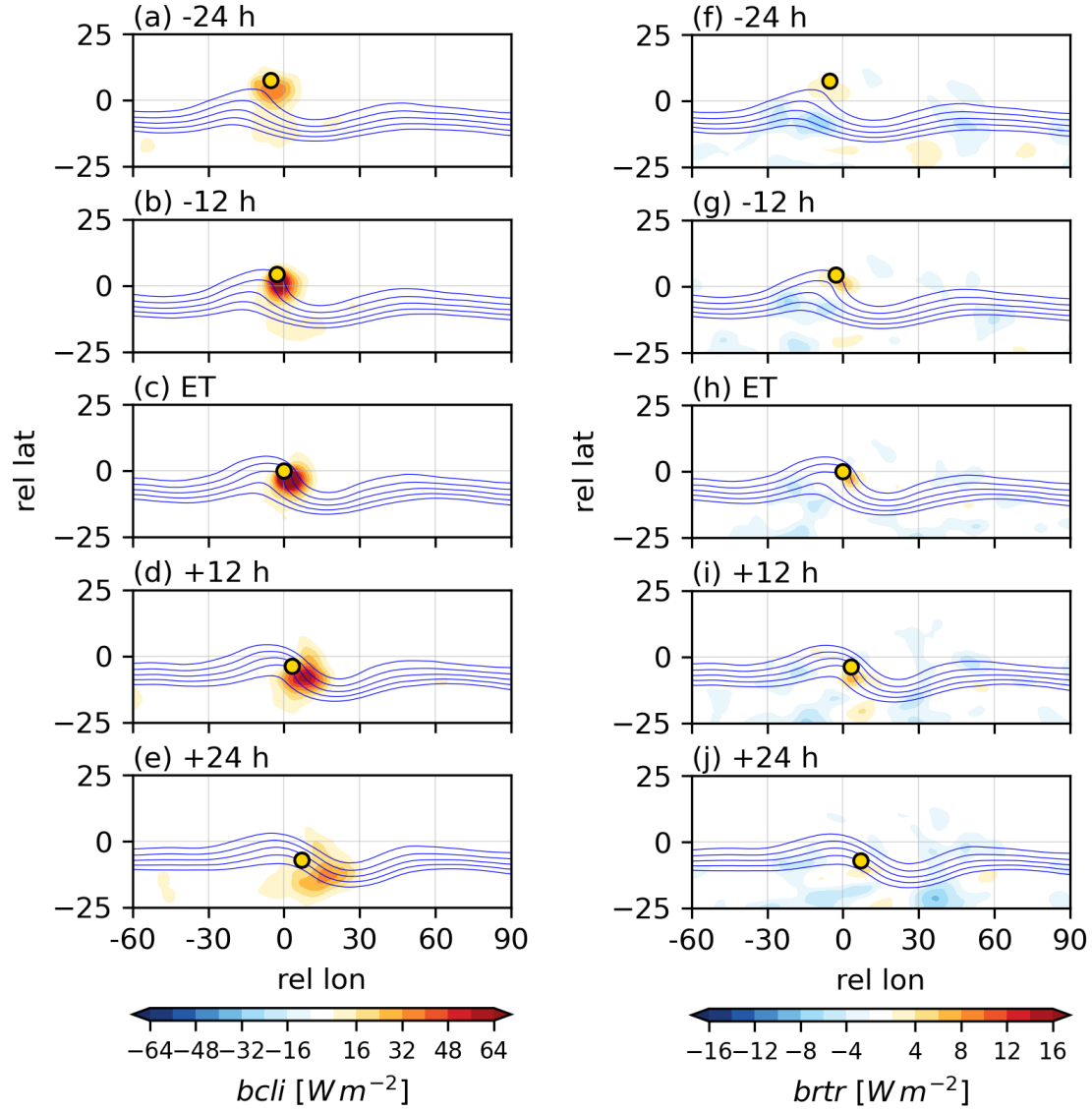
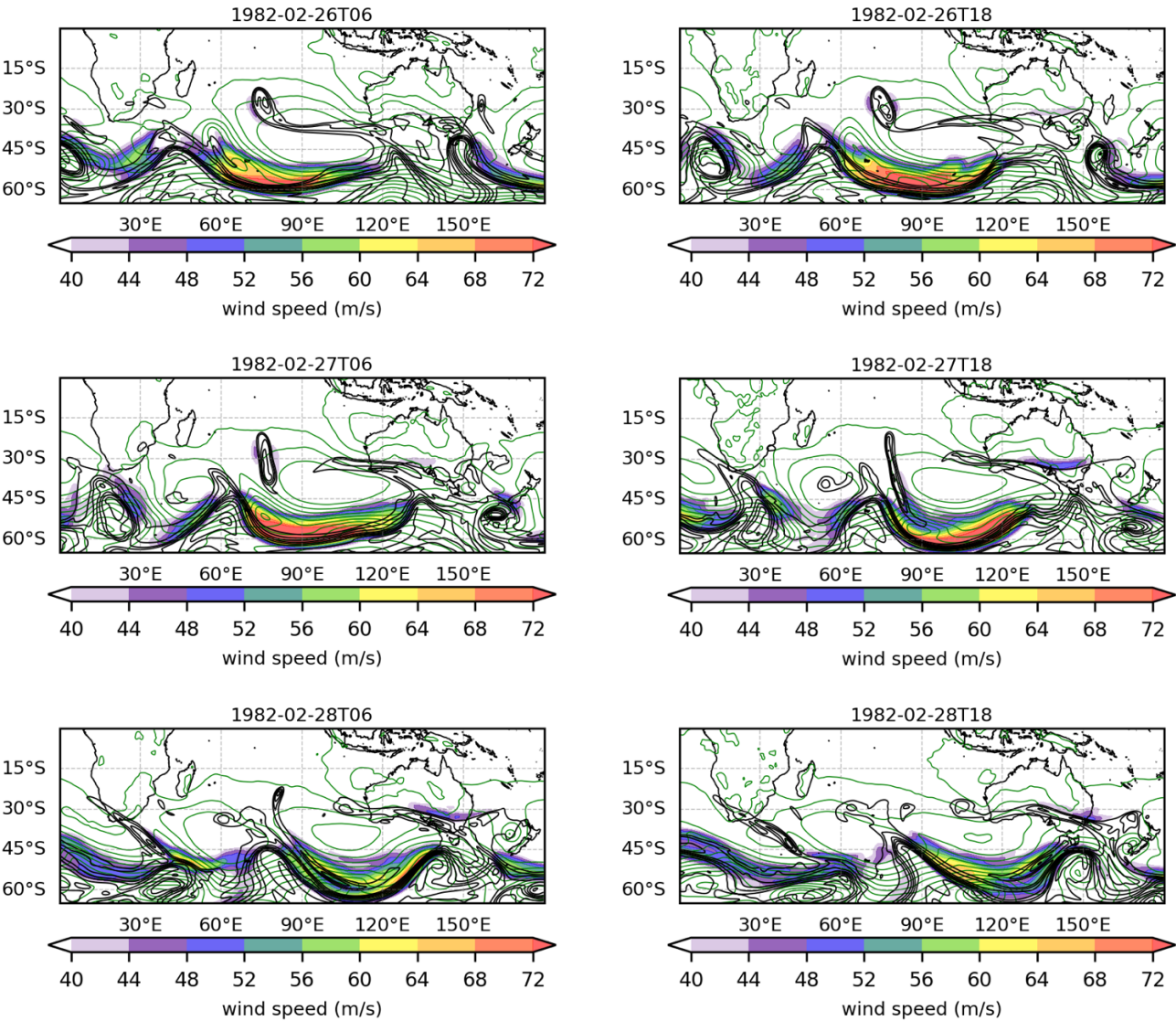


Figure S3: Lead-lag composites of (a-e) baroclinic conversion $bcli$ and (f-j) barotropic conversion $brtr$ for C3. $bcli$ and $brtr$ are shaded as per the colorbar. 500-hPa geopotential height is marked by blue contours (every 5 dam starting from 550 dam). Yellow dots mark the cyclone position.

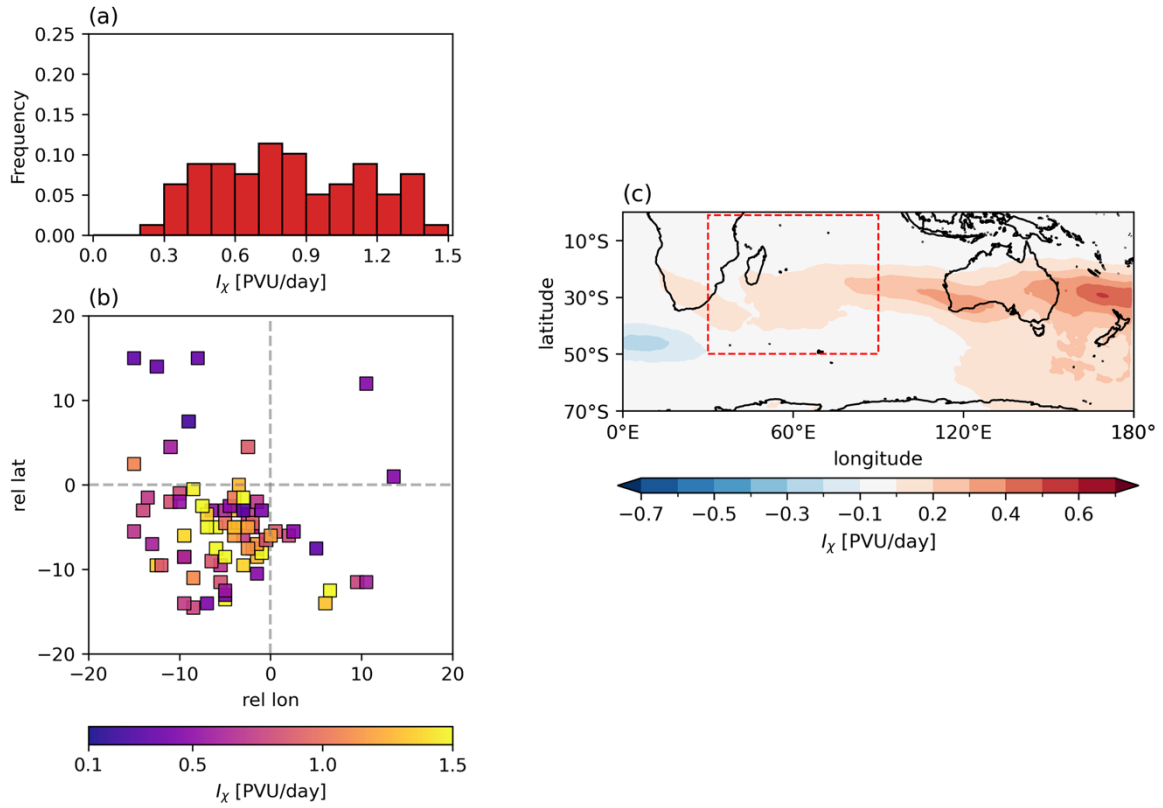
Case study: southwest Indian Ocean, February 1982

30 A case study of extratropical transition over the southwest Indian Ocean shows that the anticyclonic wave breaking downstream of the extratropical transition triggers a potential vorticity stream, which eventually breaks up as a cut-off low. The cut-off low then merge back into the midlatitude waveguide, promoting the ridge development again.



35 Figure S4: Case study of extratropical transition of tropical cyclone over the southwest Indian Ocean and its downstream development between 26 and 28 February 1982. 200-300-hPa potential vorticity is marked in black contours (every 1 PVU starting at -2 PVU), and mean sea level pressure is denoted by green contours (every 5 hPa starting at 960 hPa). 200-300-hPa horizontal wind speed is shaded as per the colorbar. TC completes the transition at UTC 06 26 February 1982.

Maximum interaction relative to TC for C2 and C3 in southwest Indian Ocean



40 **Figure S5: (a) Distribution of maxima of the magnitude of positive I_χ , (b) Position of maxima of the magnitude of positive I_χ relative to ET position. (c) November-April climatology of I_χ during 1979-2021. Positive I_χ values indicate the upper-level divergence on the equatorward side of the jet, whereas the negative I_χ values indicate the upper-level convergence on the equatorward side. Red dashed box indicates the southwestern Indian Ocean region where C2 and C3 ET events are focused.**