# Extratropical - Tropical Interaction During Tropical Cyclone Larry Genesis


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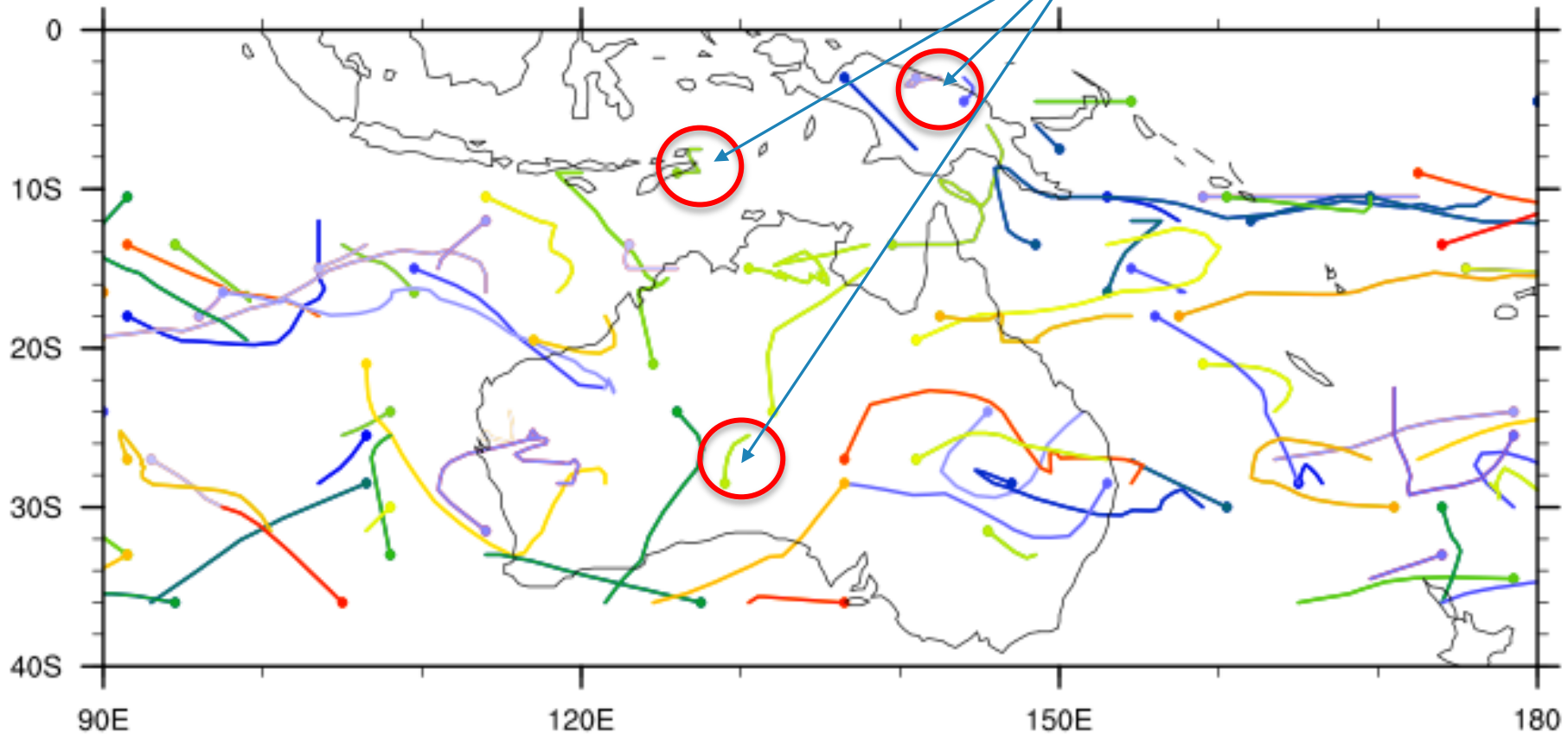
# Climatology of coherent cyclonic PV

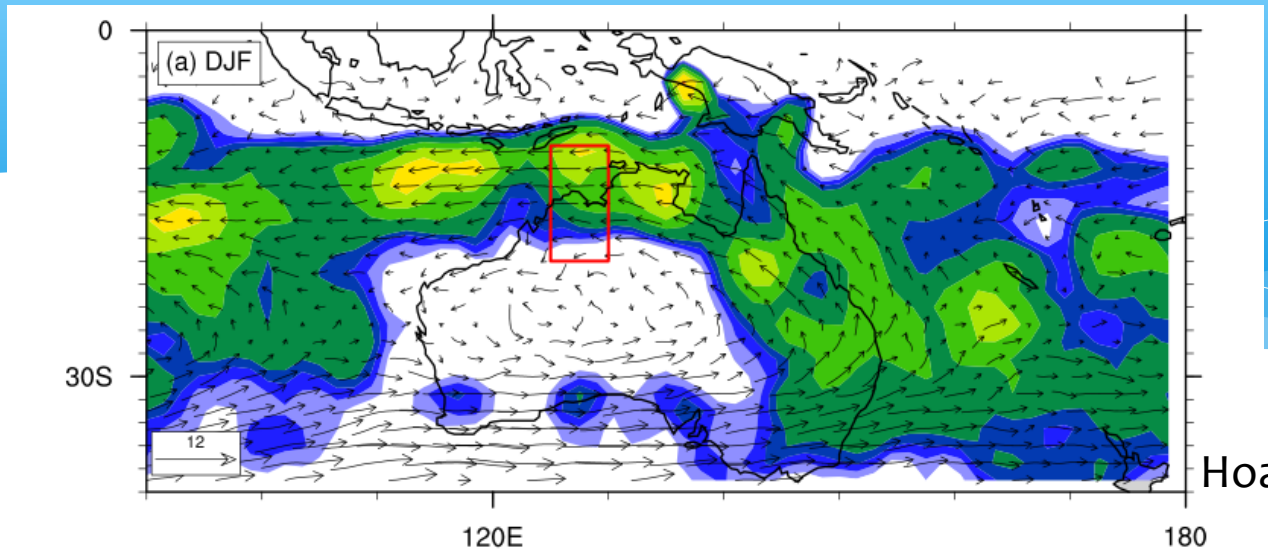
Remove those cyclonic PV that live less than 2 days in statistics

Coherent PV maximum tracks

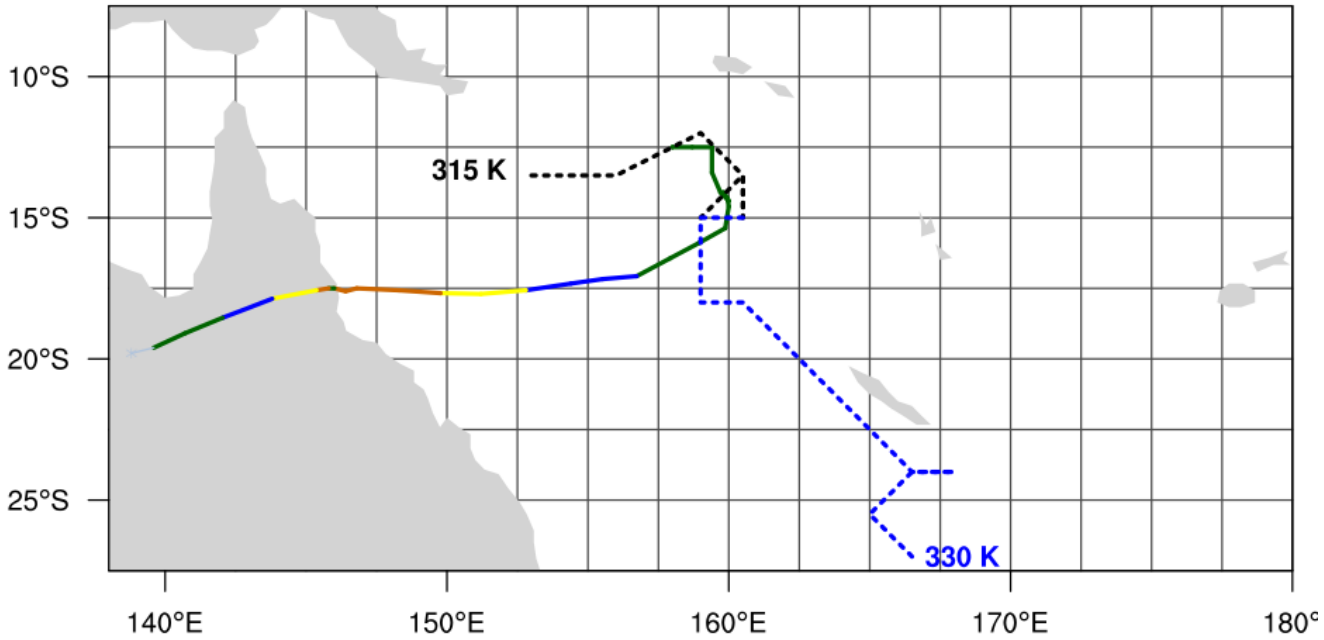



Hoang et al. 2016

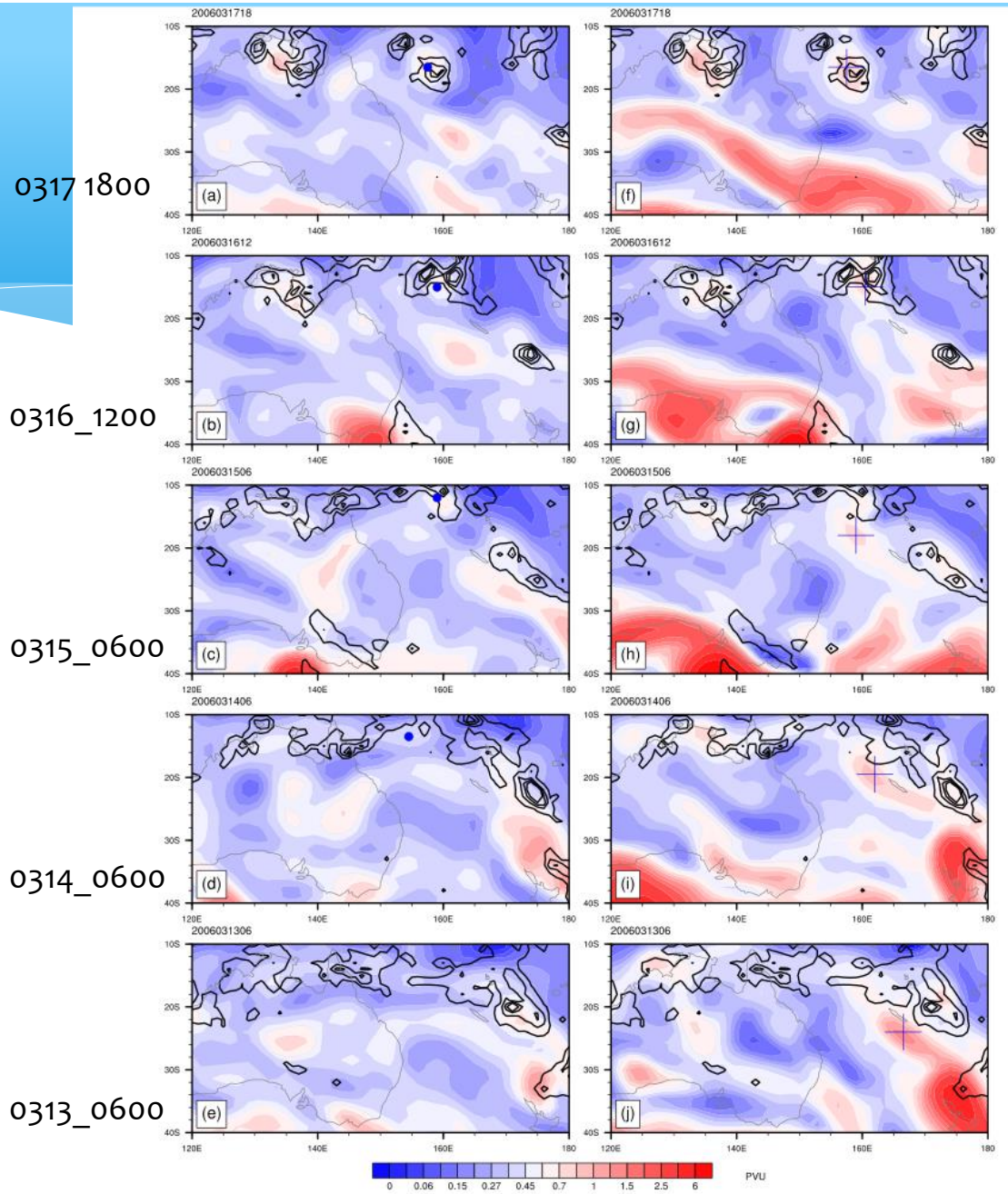
# Why TC genesis? Why Larry?



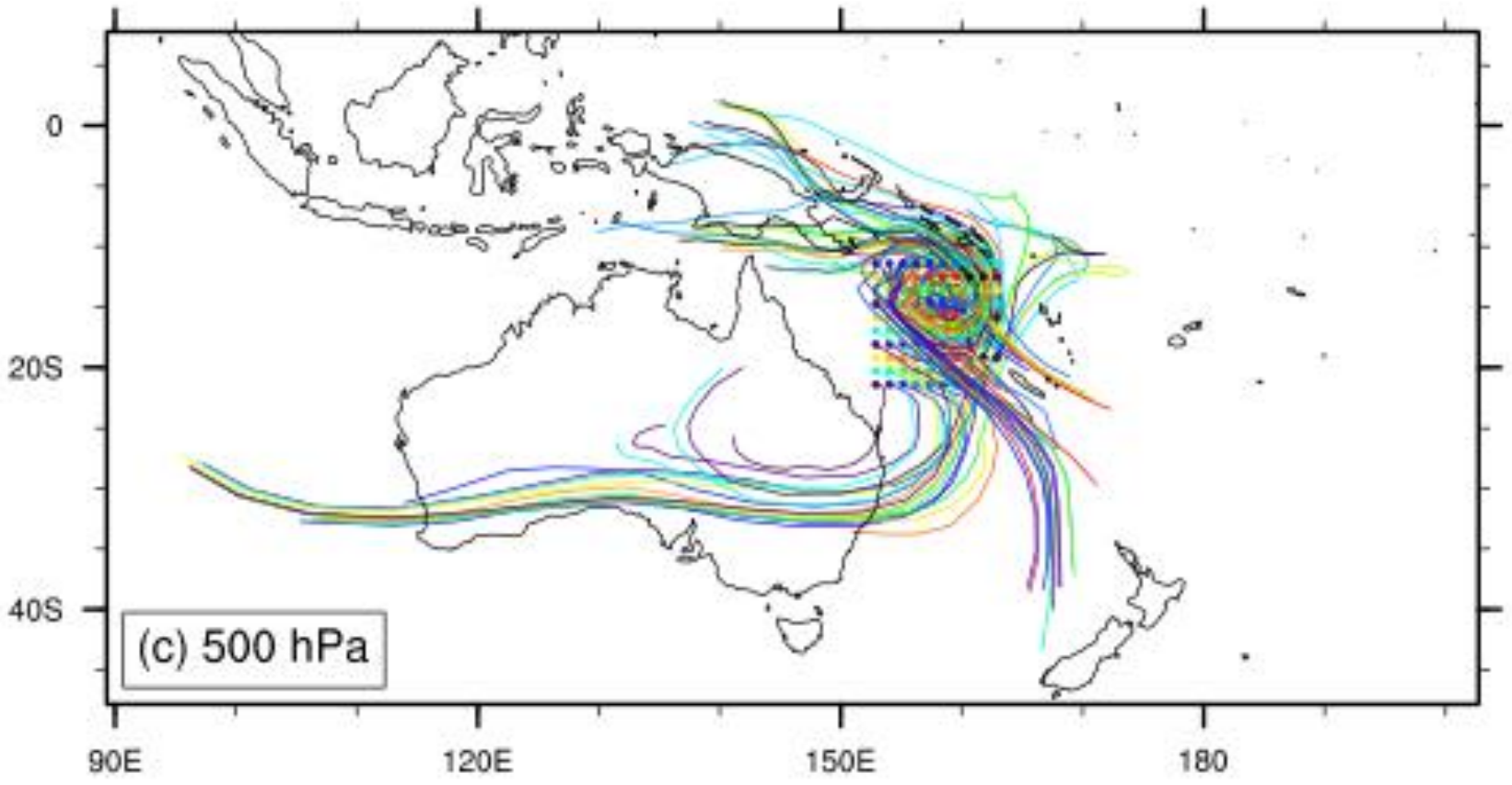

Hoang et al. 2016



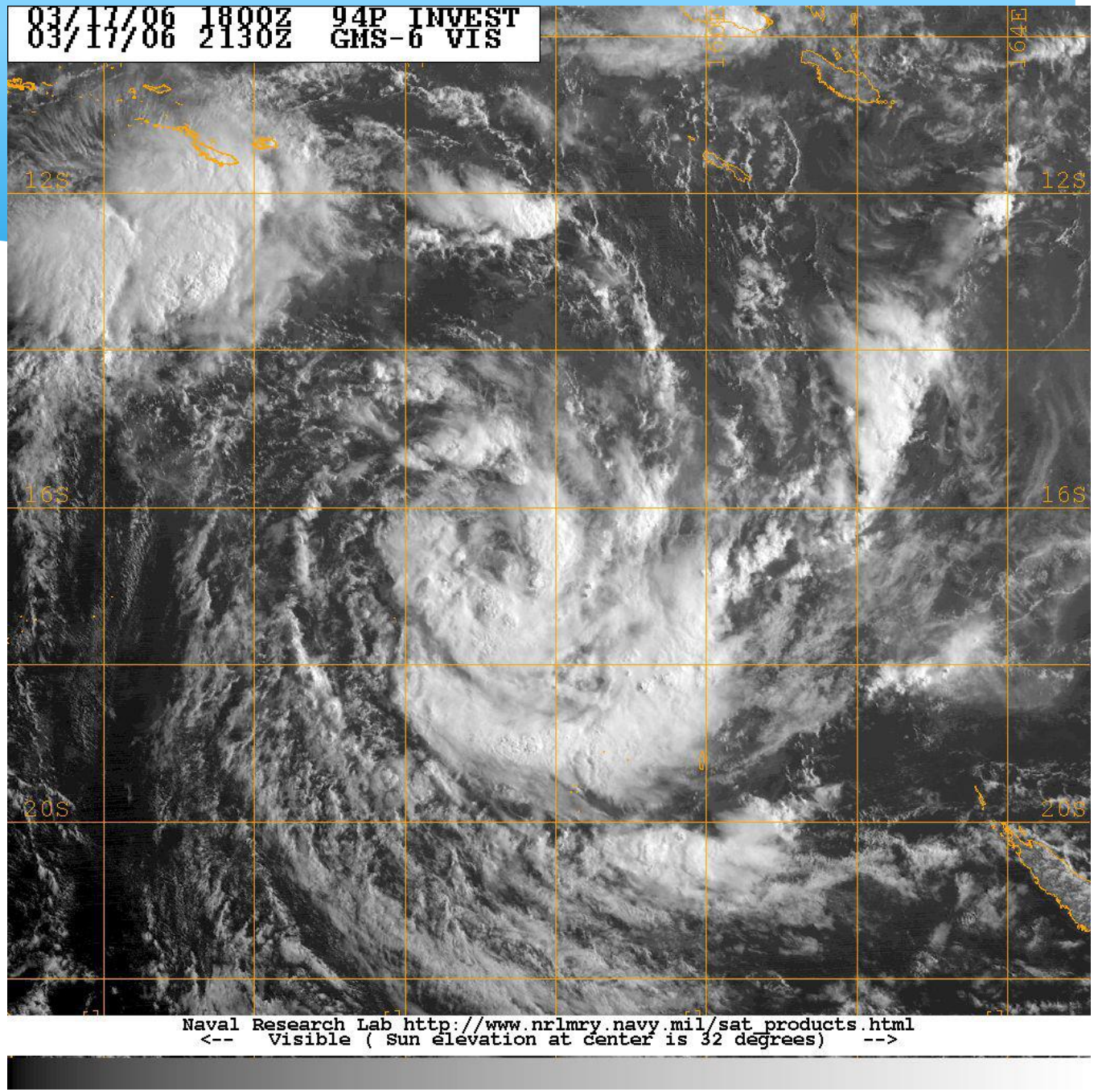
How coherent PV maxima tracked backward from genesis location of TC Larry in ERA-Interim?



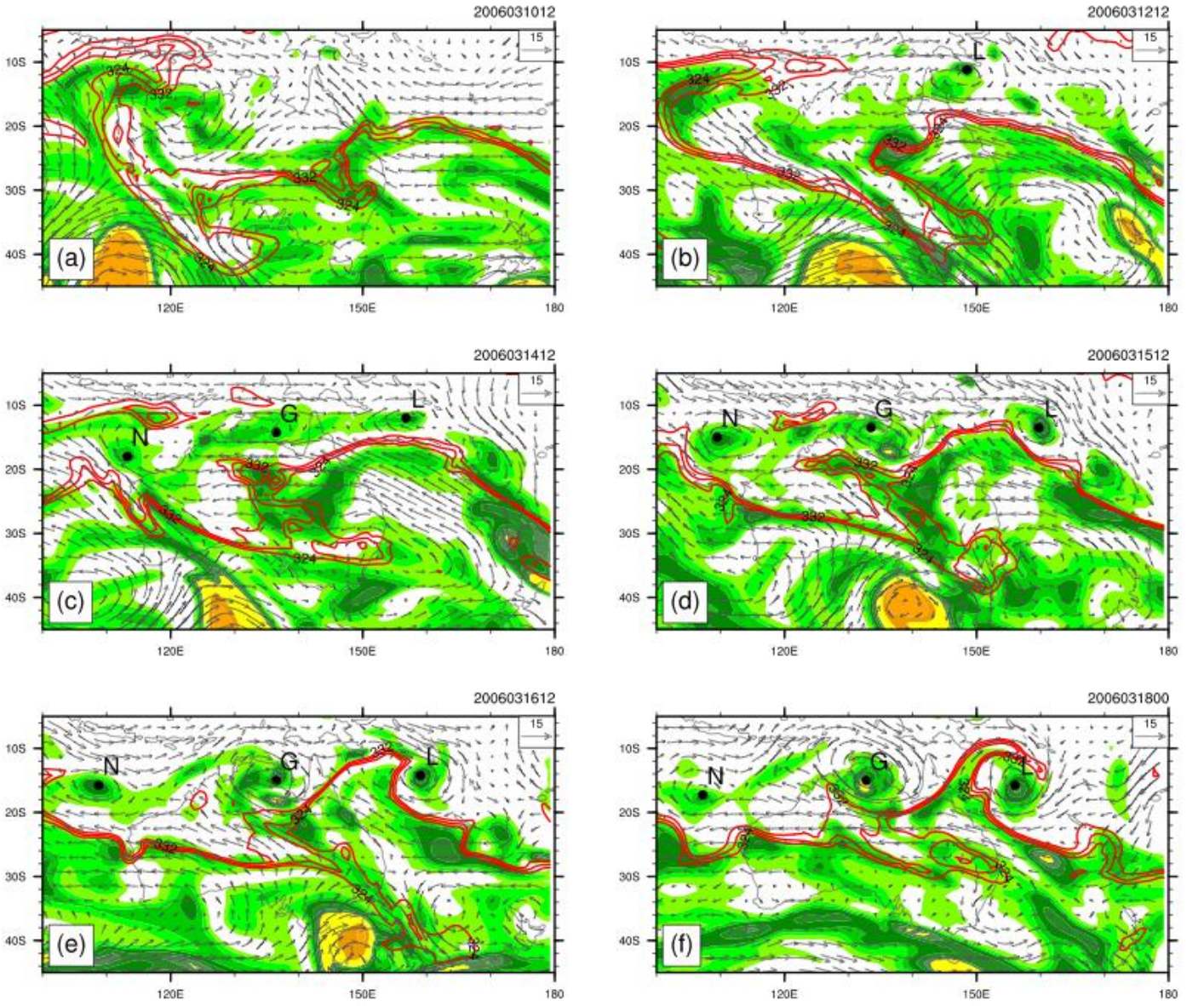
# 10-day back trajectories of air parcels at 500 hPa from TC Larry locations



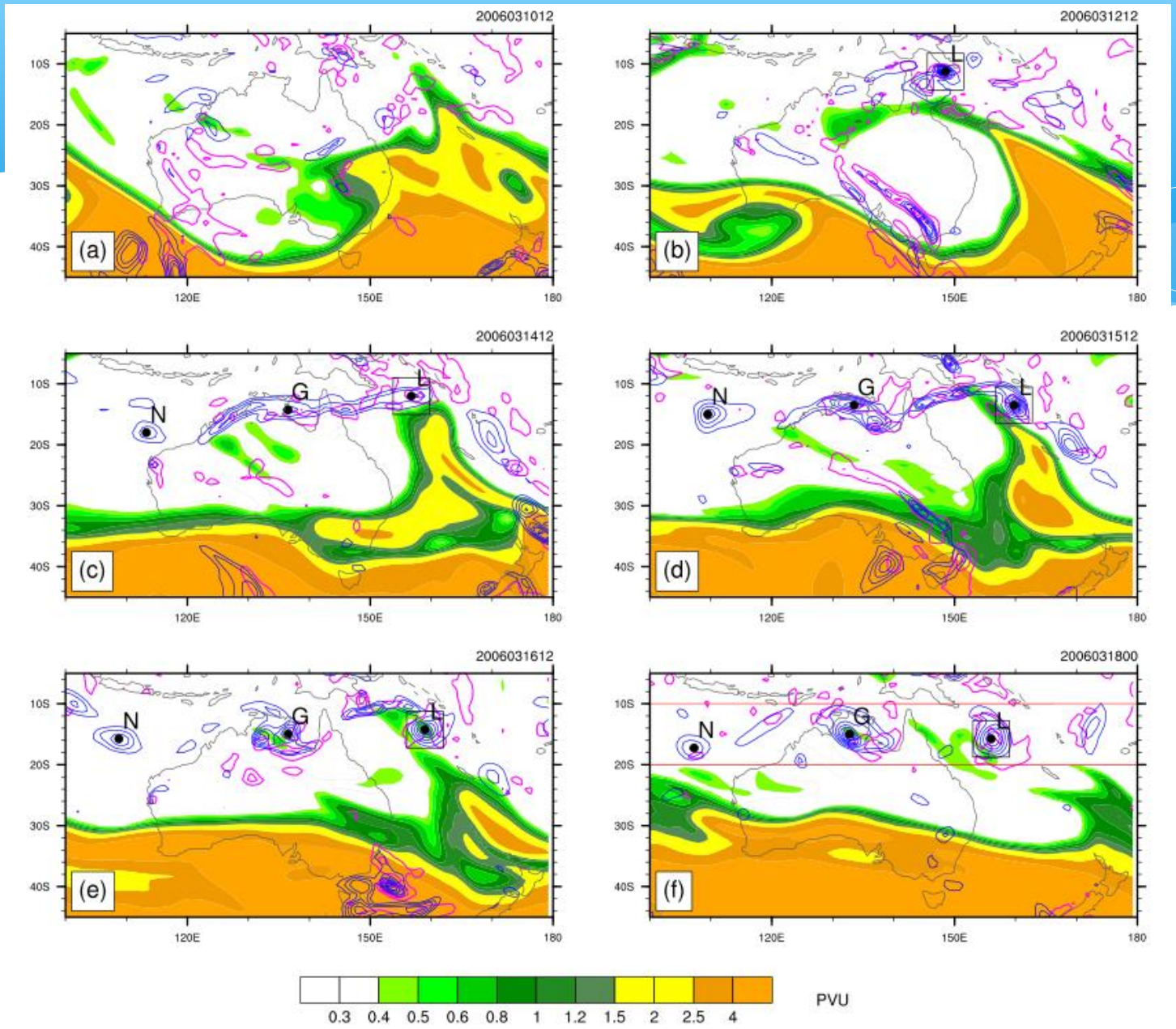
# Satellite images



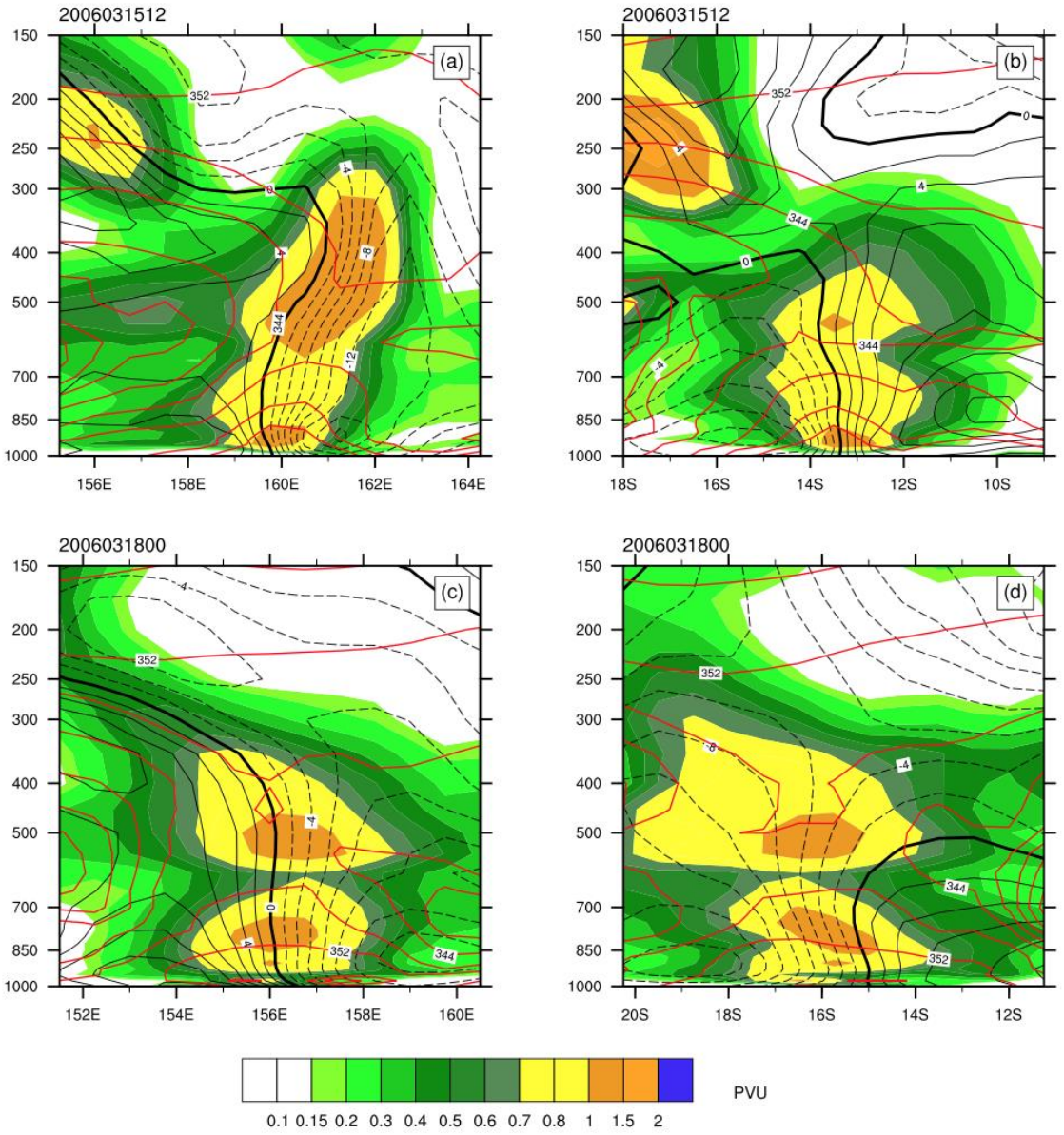
# ERA-Interim 315 K PV, ePT, Winds



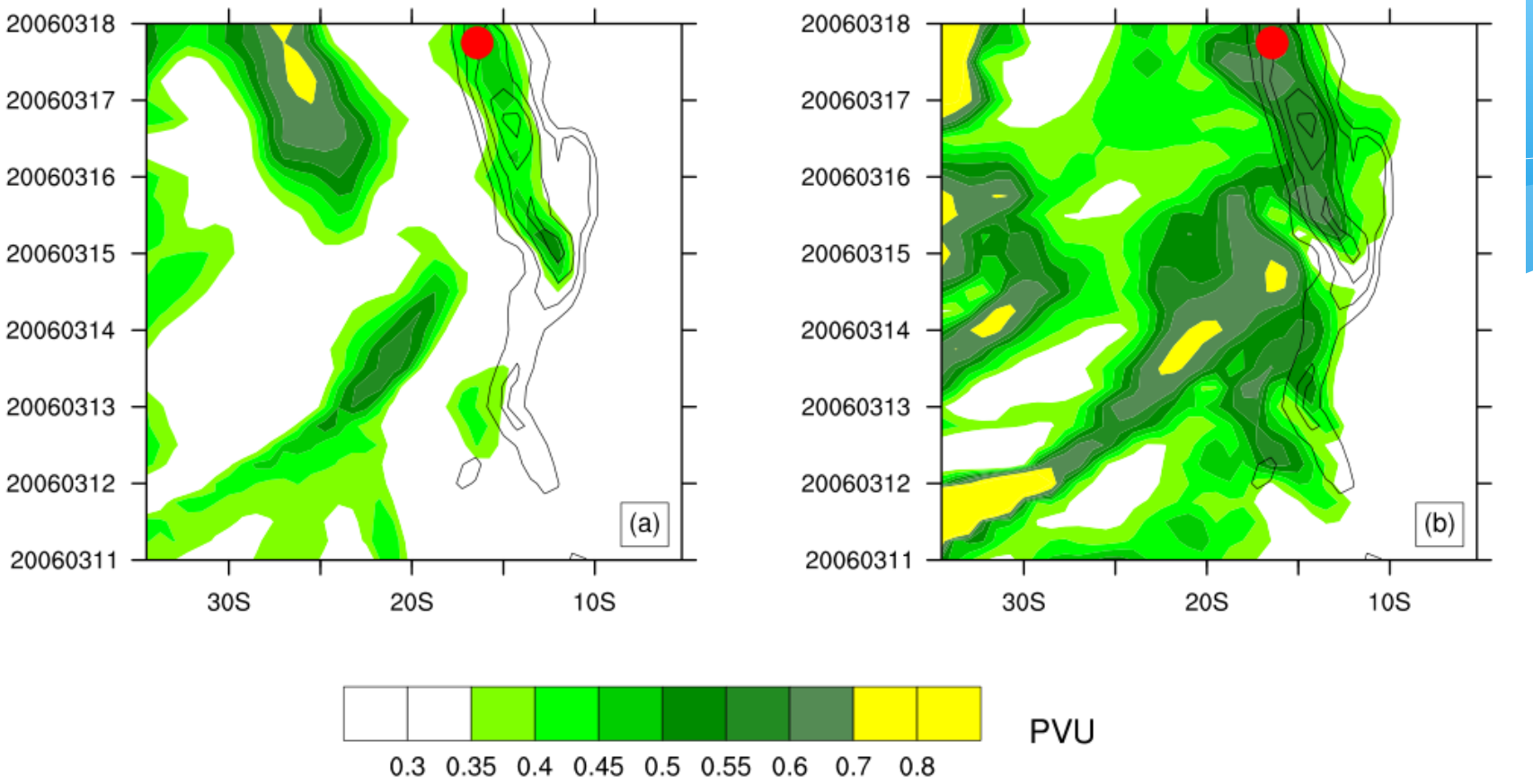
# ERA-Interim 350 K PV, 850 RV, 700 w



# EW (left) and NS (right) cross-section along 850 hPa vorticity location



# Hovmueller diagram



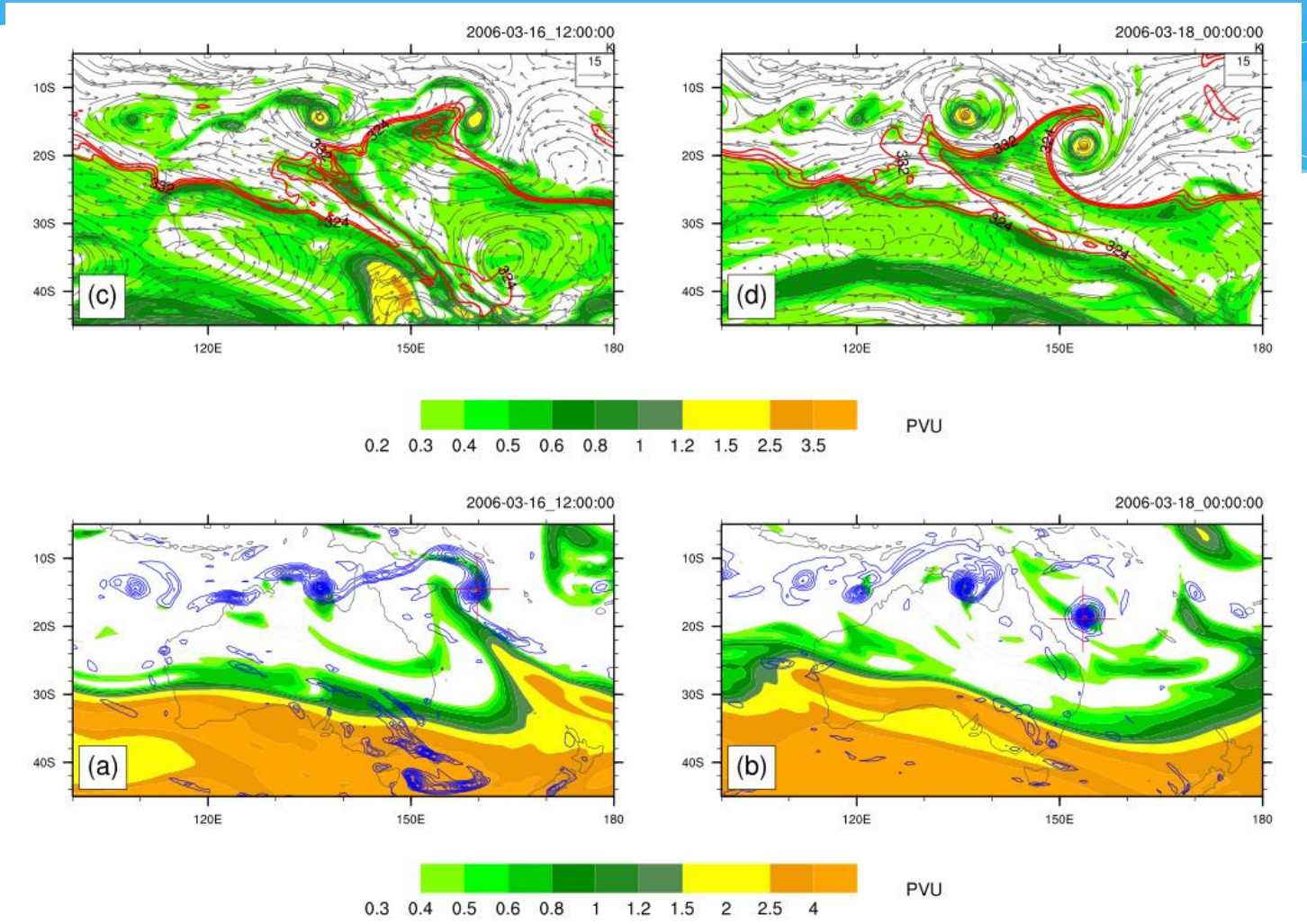

The Hovmueller diagram of (a) 315 K and (b) 330 K isentropic PV (shaded, PVU) averaged over 5-degree longitude band centered at genesis longitude of TC Larry (159.7◦E) and 850 hPa relative vorticity (contour).

The red dots indicate the genesis latitude and time of tropical cyclone Larry (16.6◦S at 18 UTC, 17 March 2006)

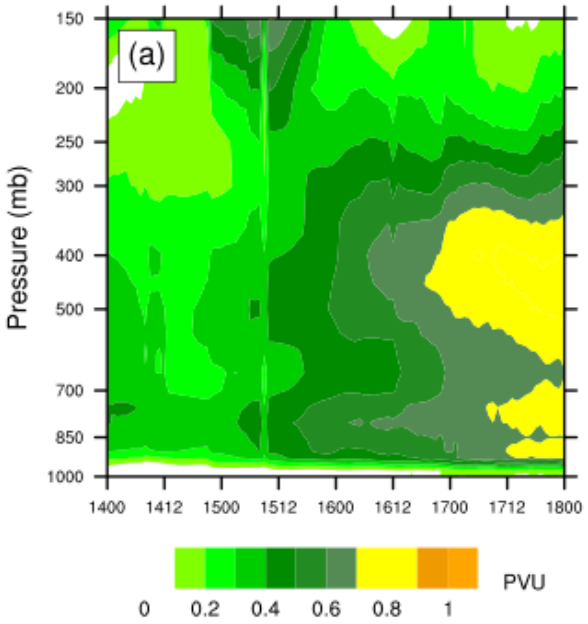
# Model configuration

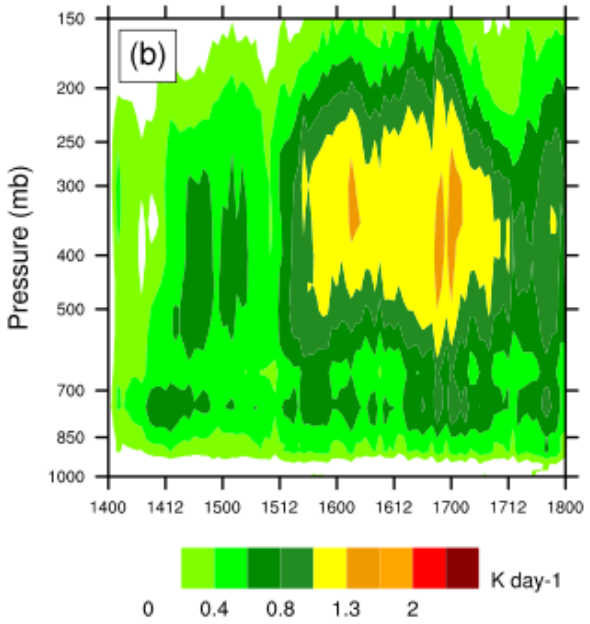
* WRF ARW v3.5.1
* Single domain, 60x60 km grid size, 30 vertical levels up to 5 hPa
* Single-moment 3-class microphysics scheme and Kain-Fritsch cumulus parameterization scheem
* Initial and boundary conditions: GFS FNL 1x1 degree from NCEP
* 24 hour forecast, run every 12 hours
* Forecast data from 12 – 24 hours periods are merged to form a longer simulation.

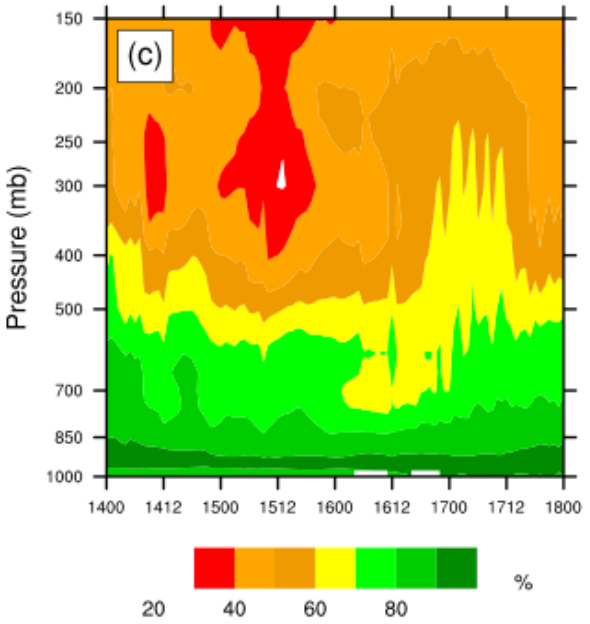
# WRF output: (top) 315 K PV, 700 hPa ePT and 850hPa winds and (bottom) 330 K PV, 850 RV



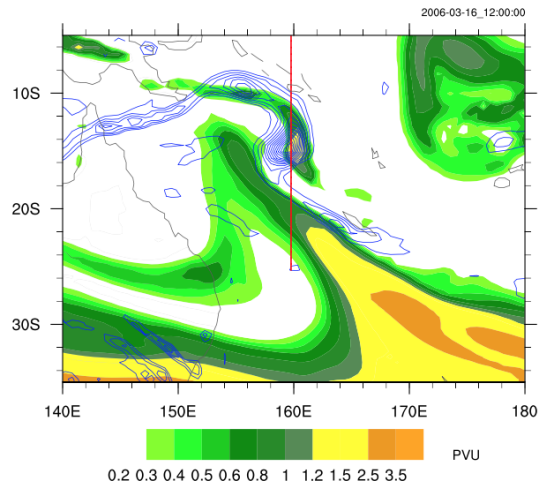
# WRF output: 5x5 degree averaged of PV (left), diabatic heating (center) and relative humidity (right)



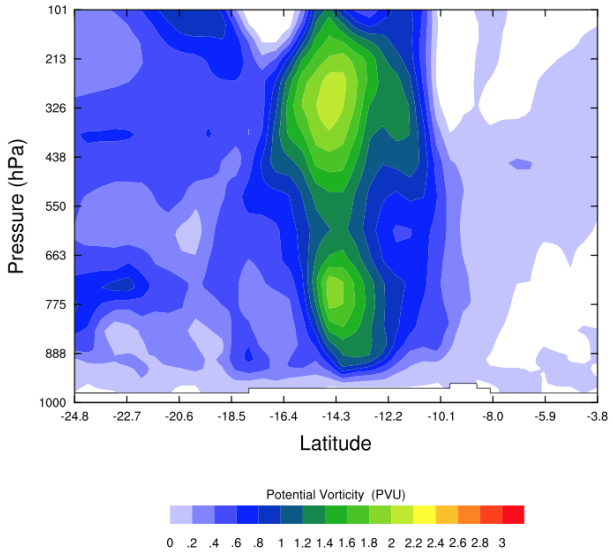



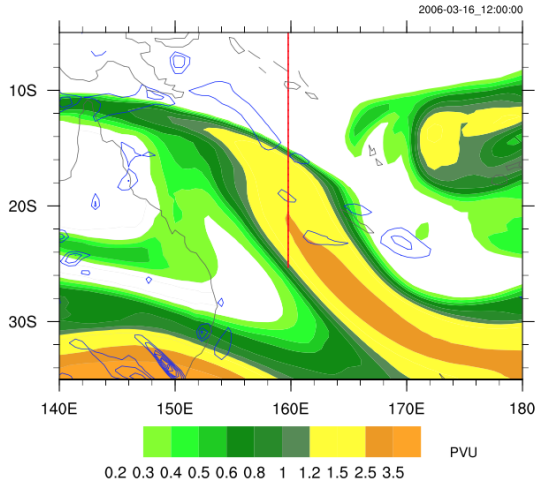
# Compare wet (left) vs dry (right) simulation



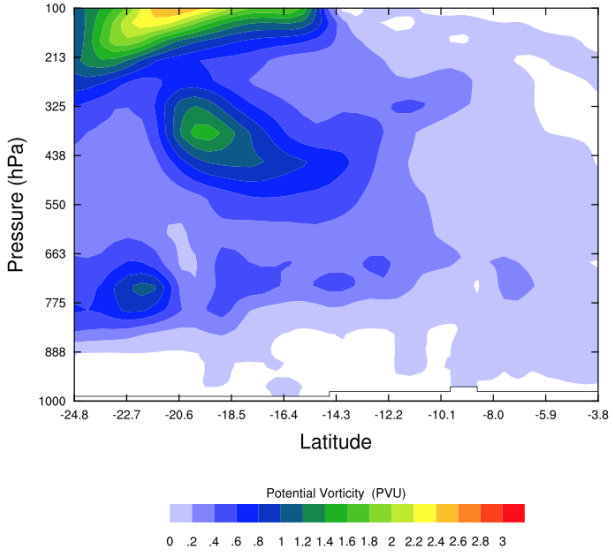

(a)




(b)




(a)




(b)

# Conclusion

- The 315 K coherent cyclonic PV of TC Larry was generated in the tropics and then moved poleward.
- The 330 K coherent cyclonic PV of TC Larry coherent cyclonic PV resided in the extratropics
- Low-level vorticity was formed after a strong RWB event in the north Coral Sea on 12 March
- Extratropical trough increased the upper-level PV as well as the low-level vorticity and made the the middle and upper-troposphere drier
- A cold front increased the easterly wind poleward of the low-level vorticity, combining with small vertical wind shear intensify the vorticity to TC Larry at 1800 UTC 17 March