



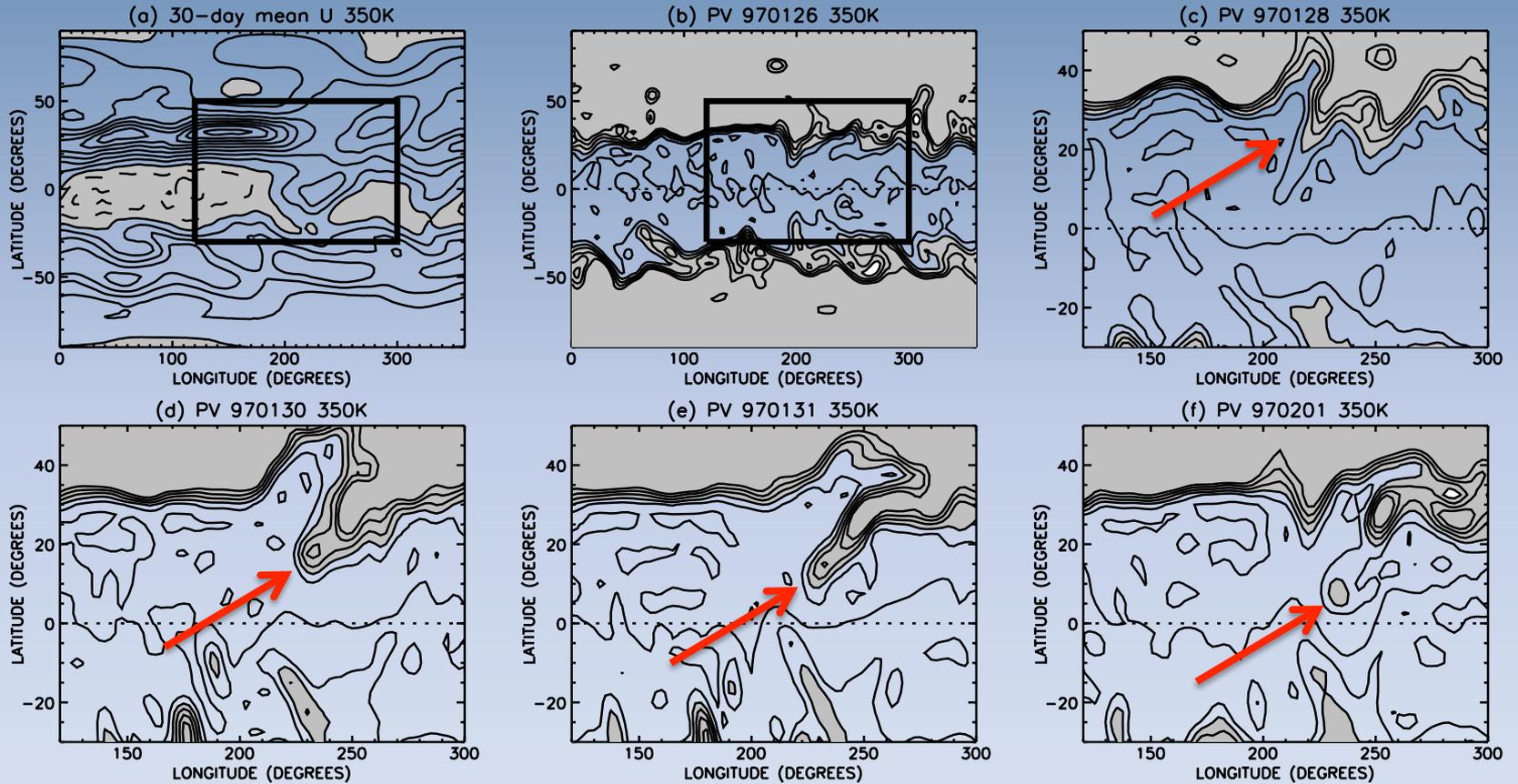
Signature of Transport from the Extratropical LS into the TTL – Mechanism and Analyses from ATTREX

Cameron Homeyer

Dominant Transport Mechanism: Rossby Wavebreaking

- Observed as reversals in the meridional gradient of PV on an isentropic surface
- Peaks along tropical boundary (subtropical jet/tropopause break) during the summer at $350\text{K} \leq \theta \leq 400\text{K}$, during the winter at $420\text{K} < \theta \leq 500\text{K}$
- Most previous studies focus on $\theta \leq 350\text{K}$
(e.g., Postel & Hitchman, 1999; Waugh & Polvani, 2000; Wernli & Sprenger, 2007)
- Recent study near the tropical tropopause illustrates the role of stationary anticyclones (Asian Monsoon)
(Konopka et al, 2010)

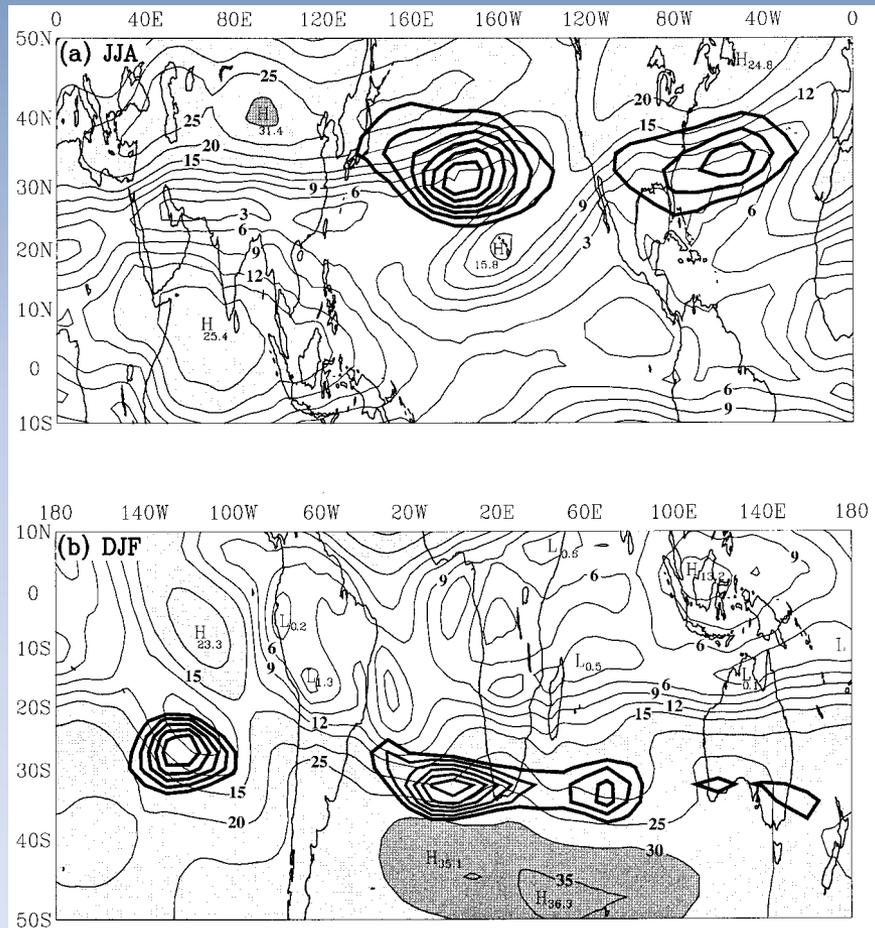
RWB Example



From Waugh & Polvani, 2000; PV > 2 pvu shaded

Geographical Distribution

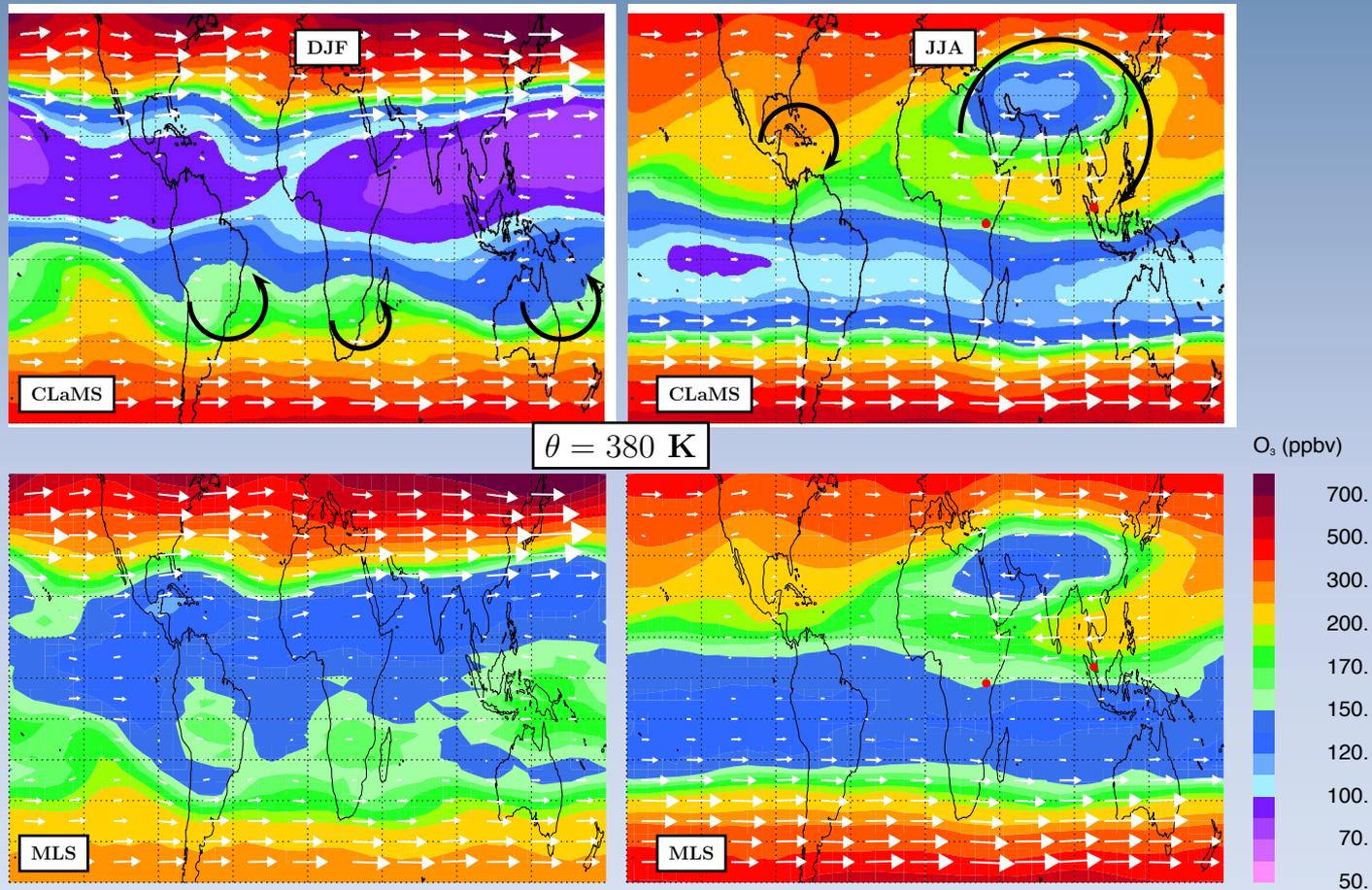
- @350K from Postel & Hitchman, 1999
- Maxima occur in regions of weak westerlies
- Locations of maxima vary with altitude



Role of Westerly Ducts

- Regions over eastern Pacific and central Atlantic of westerlies from NH subtropics to SH subtropics
- Strongest during NH winter, facilitate equatorward propagation of Rossby waves
- Focus of RWB analysis in Waugh & Polvani, 2000
- Caveat: typically only 2-3 significant events over NH Pacific during entire winter season

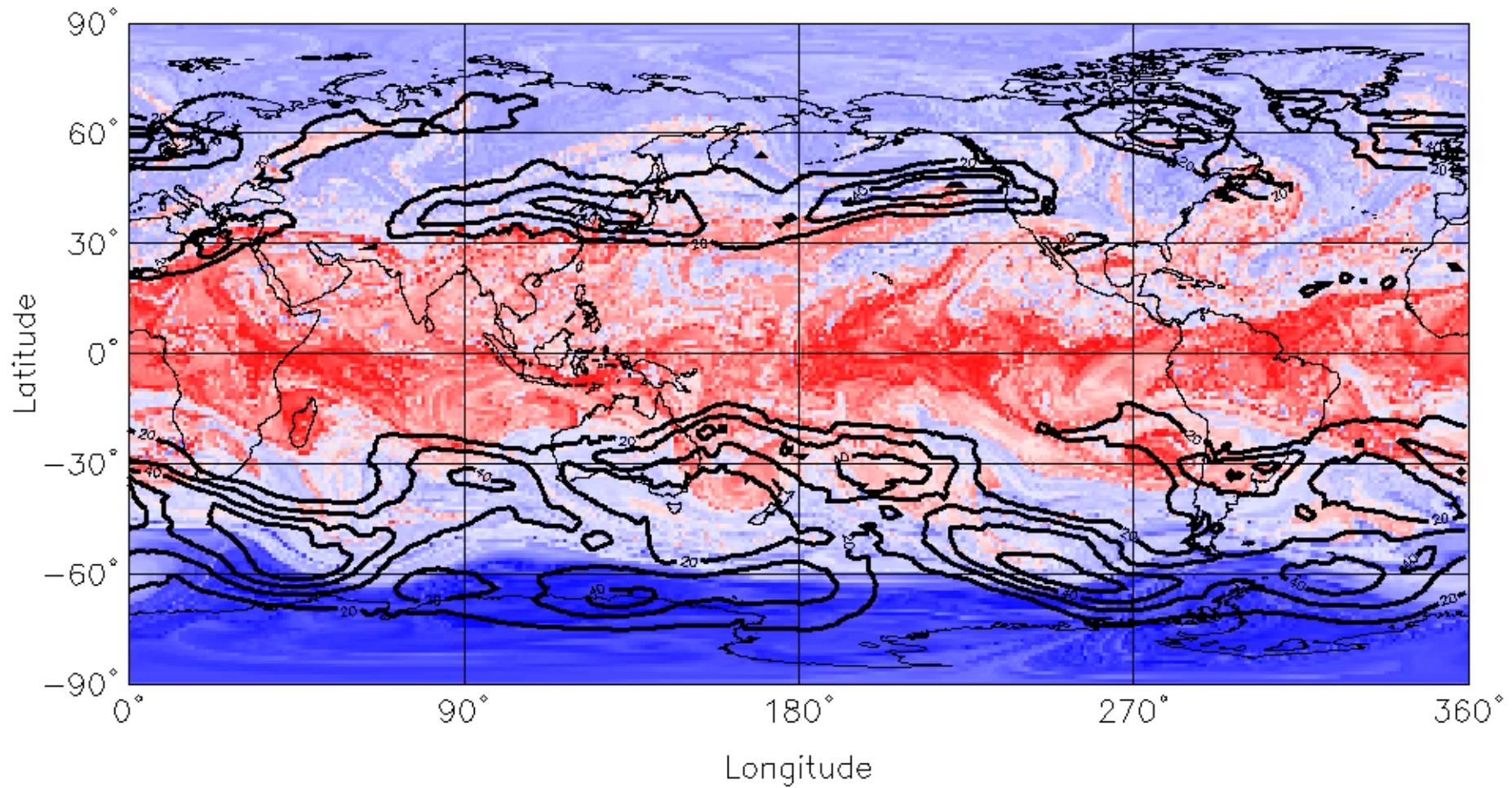
Role of Stationary Anticyclones



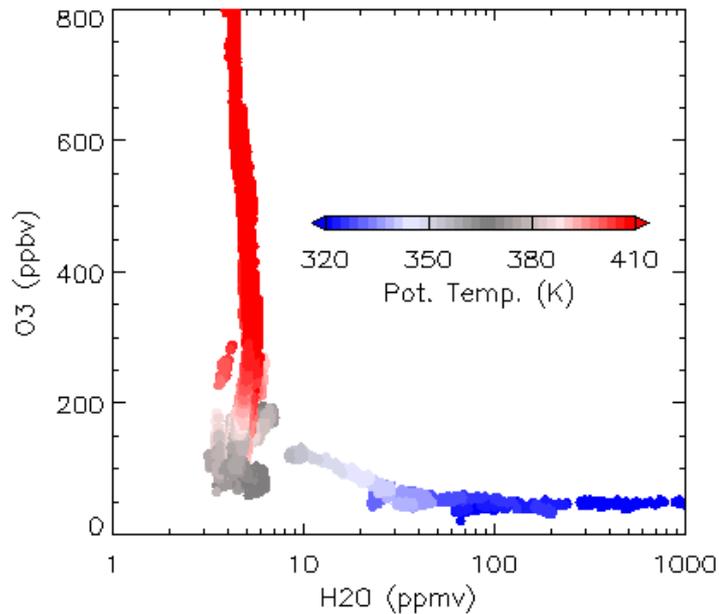
From Konopka et al, 2010

ATTREX Observations

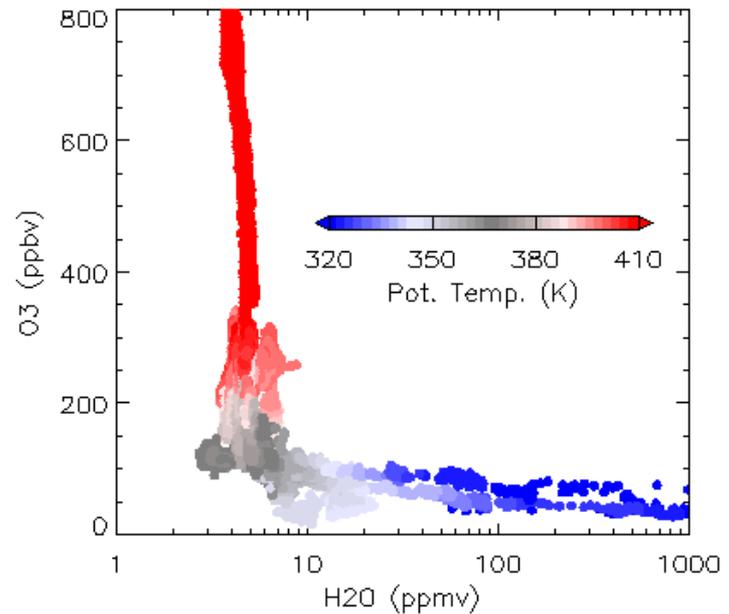
380K 10-day RDF PV 2011-10-21 00Z



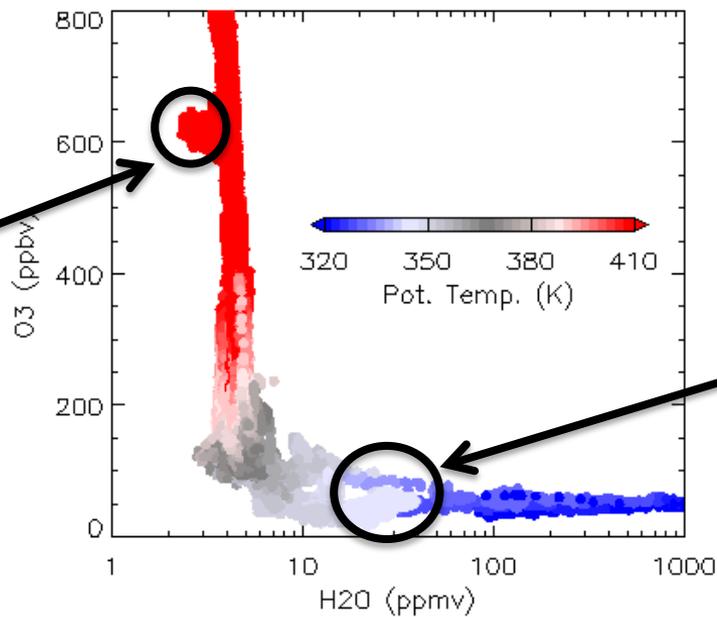
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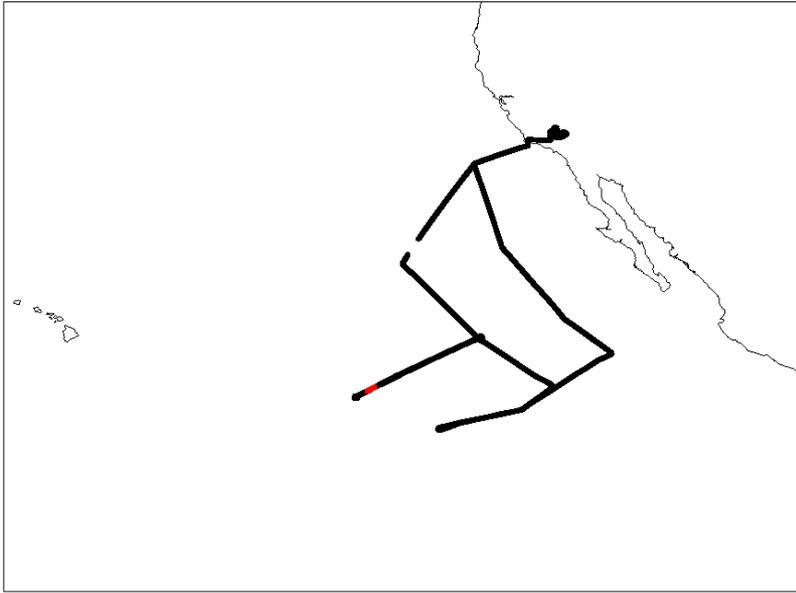


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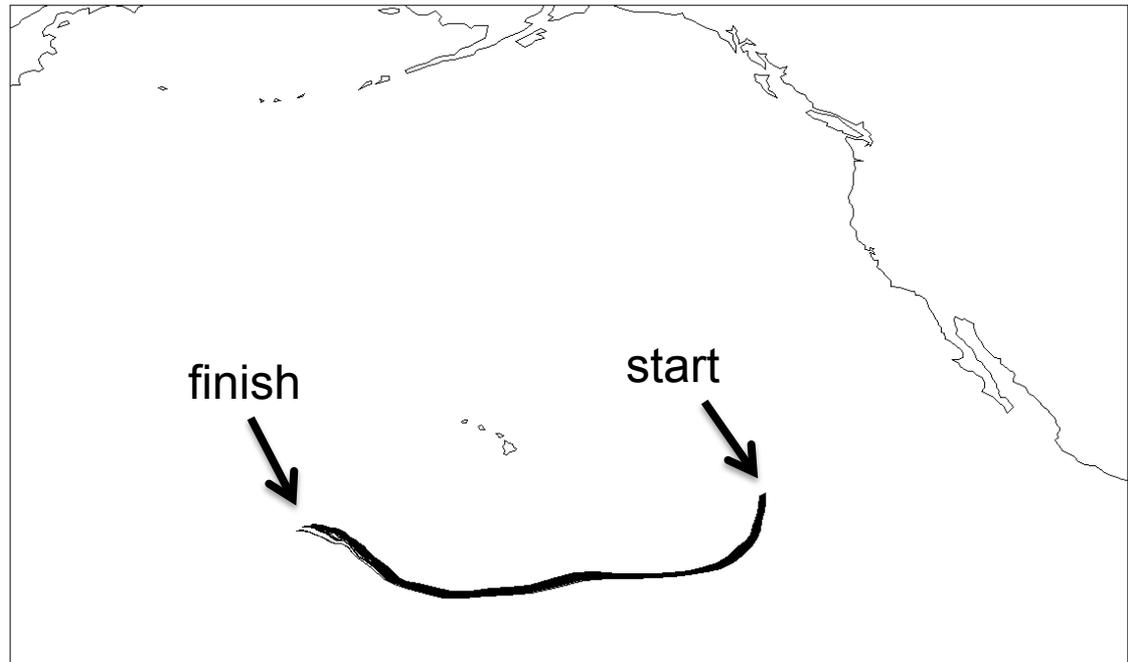
Very dry air
near 440K
(~19 km)

Convective
Detrainment

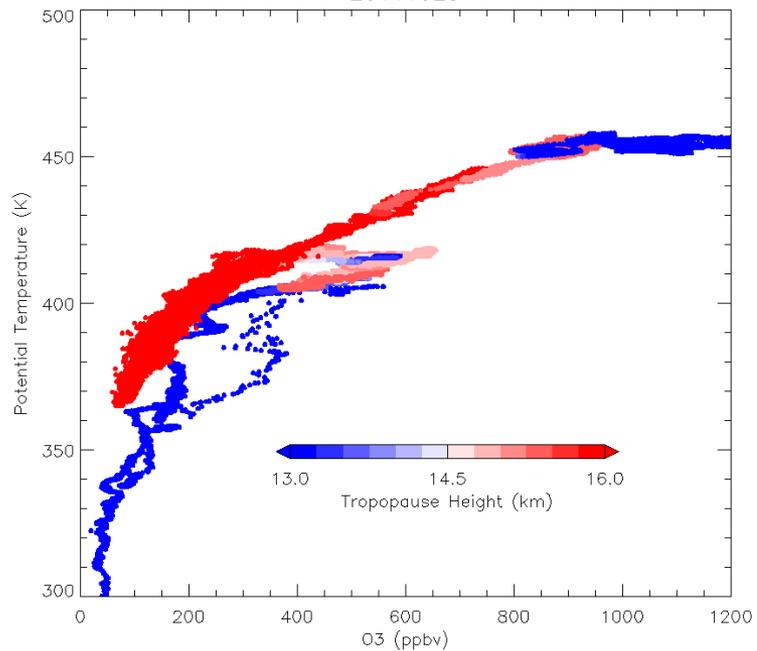


Red points: very dry observations

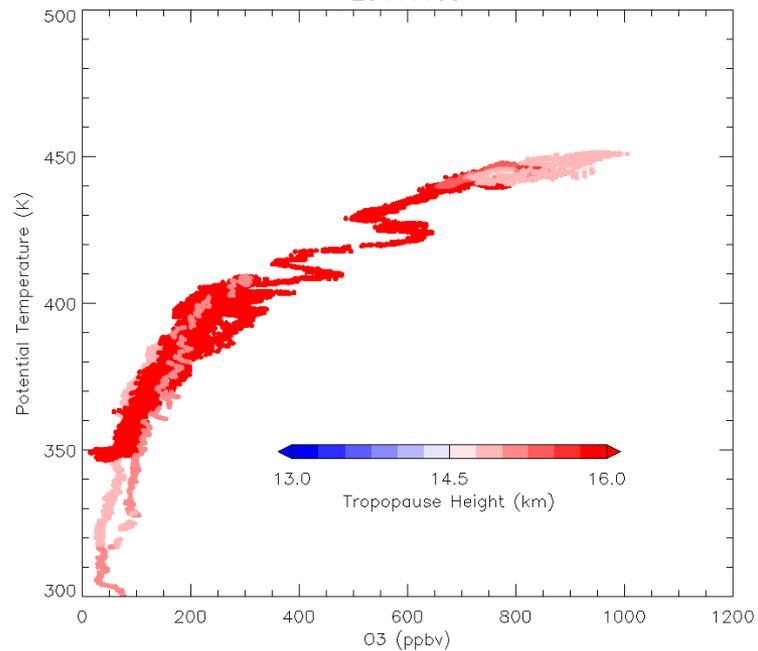
10-day backward trajectories



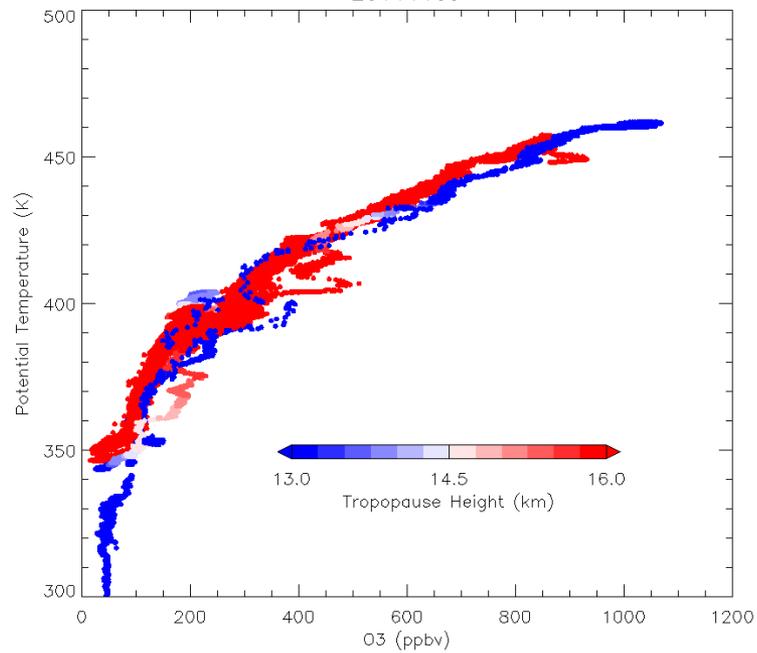
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Conclusions

- No evidence of recent mixing of extratropical LS air into the TTL in the available ATTREX observations
- Best opportunity for observing RWB into the TTL will be from late spring to summer over the Pacific
- Possible to target an event in the westerly duct during winter