START08 Flight Scenarios

Laura Pan, Jan 2008

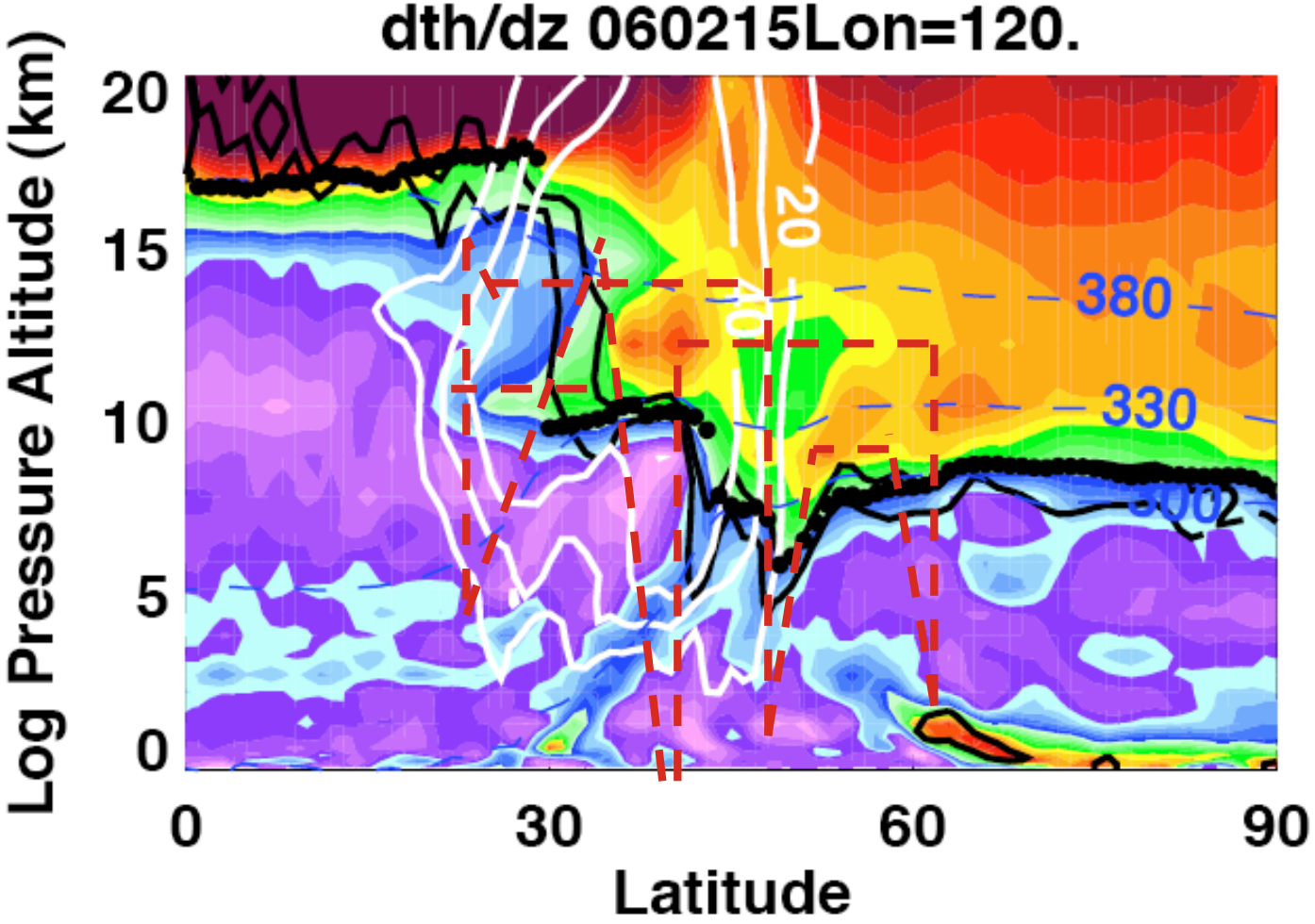
START08/PreHIPPO workshop,
January 8-9, 2008

Six flight scenarios with START emphases in planning

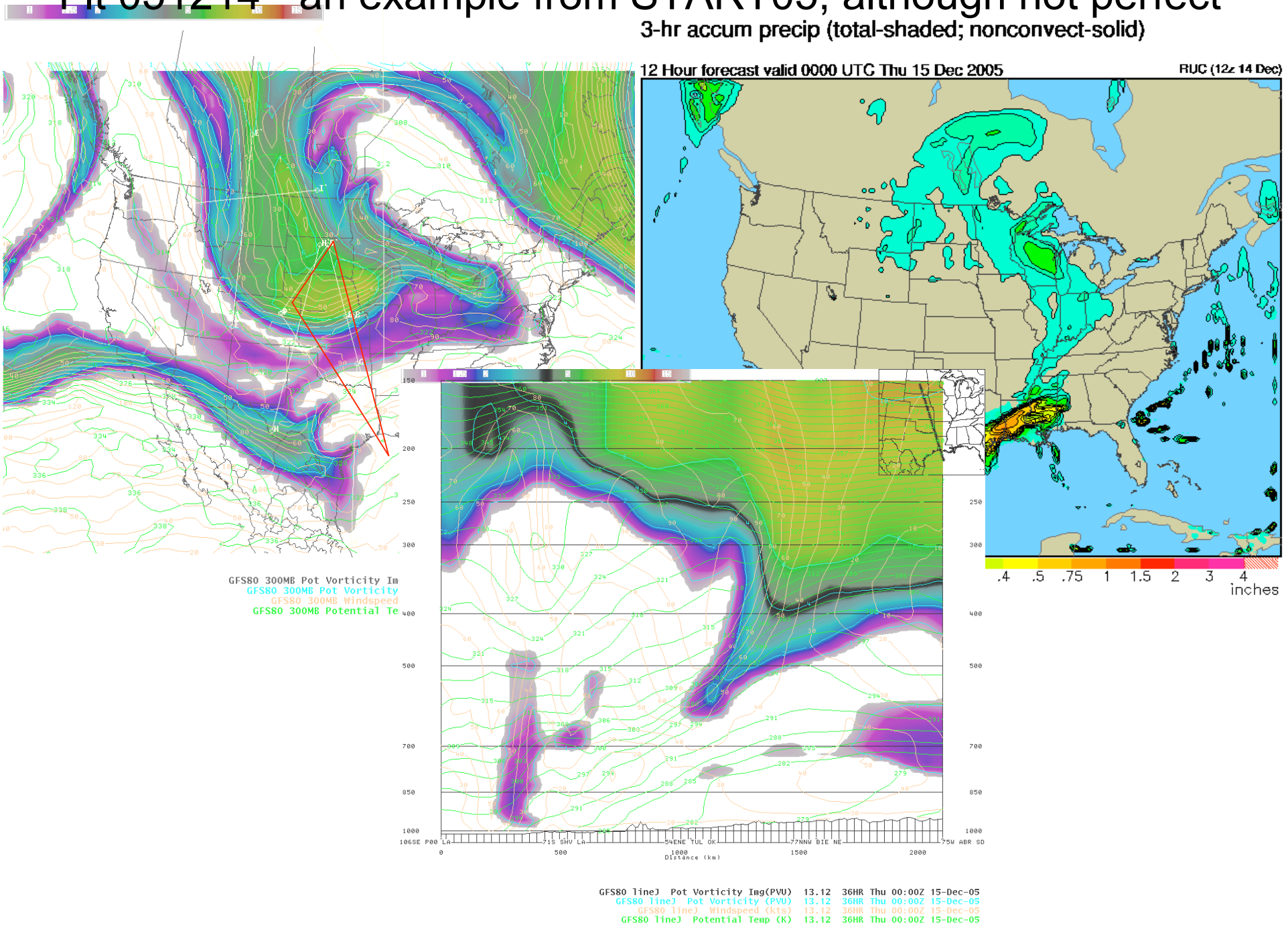
Flight resources allocation:

1. Extratropical Tropopause and transition layer (ExTP/ExTL) Survey (~ 23 flt hrs, one each month)
2. Stratospheric intrusion (tropopause fold) (16-23 flt hrs, at least once April and May)
3. Tropospheric intrusion (poleward wave breaking into the lower stratosphere) (16-23 flt hrs, more likely April)
4. Convective transport (6-8 flt hrs, June)
5. Gravity wave (8 flt hrs, more likely April)
6. Cirrus layer (single or multiple) near the tropopause (1 dedicated flt if conditions found in forecast)

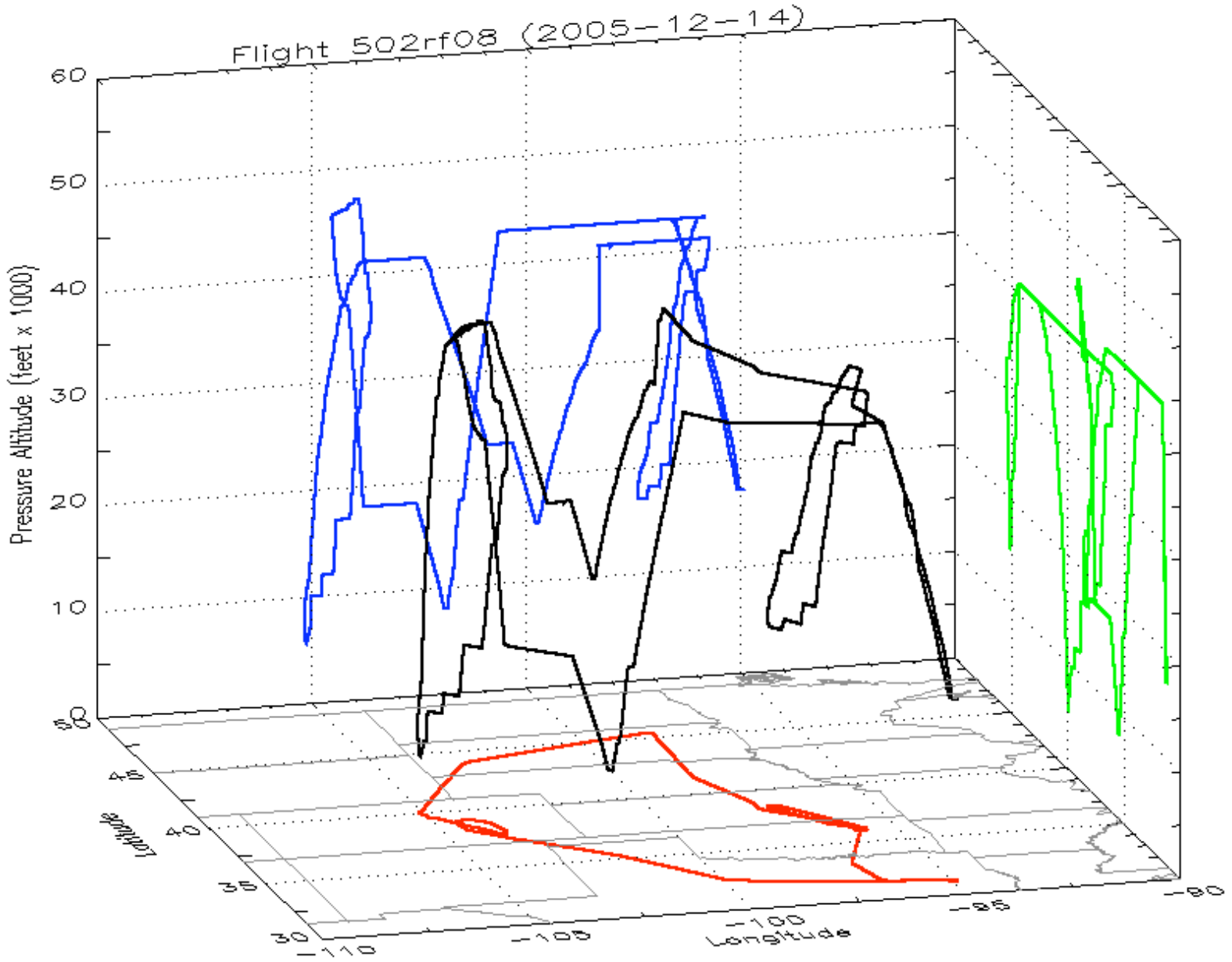
Flight Type 1: ExTL survey

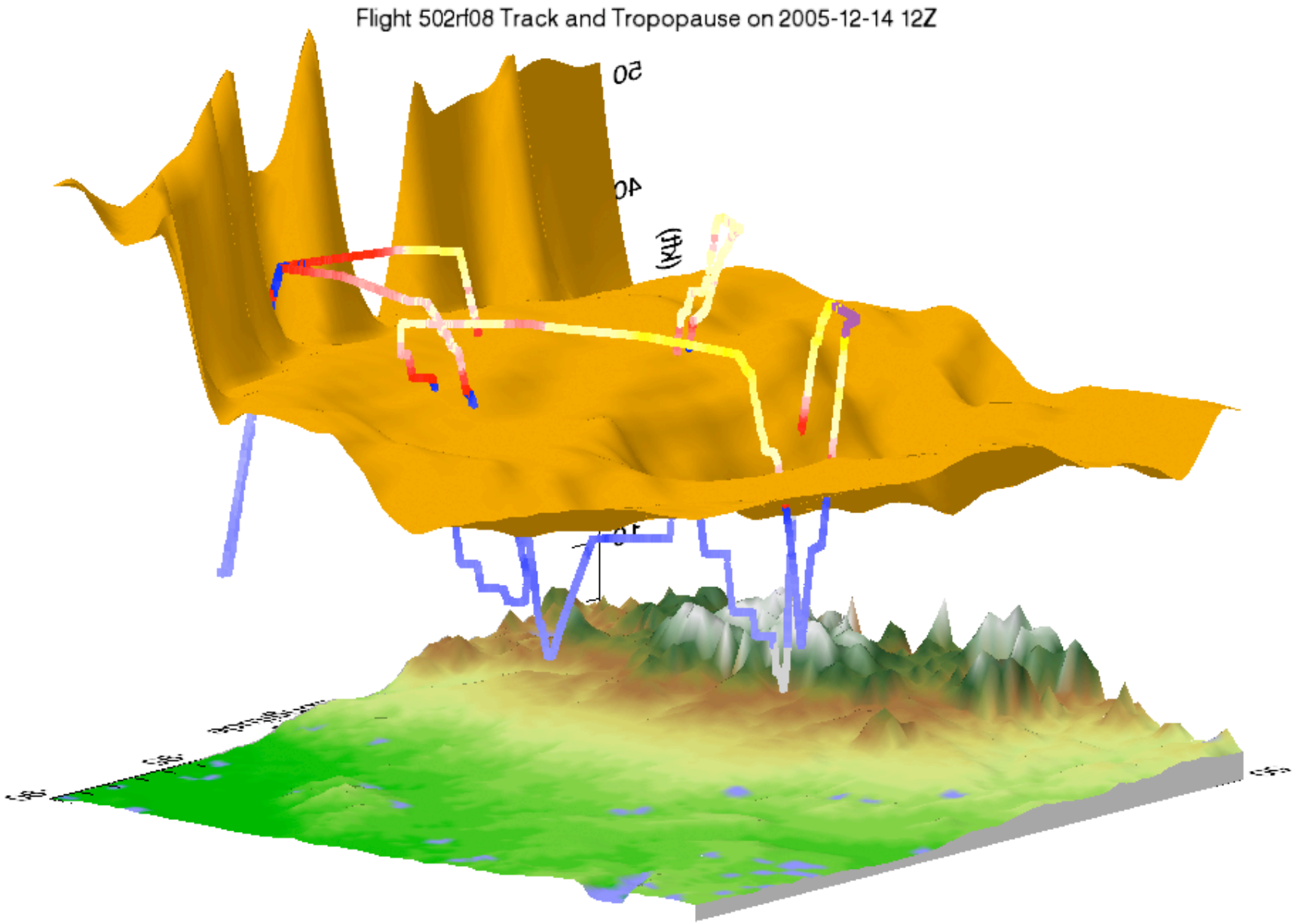


Flt 051214 - an example from START05, although not perfect

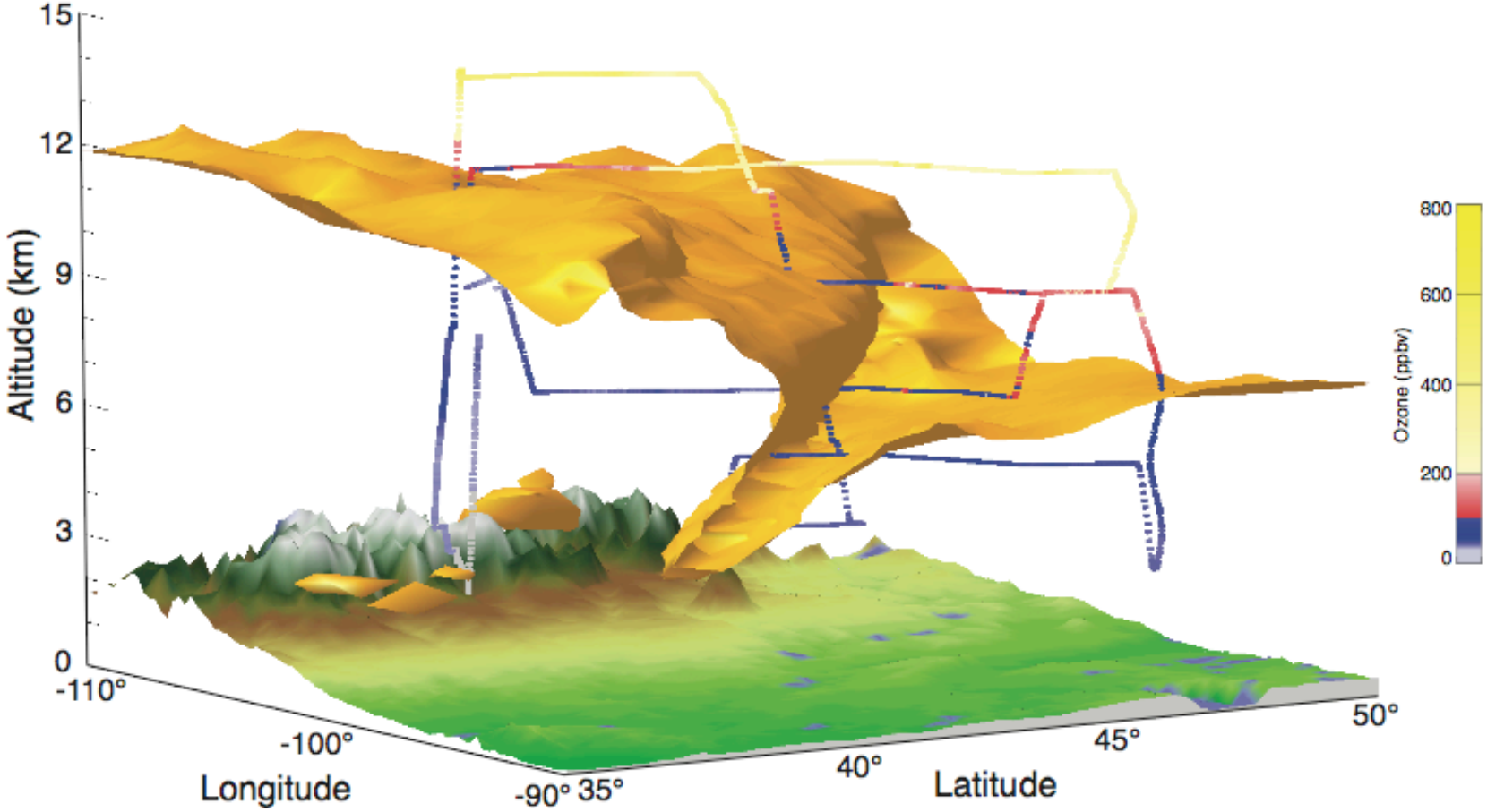


Flight RF08 - 2005-12-07

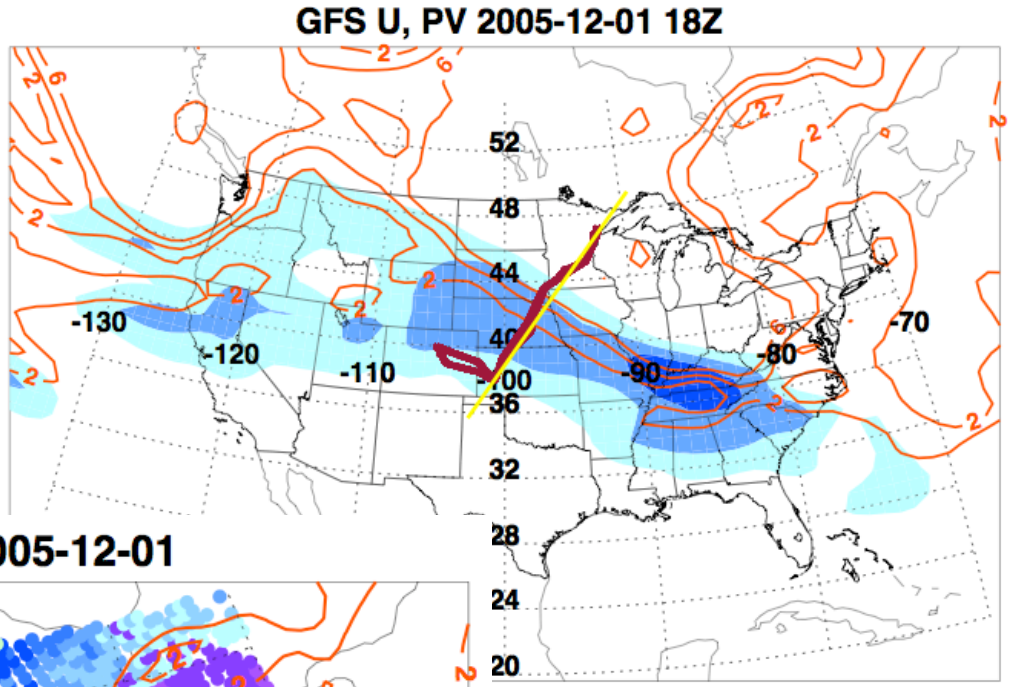


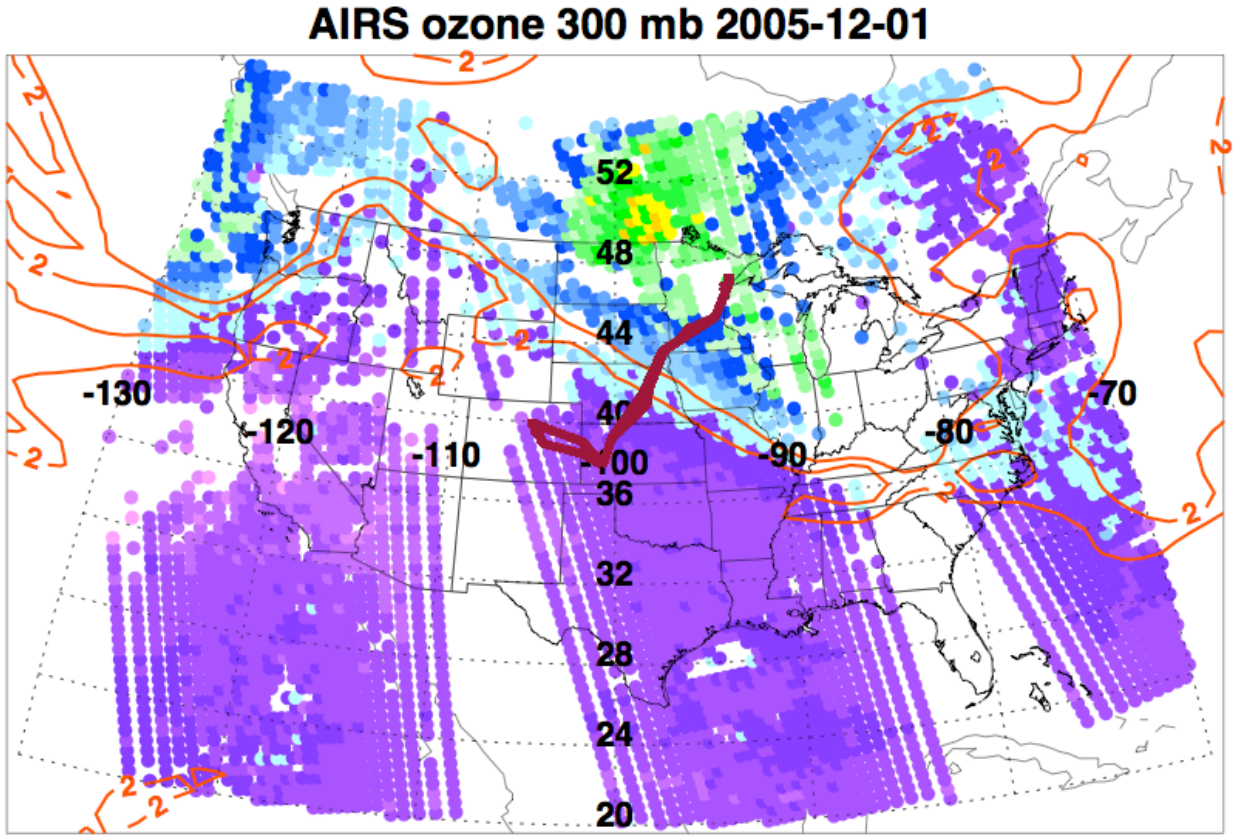

Flight 502rf08 Track and Tropopause on 2005-12-14 12Z

Flight Type 2: Stratospheric Intrusion



START Flight 1, 2005-12-01

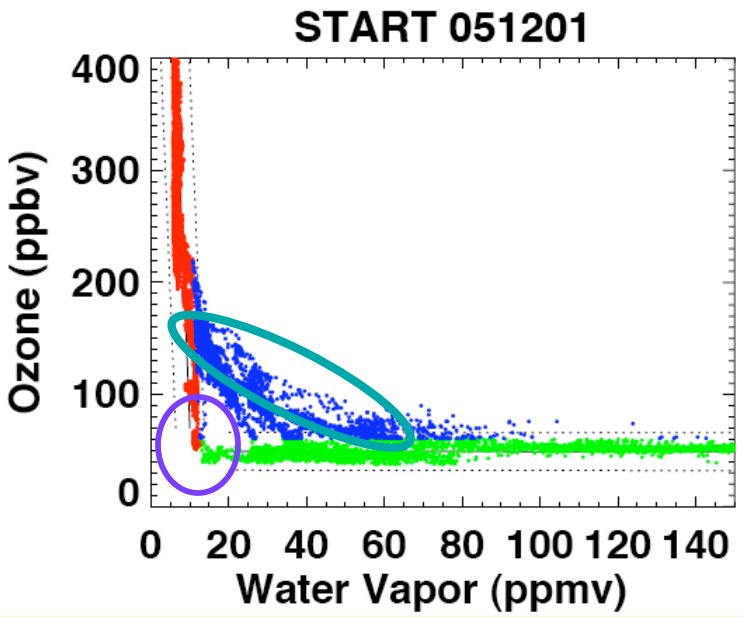




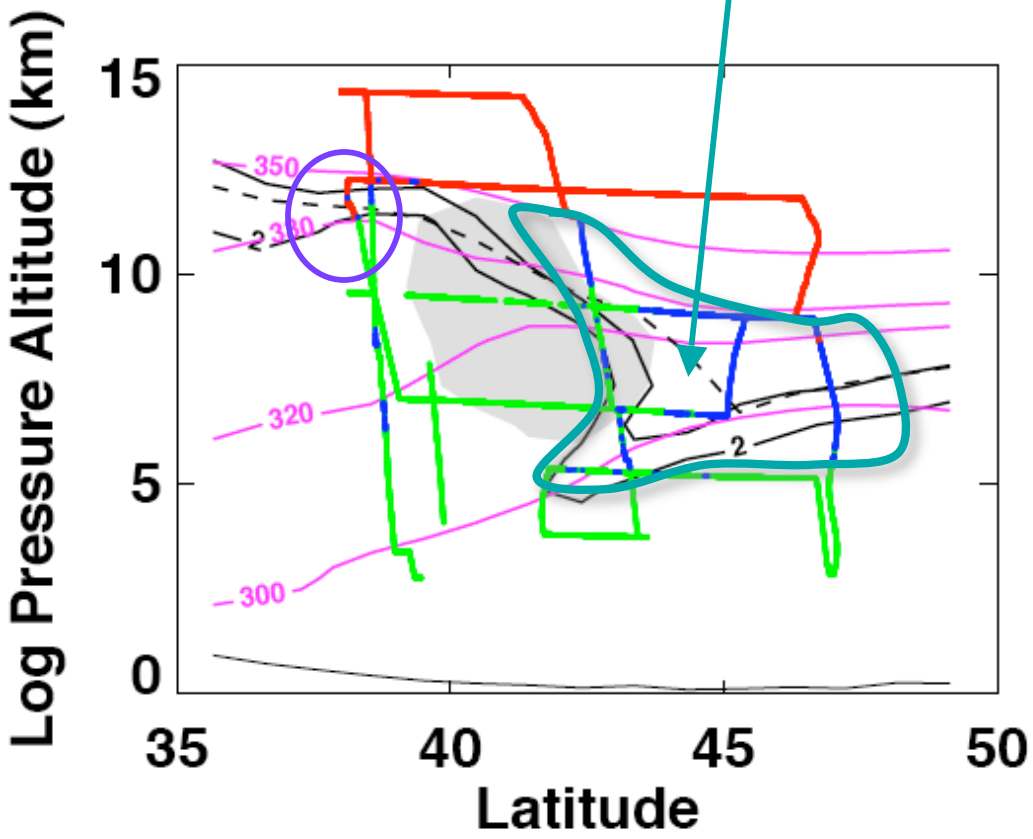
Pan et al., 2007

Chemical behavior of the extratropical tropopause

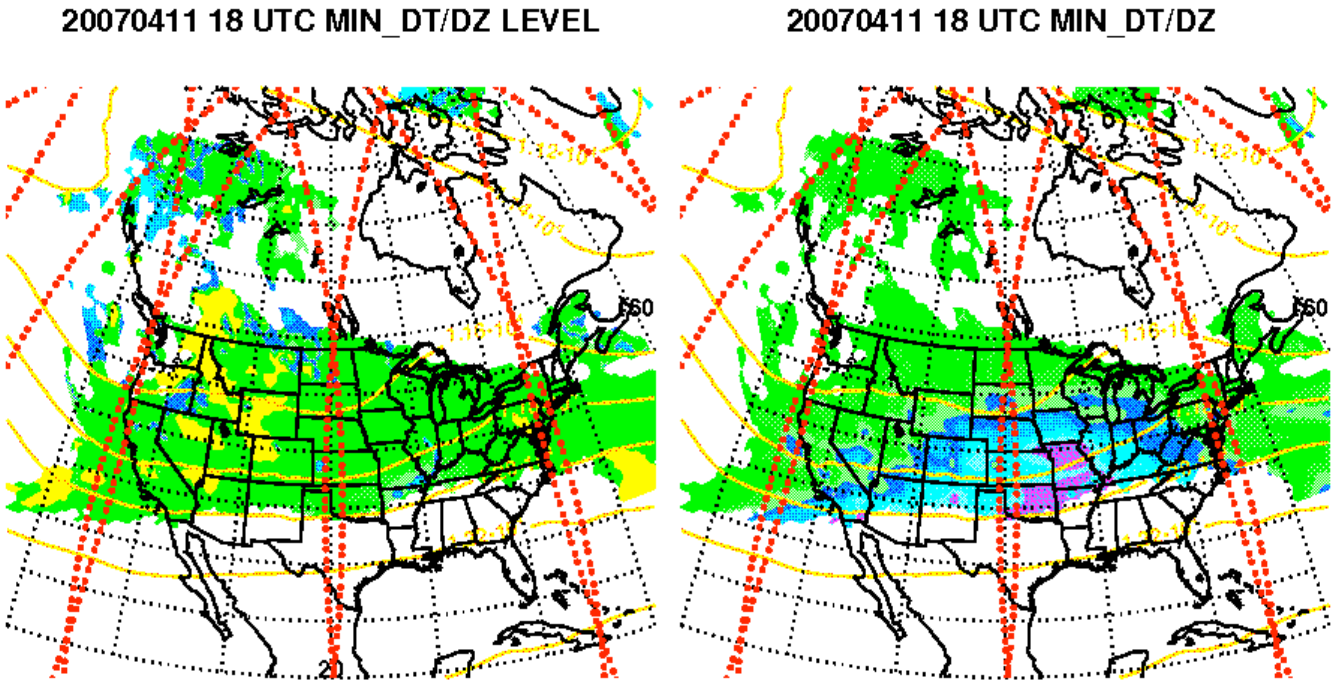
Pan et al., 2007



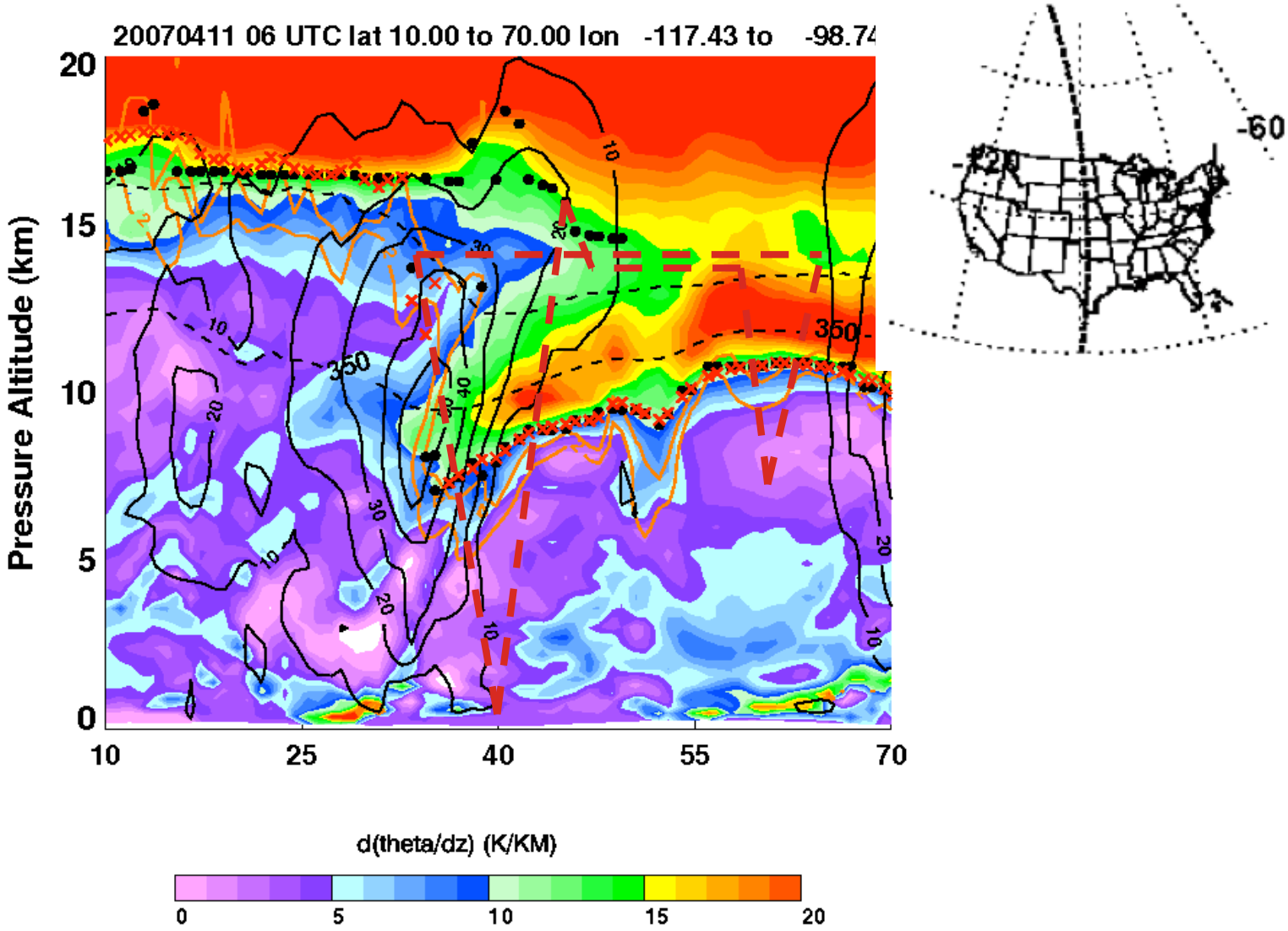
Cyclonic side of the jet



Flight Type 3: Tropospheric Intrusion

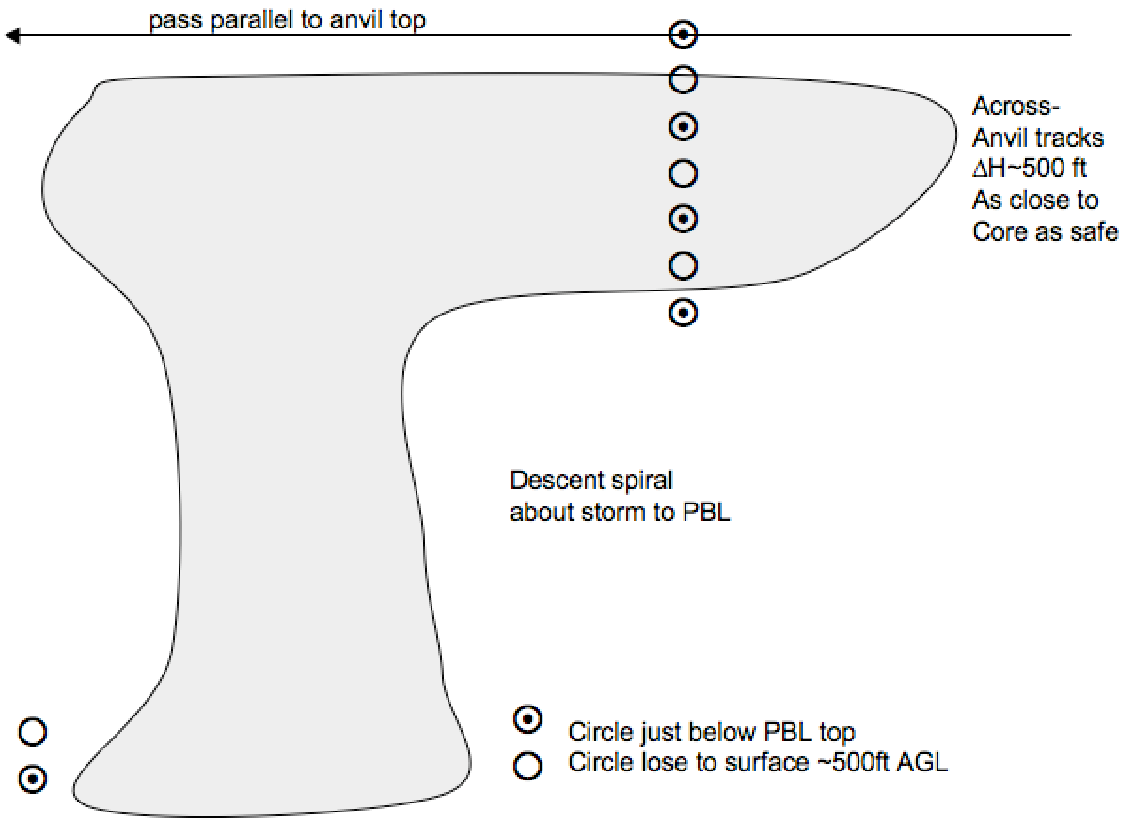


Flight Type 3: Tropospheric Intrusion



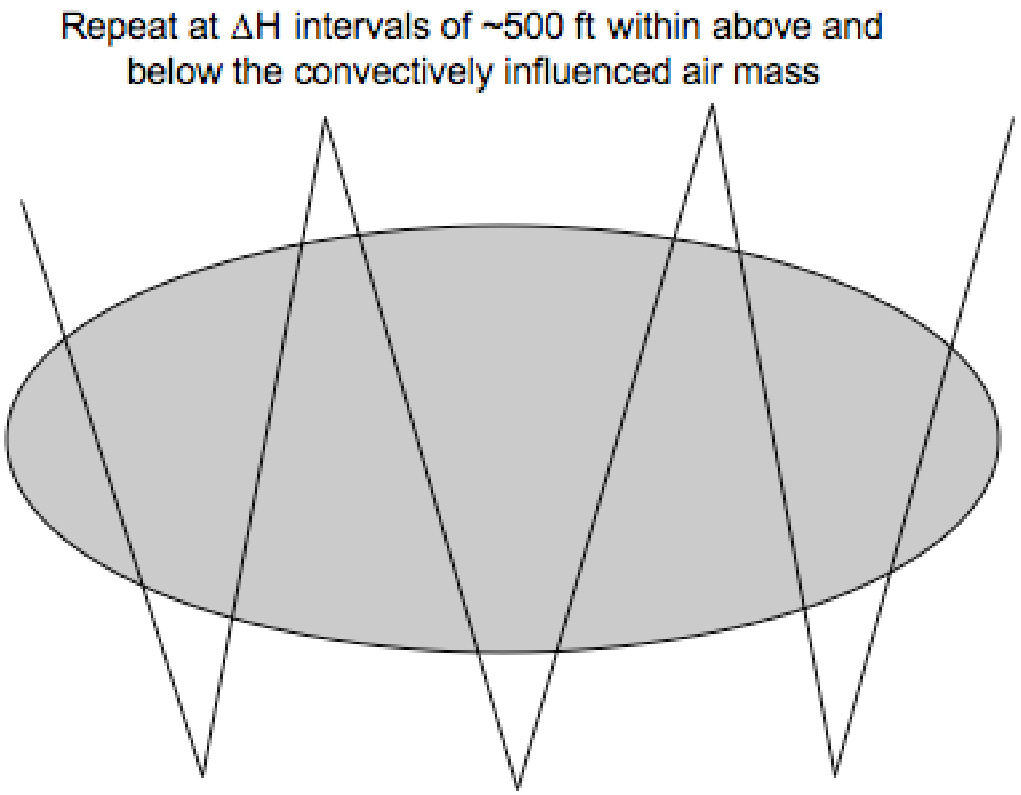
Flight Type 4: convective transport

Storm active phase

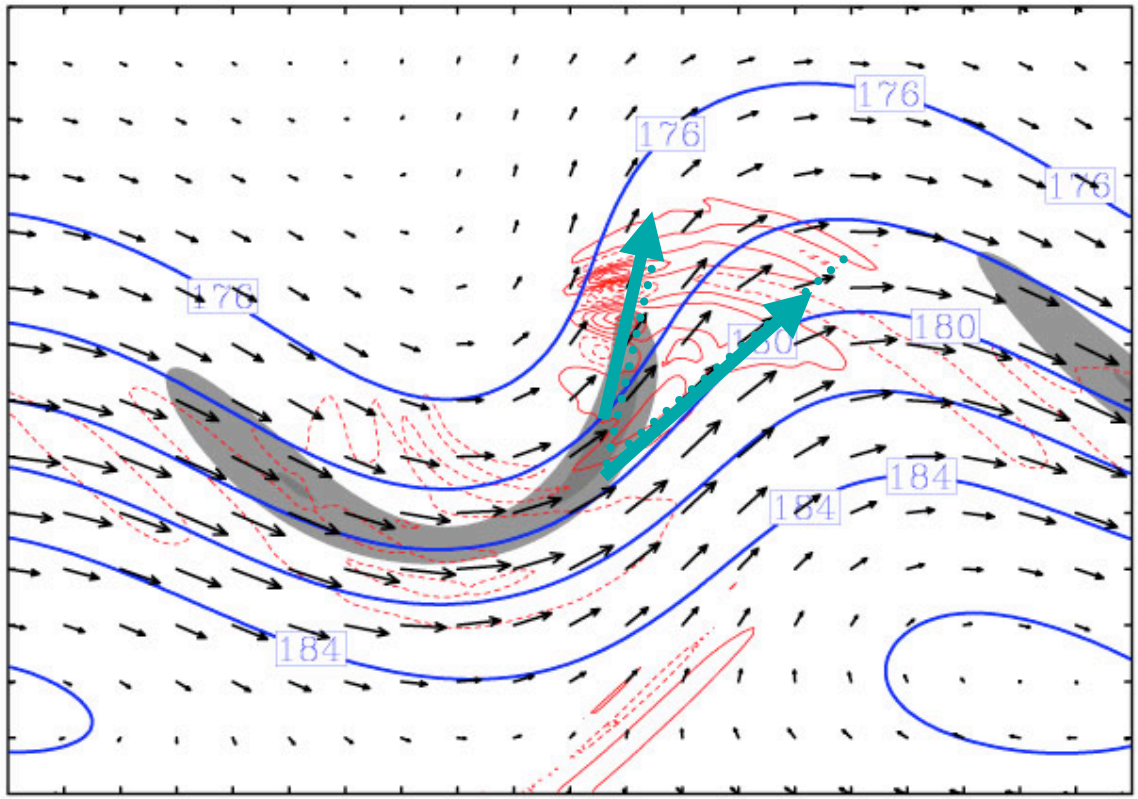


Flight Type 4: convective transport, (2)

Storm inactive phase, targeting region of collapsing storm



Flight Type 5: Jet/frontal GW



The 13-km pressure (thick blue line, every 2 hPa), horizontal divergence (thin red line; solid, positive; dashed, negative; every 5x10-6 s-1) and wind vectors (maximum of 25 m s-1) simulated from the triple-nested mesoscale model MM5 with horizontal (vertical) resolutions of 10 km (360 m). The wind speed at 8 km (near the maximum jet strength level) greater than 45m s-1 is shaded in grey (every 5 m s-1). Tick mark distance is 300 km.

Flight Type 5: Jet/frontal GW

Flight plan: Assuming we will have 5-hour flight time and HIPAER travels at 800km/h, we start from the level of maximum jet (~8-10km) along the jet core to the exit region for 1 hour, ascend to maximum height (~13km) and take the same track back to above the jet core, take a 45 degree angle to the right of jet exit, sample 1.5 hour, then descend to the level of jet core (8-10km), take the same track back to the jet core. Sample cross jet circulation if more time available, shorten the second back-forth flight distance if time constrained.

Microphysical implications of the secondary tropopause?

Noel and Haeffelin, 2007

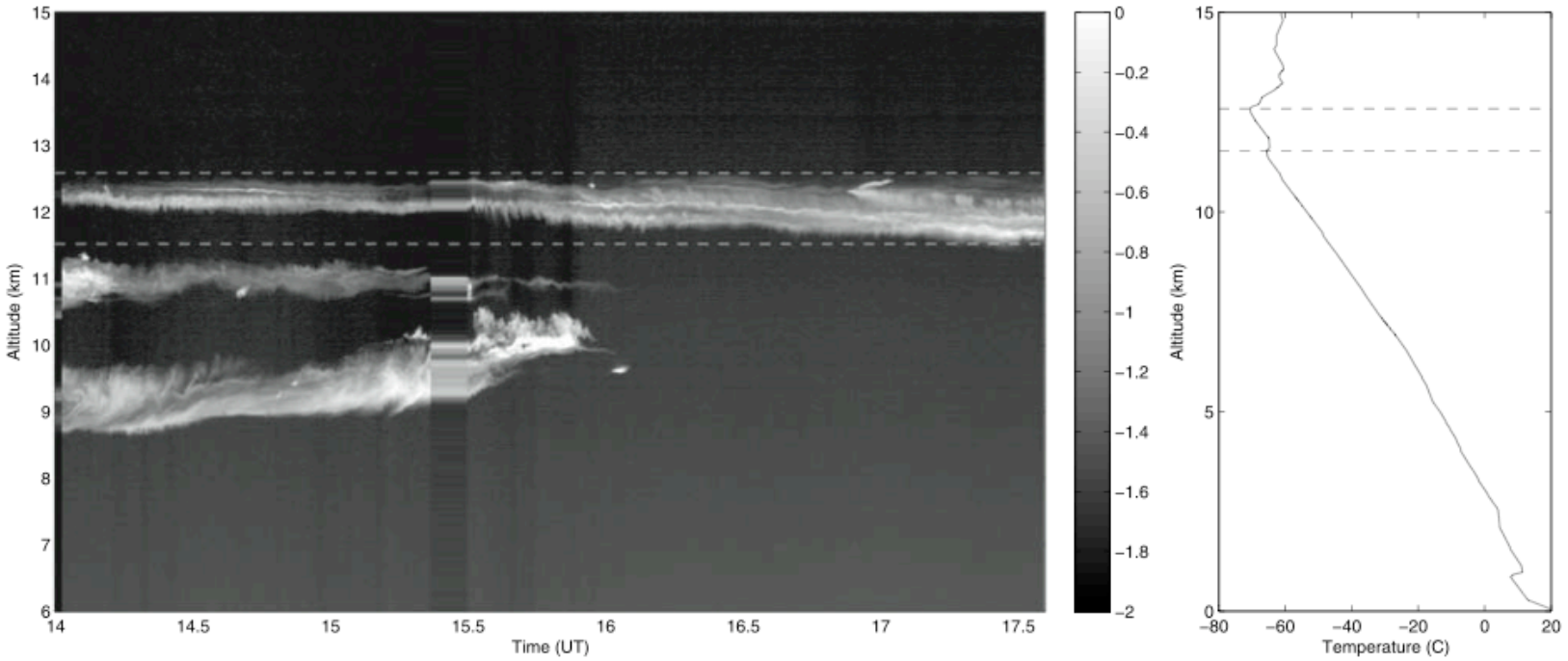


Figure 5. (a) Backscattering coefficients observed by the LNA lidar on 17 March 2005 as a function of time and altitude, using a logarithmic color scale. (b) Temperature profile from radiosoundings on 17 March 2005. On both figures, the first two tropopauses are indicated using dashed lines.

CALIPSO 532 Total Attenuated backscatter