

Airborne Tropical Tropopause EXperiment (ATTREX)

Eric Jensen (NASA Ames Research Center) and ATTREX science team



Outline

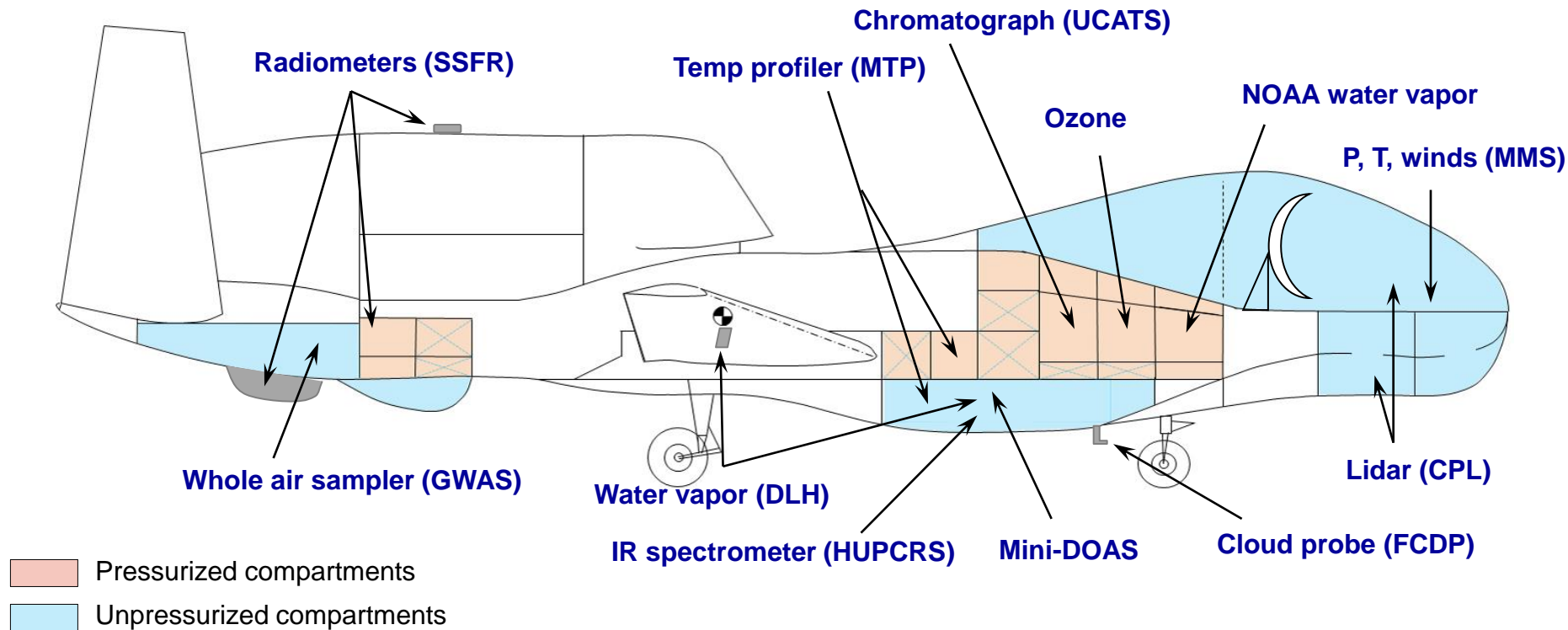
- ATTREX science objectives
- Global Hawk performance and payload
- Overview of ATTREX 2011 and 2013 flights
- A few examples of interesting measurements
- Guam plans

NASA Global Hawk performance



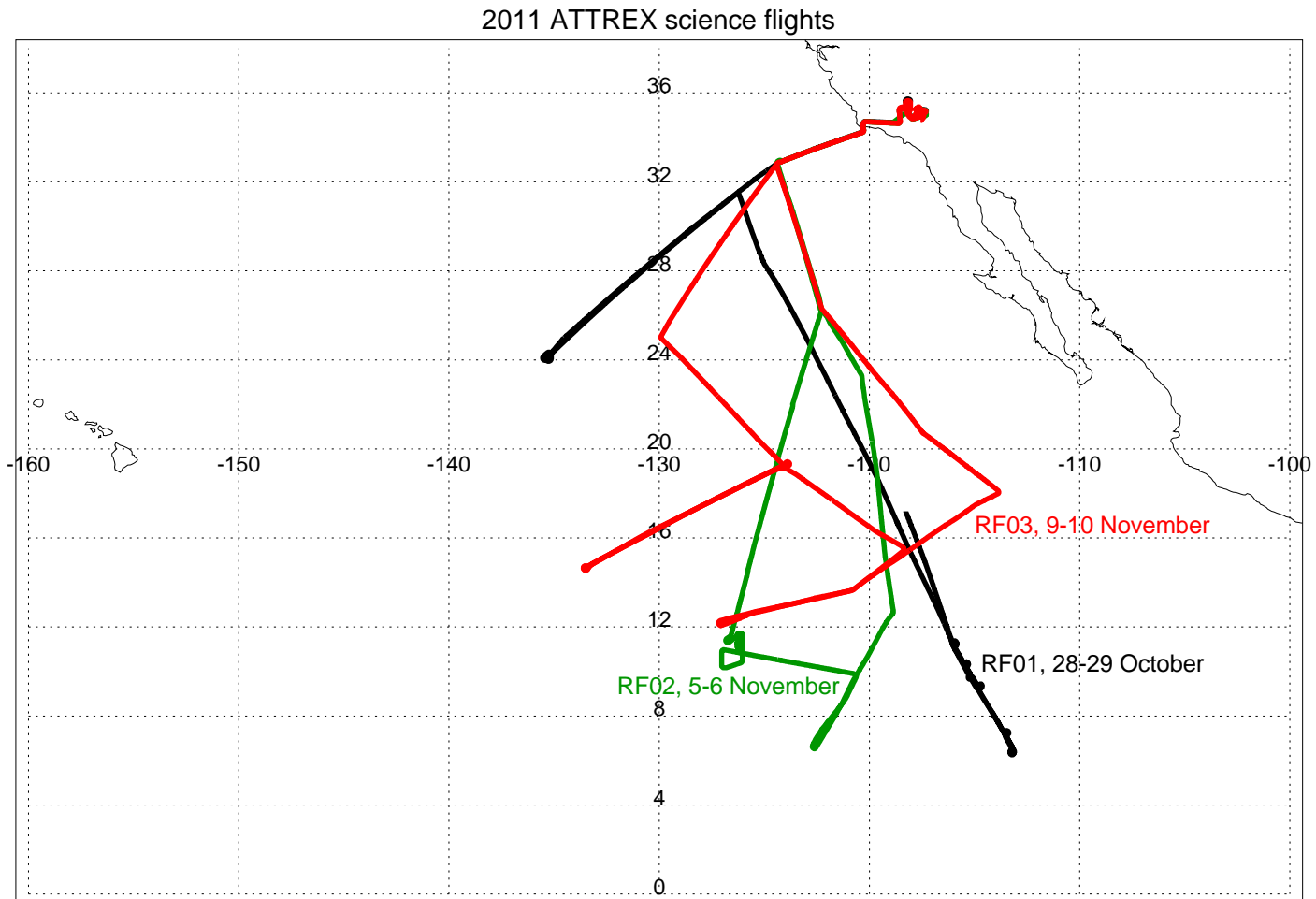
- With ATTREX payload, the GH duration is 24–25 hours
 - Corresponding range is ~8200 nm
- Initial climb out to ~54 kft
- Slow cruise climb to over 60 kft late in flight
- Vertical profiles down to 43–45 kft

ATTREX Payload



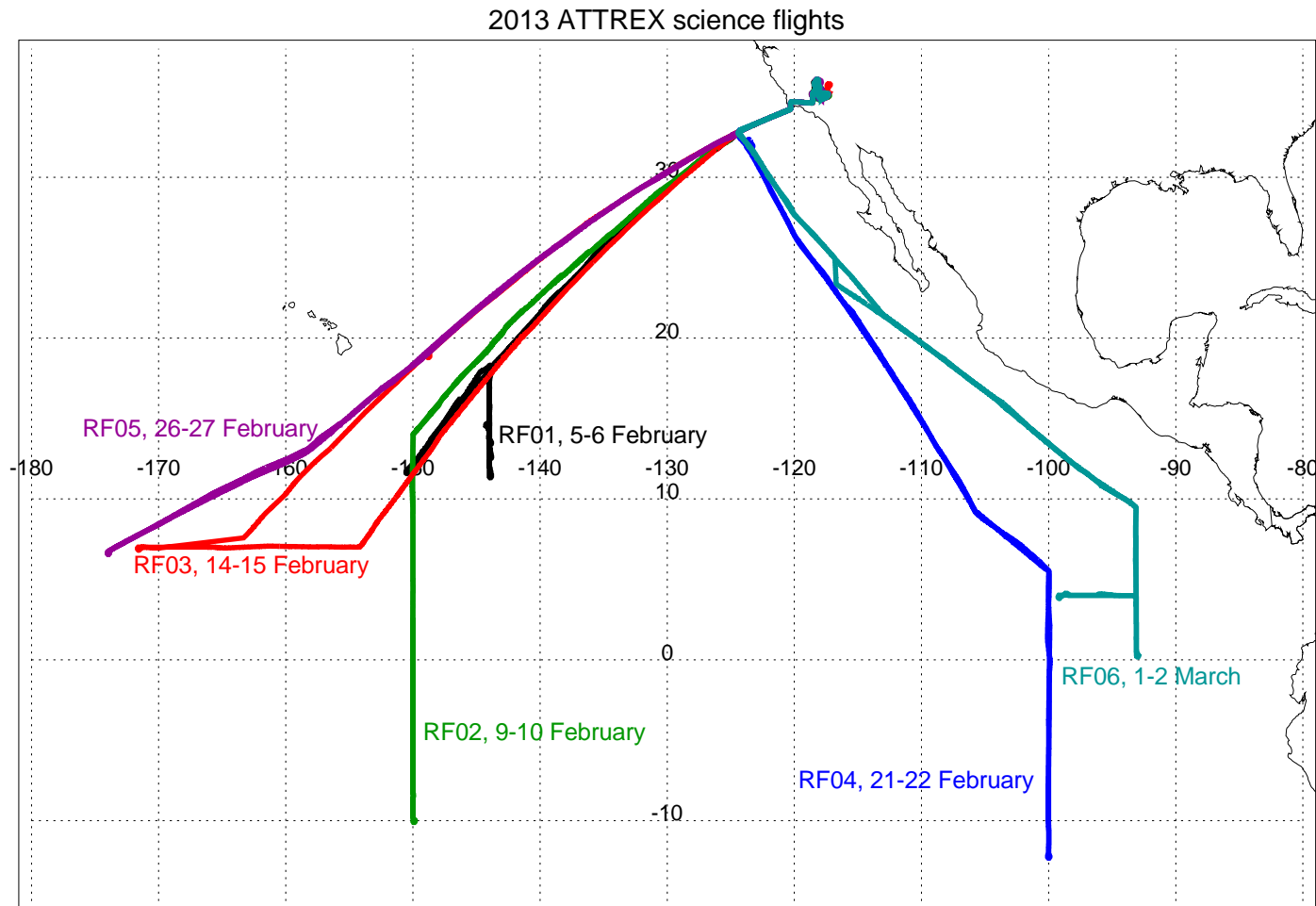
- Still hope to get Hawkeye on the aircraft for 2014

Fall 2011 flights



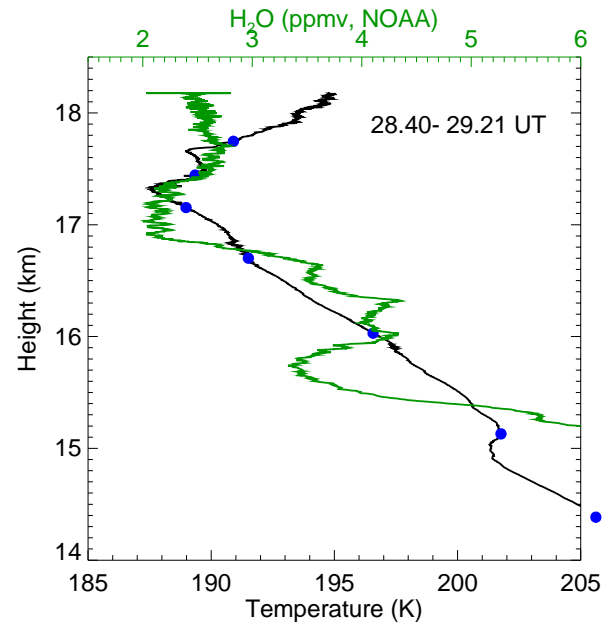
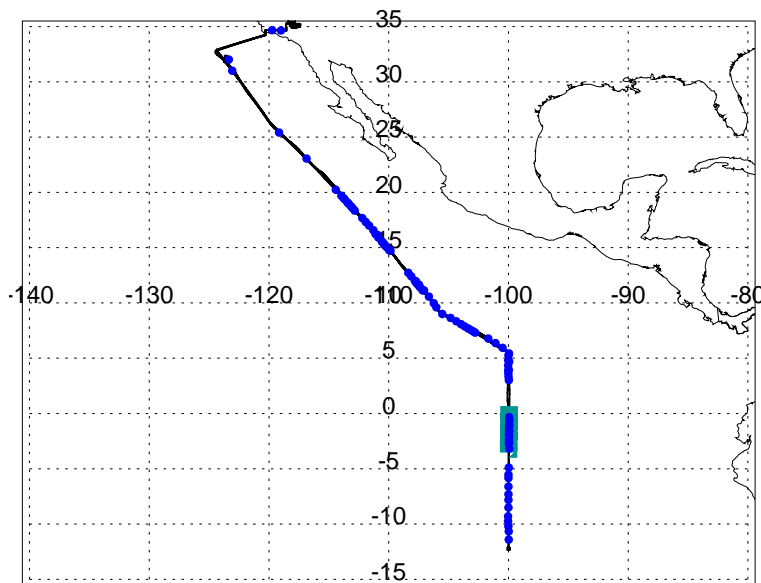
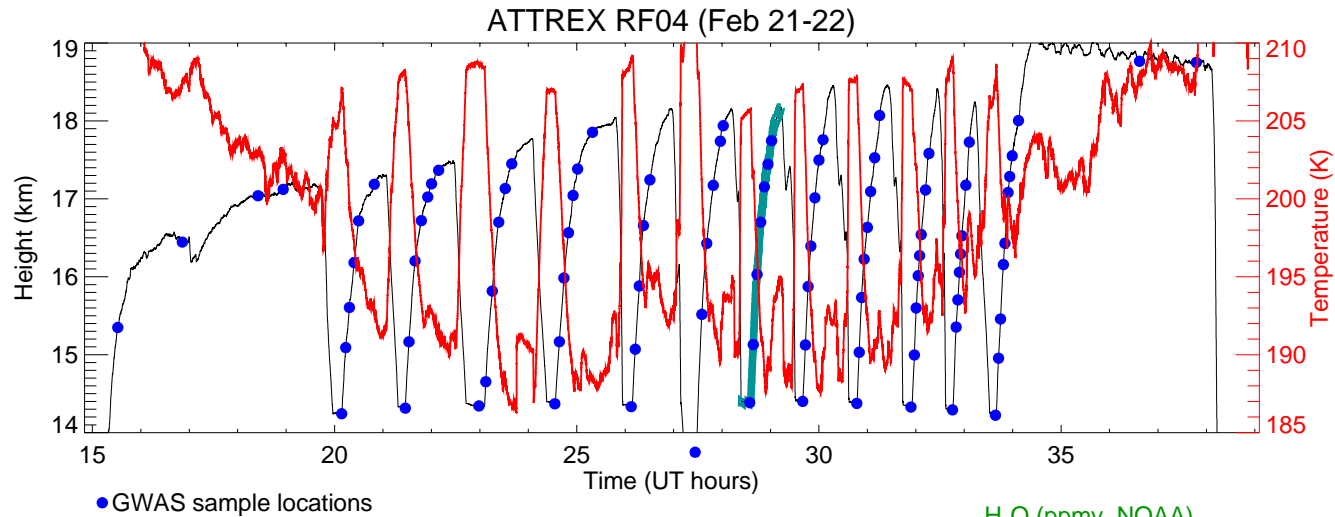
- Three long flights to the tropics (16–24 hours duration)
- Sampling cold TTL regions and downwind of deep convection

Winter 2013 flights



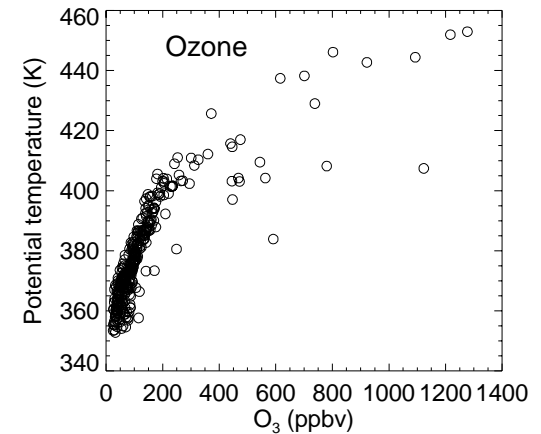
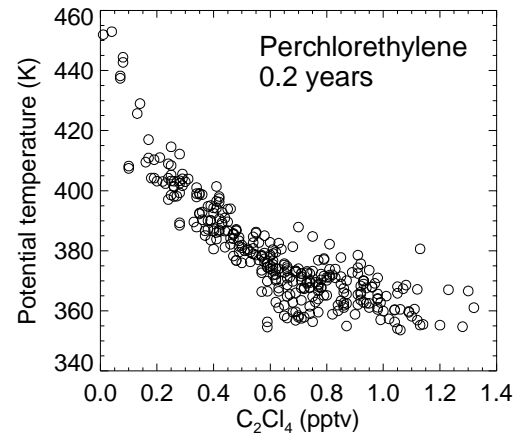
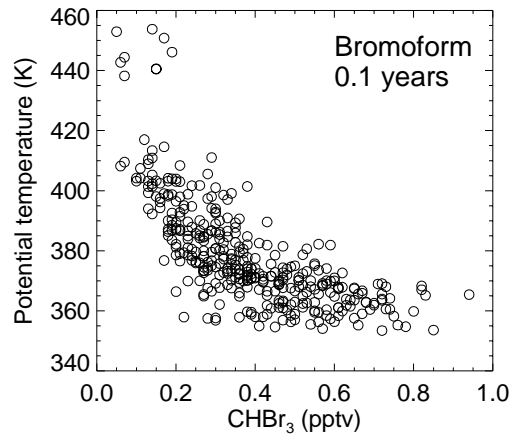
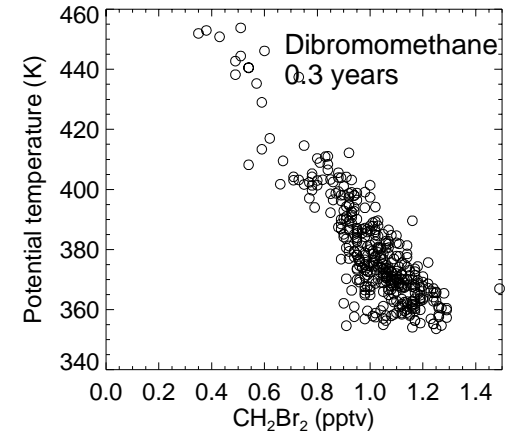
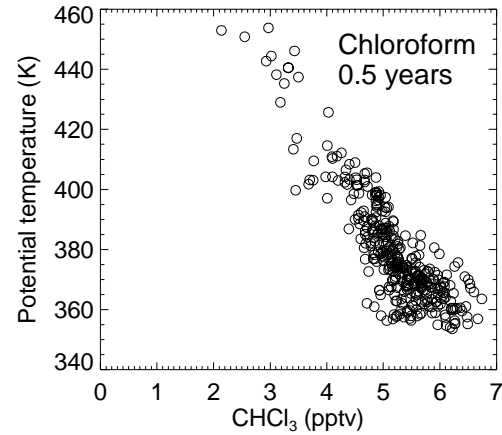
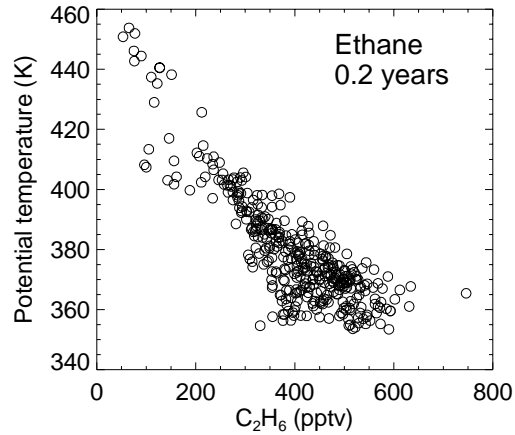
- Six long flights to the tropics (~24 hours duration each)
- Sampling cold TTL regions, downwind of deep convection, and latitude surveys

TTL vertical profiling



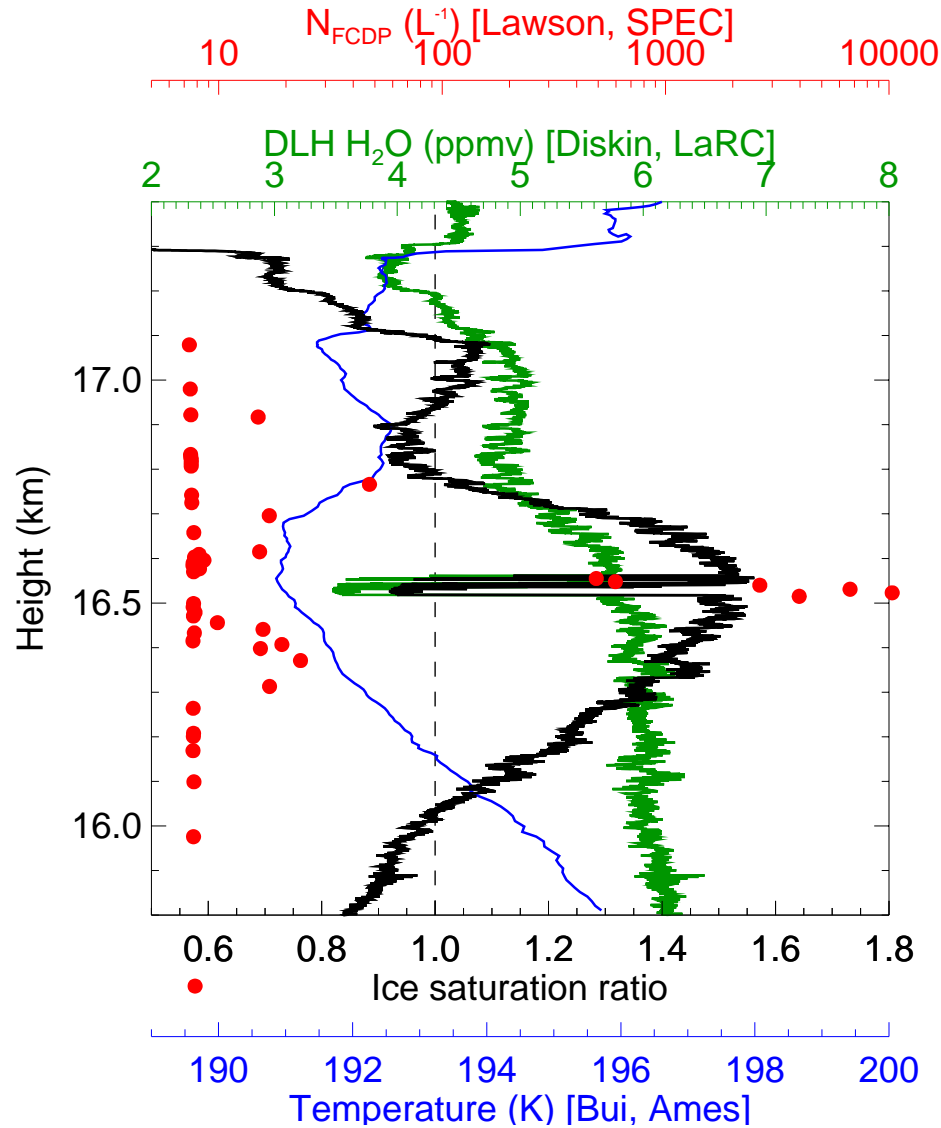
- Most of the flight time was spent ascending/descending through the TTL.

TTL tracer profiles



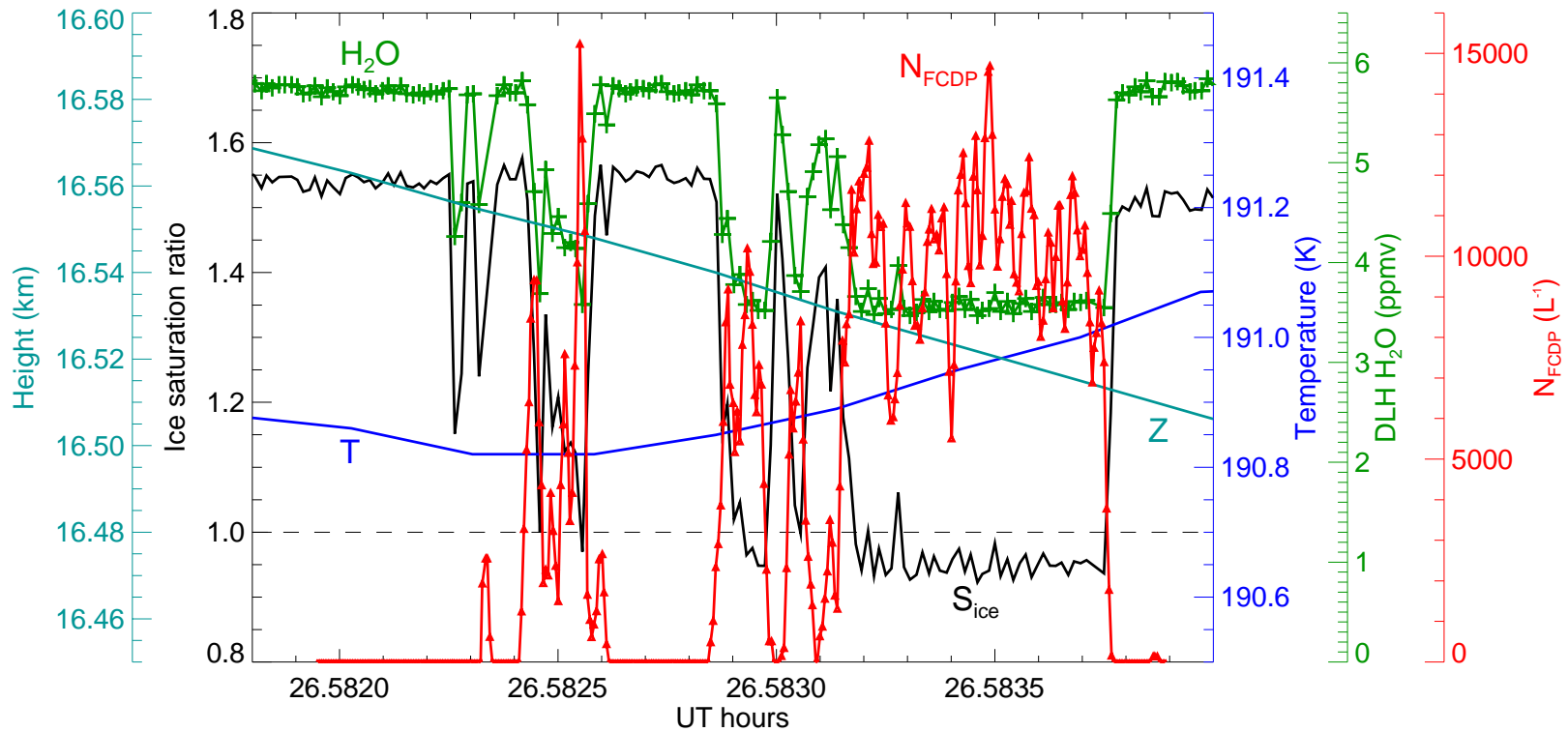
- Dependence of vertical gradient on tracer lifetime as expected
- Combination of trajectory modeling and tracer measurements to assess convective influence

Cloud and humidity measurements (2011 RF02)



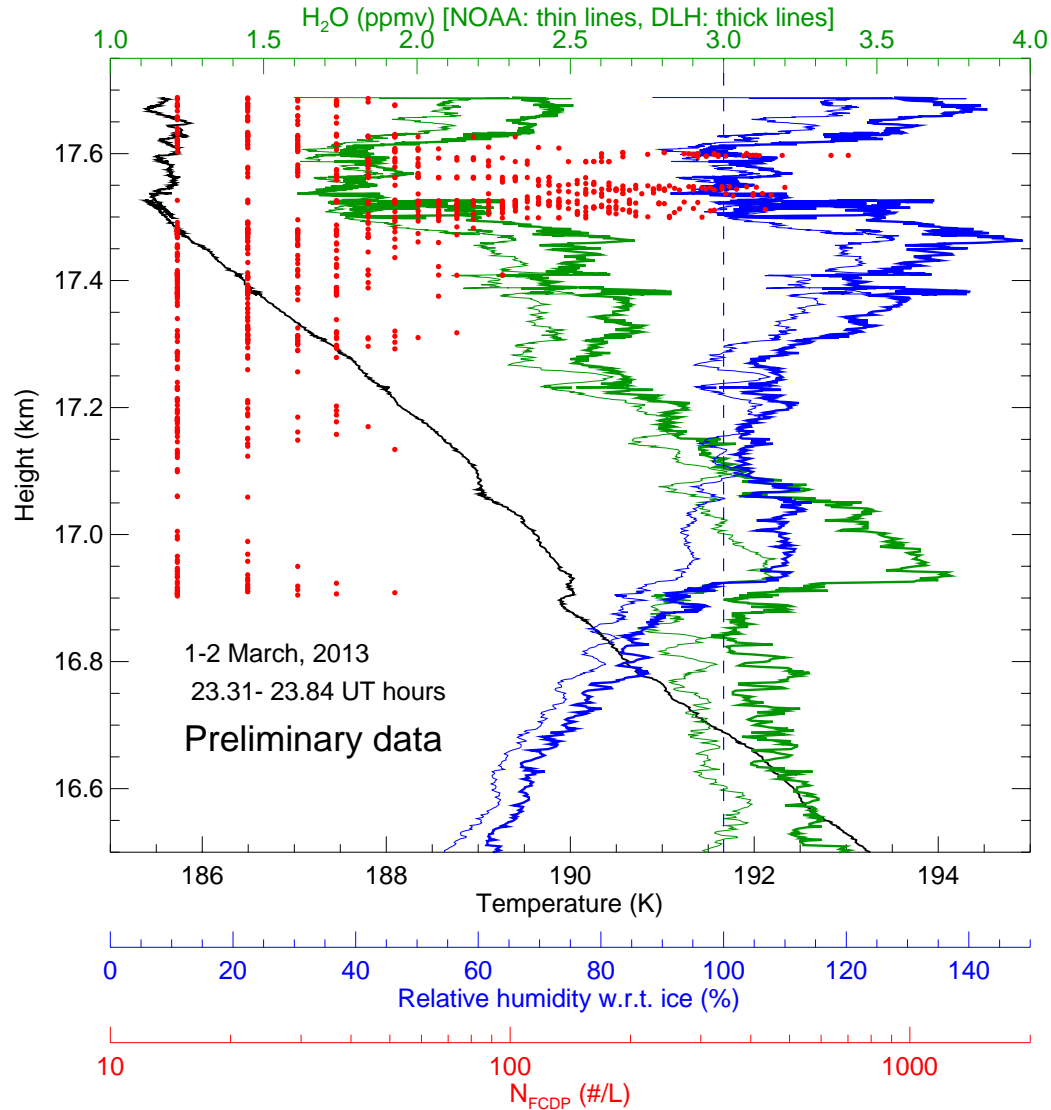
- Ice saturation ratio held near unity in cloud with very high ice concentrations; significant supersaturation above and below

Cloud and humidity measurements (2011 RF02)



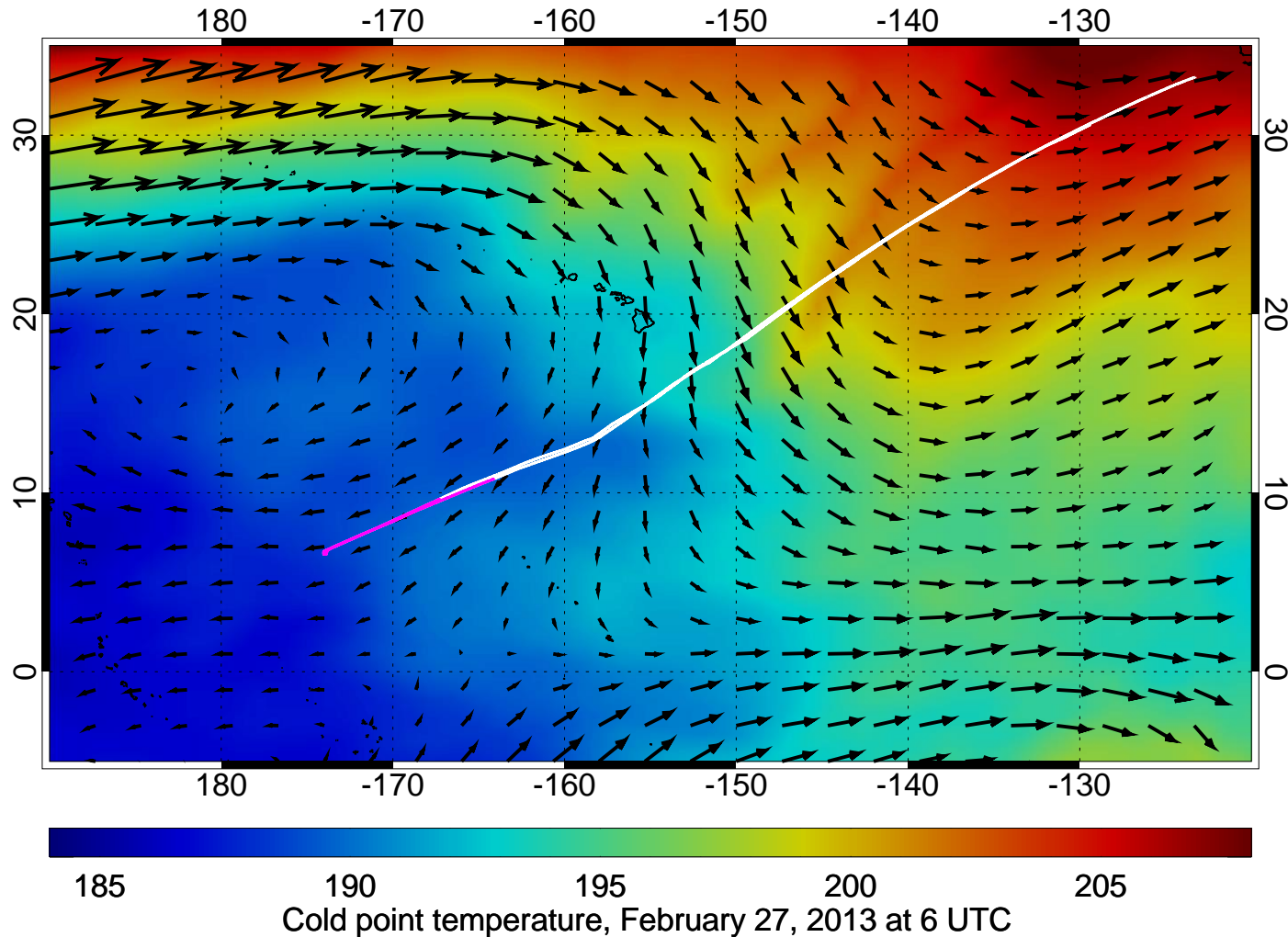
- 2.5 ppmv dehydration within high ice-concentration cloud

Cloud and humidity measurements (2013 RF06)



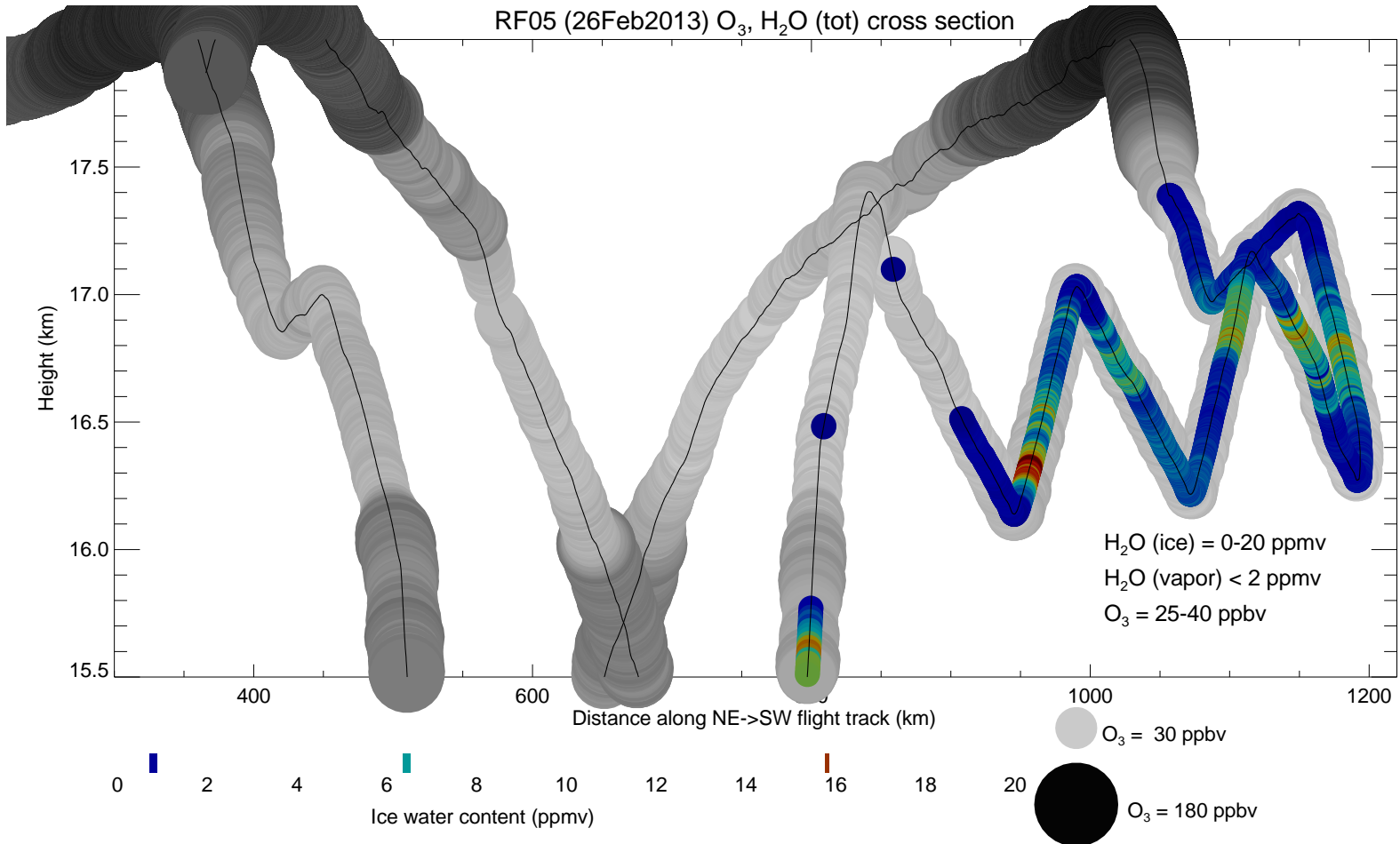
- Consistent with 2011 DLH measurements: near ice saturation in high ice concentration cloud and supersaturation above and below

Cloud and humidity measurements (2013 RF05)



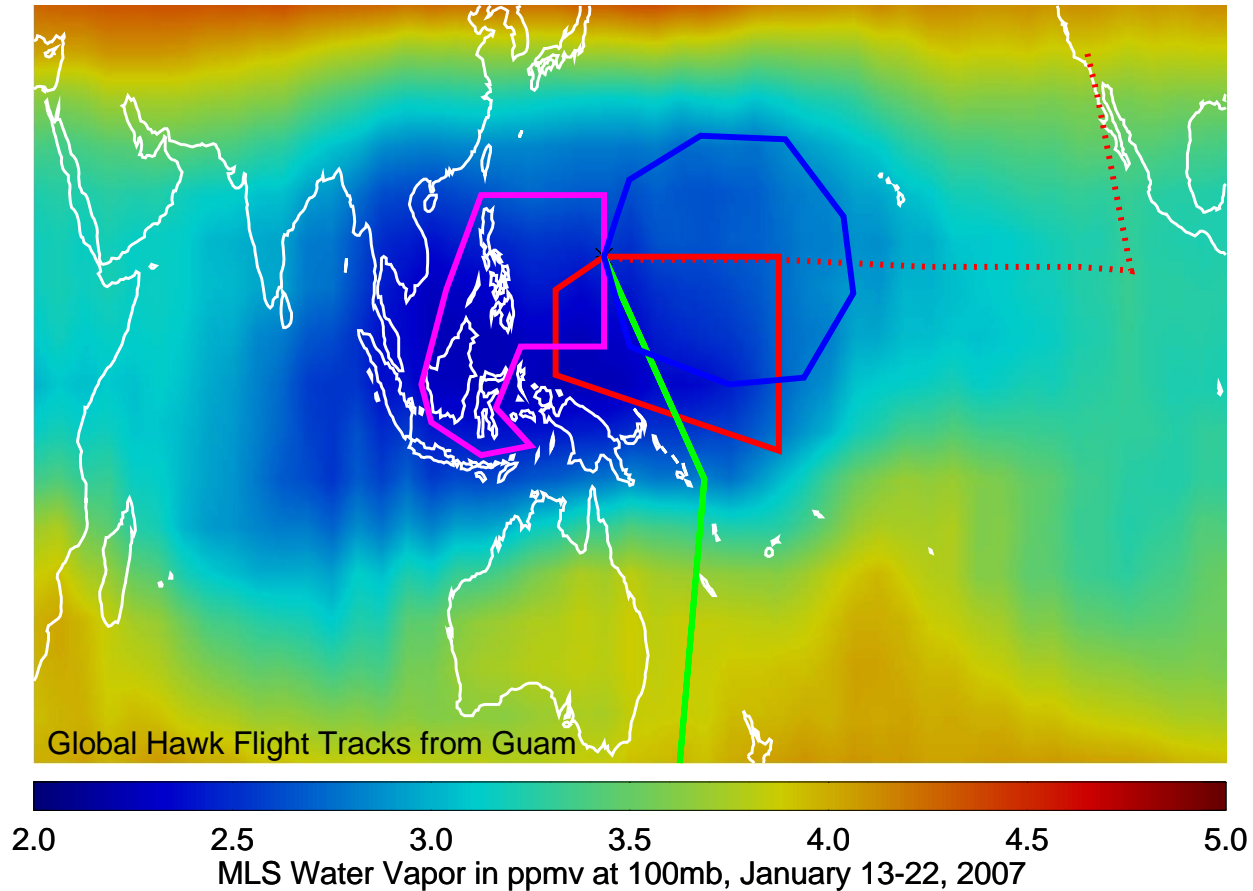
- Global Hawk sent as far into the western-Pacific cold pool as possible.

Cloud, humidity, and ozone measurements (2013 RF05)



- Layer between 16.2 and 17.1 km with considerable ice present (up to 20 ppmv), low ozone (< 40 ppbv) and low H₂O vapor (< 2 ppmv)

Guam flight plans



- Sampling cold pool along streamlines, downstream of deep convection, TTL survey flights, etc.
- Potential for shorter-duration flights from Guam

Outlook for 2014 Guam deployment

- Delays caused by the govmt shutdown imply that our earliest possible start date is Jan 29.
- Risk of further slippage is not insignificant.
- Alternative (*for ATTREX*) would be to delay by 1 year (to Jan/Feb, 2015)
 - Could possibly then have flights from DFRC in Jan-Feb, 2014