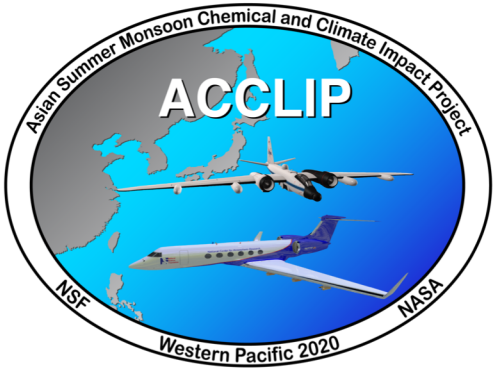
Asian summer monsoon Chemical and Climate Impact Project (ACCLIP)

Principal Investigators:

Laura Pan
NCAR Atmos. Chem. Obs. & Modeling Laboratory
Paul Newman
NASA Goddard Space Flight Center

Co-Investigators:

Elliot Atlas
Department of Atmospheric Sciences
RSMAS, U. of Miami
Owen Brian Toon
Department of Atmospheric and Oceanic Sciences
LASP, U. of Colorado
William Randel
NCAR Atmos. Chem. Obs. & Modeling Laboratory



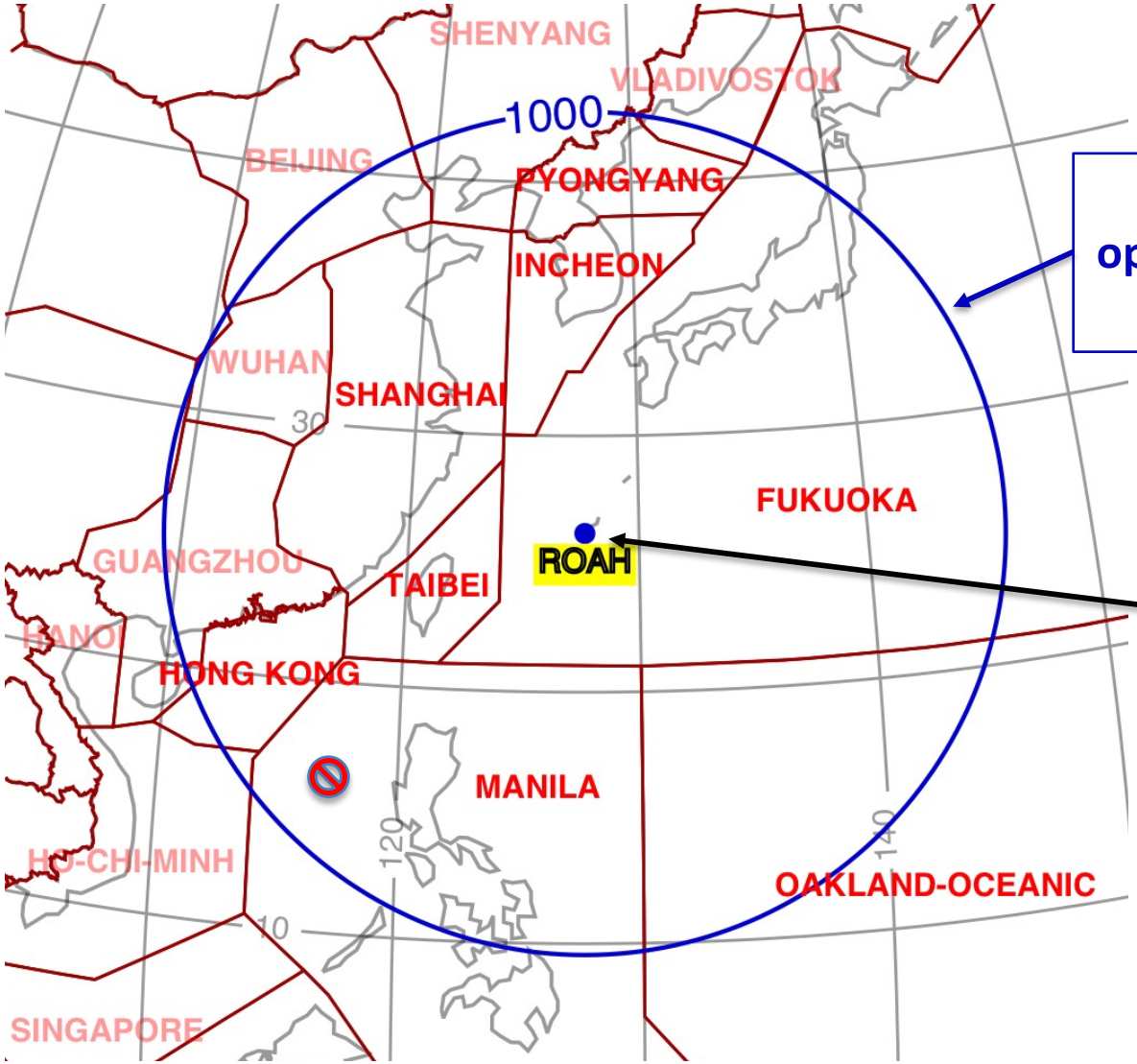
Asian summer monsoon Chemical and Climate Impact Project (ACCLIP): the NASA WB-57f

NASA Program Scientist: Ken Jucks
Project Scientist: Paul A. Newman
Deputy PS: Troy Thornberry
Project Manager: Jhony Zavaleta

ACCLIP

- Period: July-August, 2020
- Deployment Site: Naha, Okinawa, Japan
- Aircraft:
  - NSF/NCAR research aircraft Gulfstream V (GV) – July 15 to August 31
  - NASA WB-57f – August 3 to 27
- Objective: Characterize the Asian summer monsoon's impact on global chemistry and climate.

ACCLIP Deployment & FIRs



ACCLIP - 2020

Asian Summer Monsoon Chemistry and Climate Impacts Project

NASA WB-57f

NASA Johnson Space Center
Ellington Field

Duration:
6 hours
Useful Payload:
9,700 lbs
Gross Take-off Weight:
72,000 lbs
Onboard Operators:
2 (Pilot and SEO)
Max Altitude:
60 kft +
Air Speed:
410 knots (211 m/s)
Range:
2,500 Nmi (4630 km)
Power:
110V/60Hz AC
110V/400Hz AC
28 VDC

14 wing hatches

Tail cone

Four 3' pallets

Nose

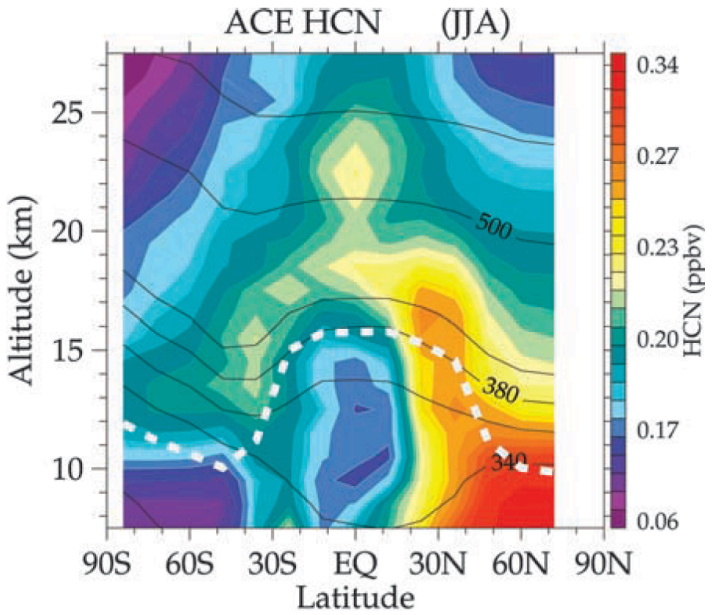
Super pod

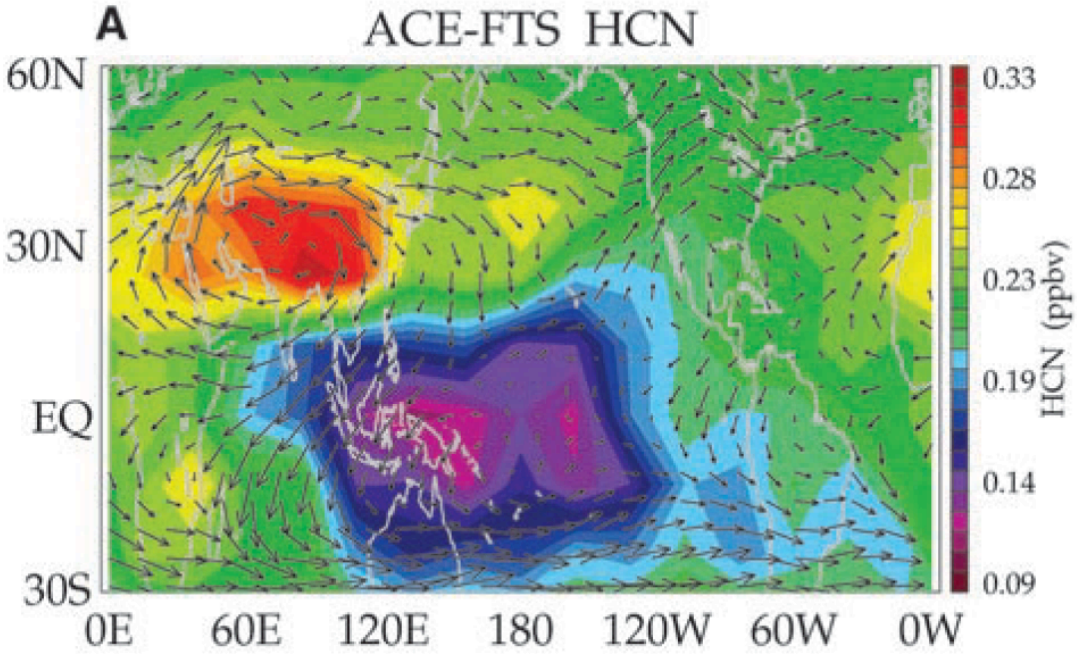
Spear pod

Power:
110V/60Hz AC
110V/400Hz AC
28 VDC

Asian Summer Monsoon

HCN time average mixing ratio (ppbv) near 13.5 km during boreal summer (June to August) derived from ACE-FTS observations. Arrows denote winds, & show that the HCN maximum is linked with the upper tropospheric Asian monsoon anticyclone.





HCN time and zonal average mixing ratio (ppbv) during boreal summer (June to August) from ACE-FTS. Tropopause is the white dashed line, and black lines are isentropes.

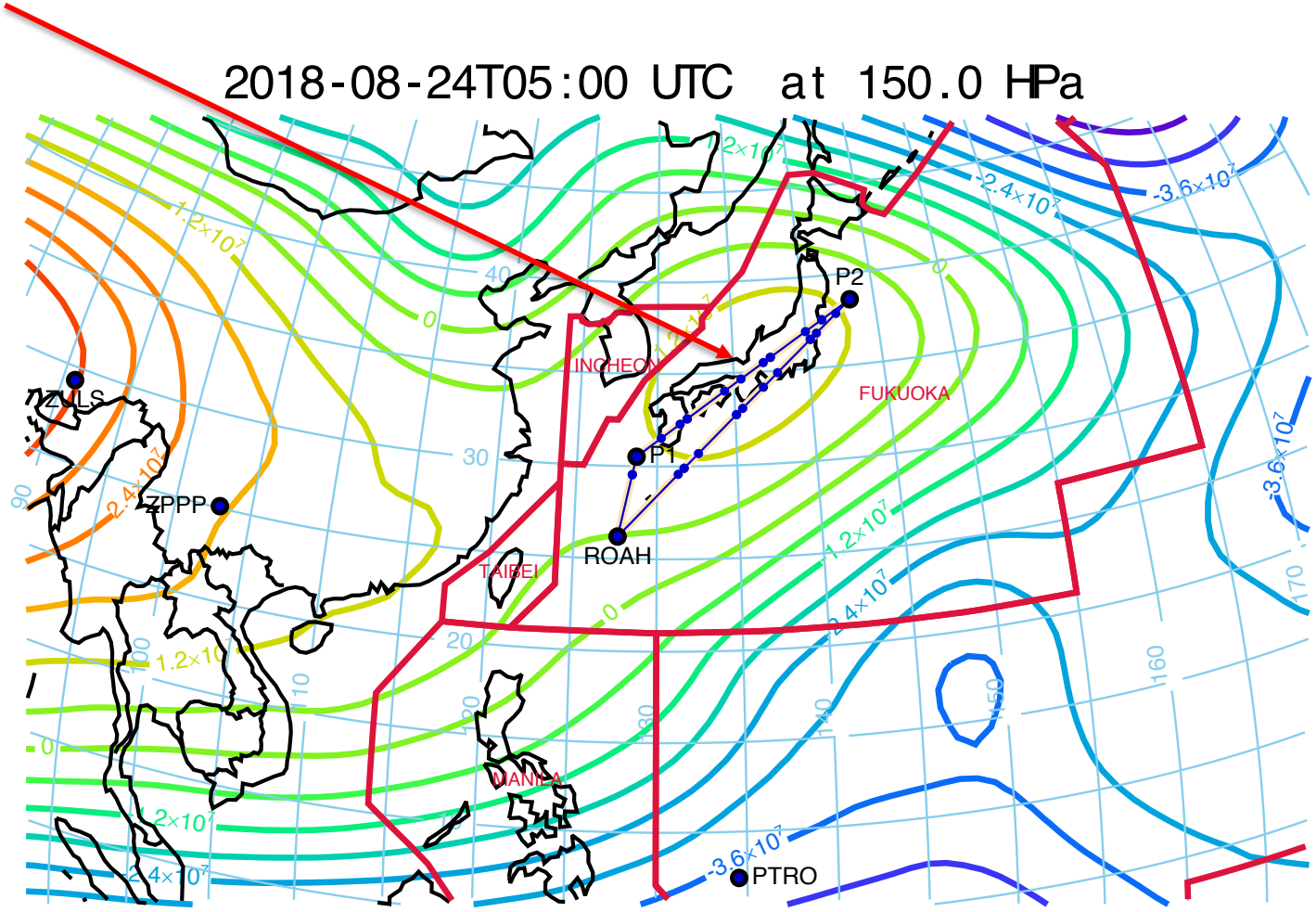
Randel et al. (2010)


ACCLIP - 2020
Asian Summer Monsoon Chemistry and Climate Impacts Project
Left Spear Pod
Cloud Probes
Left Super Pod
Lidar (Roscoe)
Nose
PALMS, MMS
Tail
ChiWIS?
Right Super Pod
Pallet Bay
FT – MMS electronics
1 – UTLS-AMP, SP2
2 – LIF-SO2, LIF-NO
3 – ISAF, Ames-LGR
4 – WAS, COLD2
AT – UASO3
Right Wing Hatch/Spear Pod
DLH

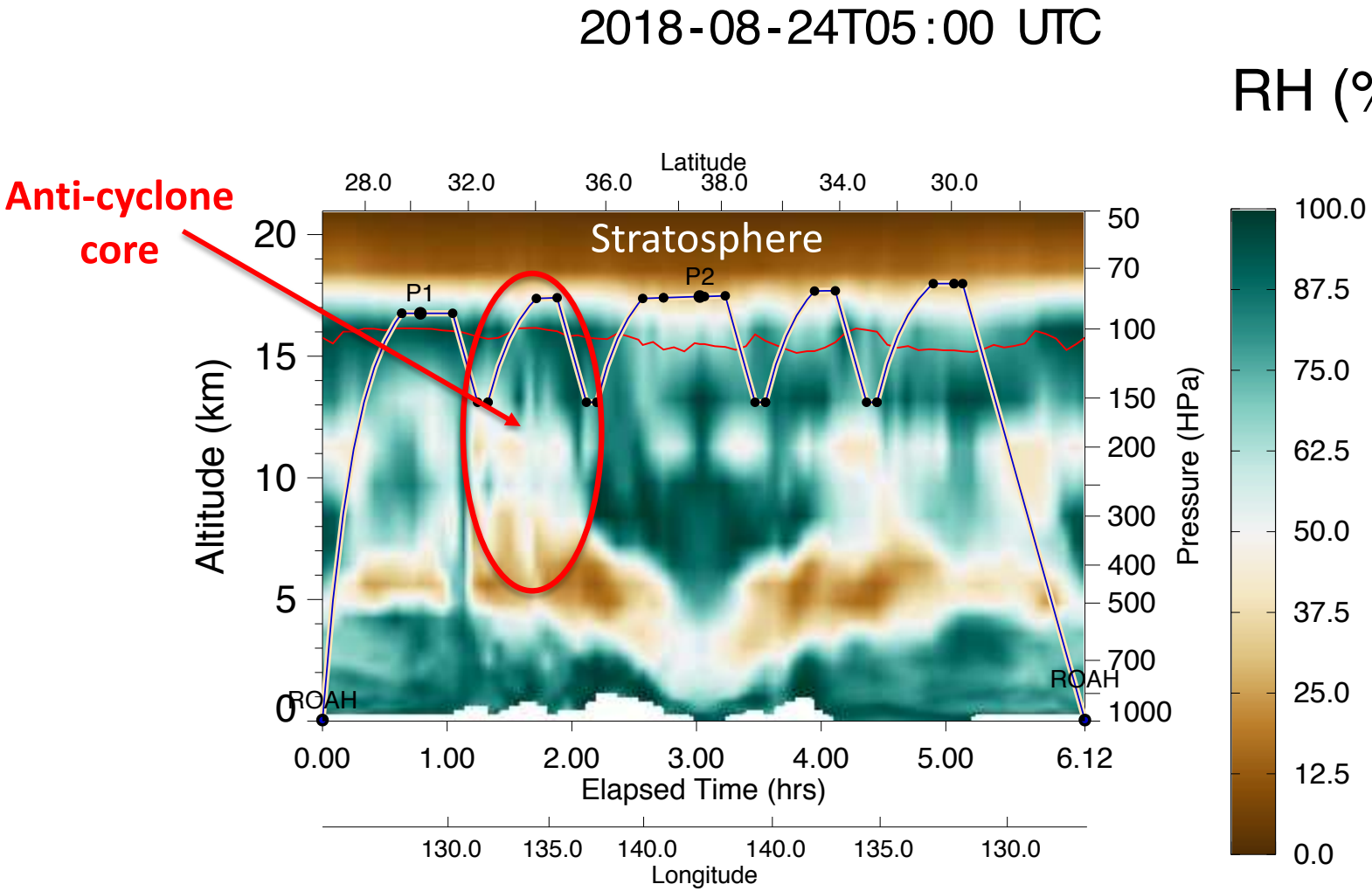
Flight planning

- Flight planning is dictated by operational constraints that include WX at Naha, FIR restrictions, ATC controls, crew limitations, and available targets
- G-V covers lower altitudes (up to mid-40s), while 57 covers 43-60 kft
- WB-57f cross-wind limit of 15 kts

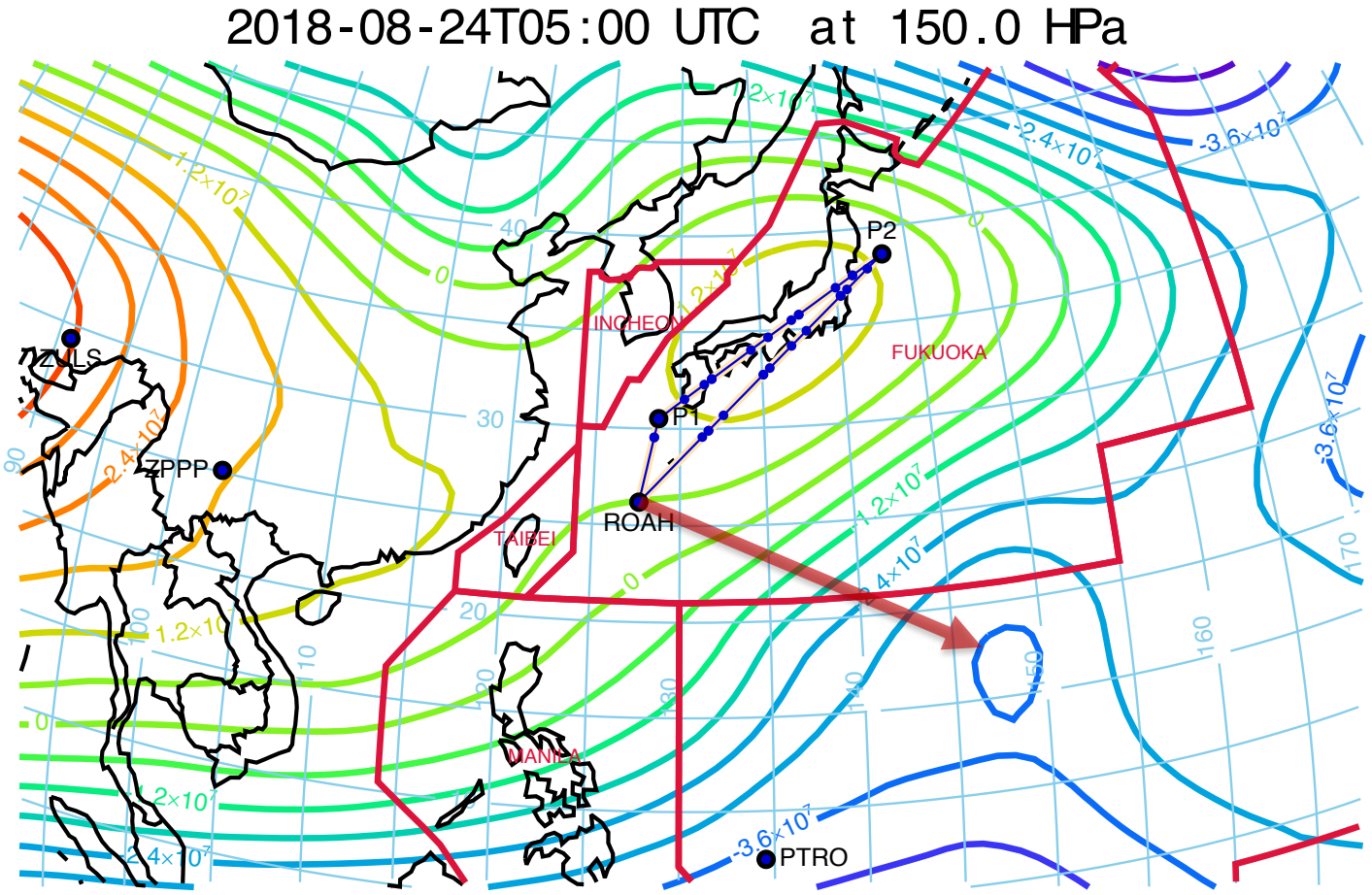
Flight objective: characterize anti-cyclone's core chem. & part. composition



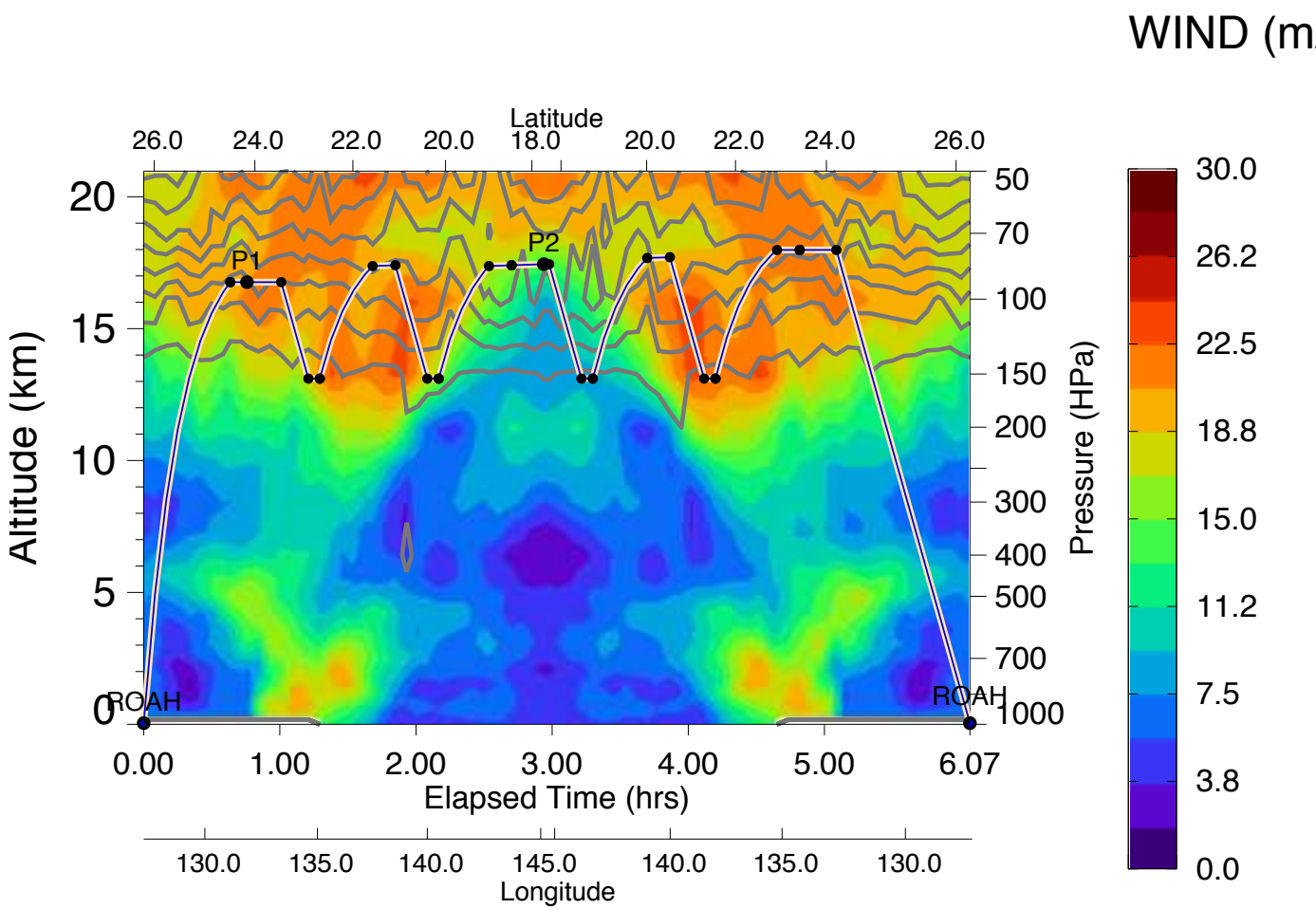
Flight objective: characterize anti-cyclone's core chem. & part. composition



Flight objective: characterize anti-cyclone's cross-gradient structure

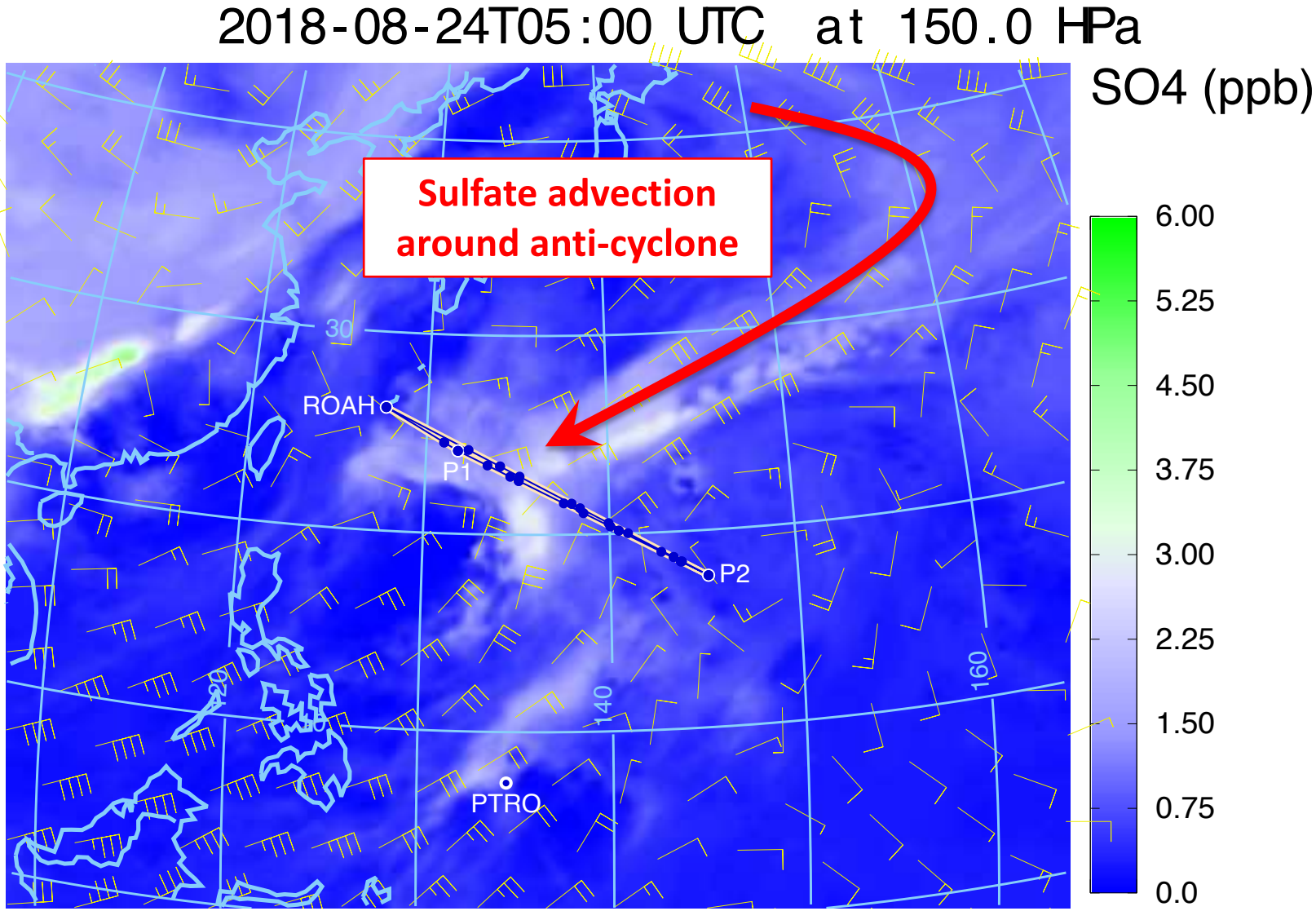


Flight objective: characterize anti-cyclone's cross-gradient structure

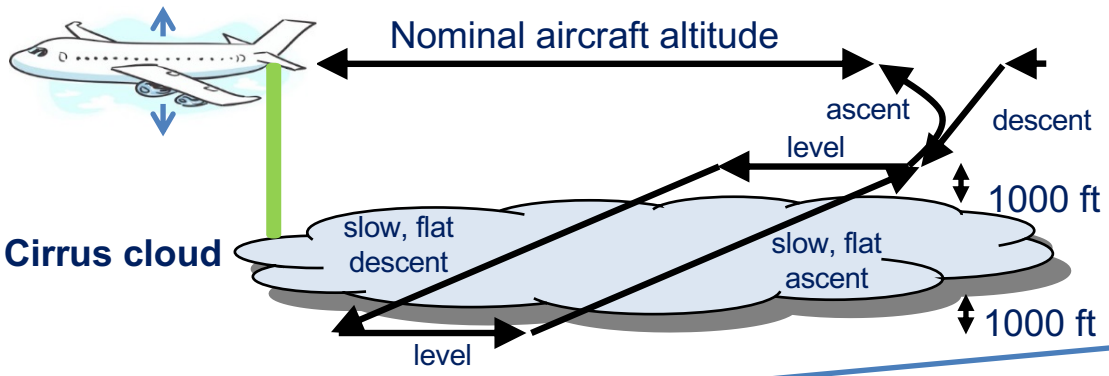


EPV (K m^2/kg s)

Flight objective: characterize anti-cyclone's cross-gradient structure



Approach 2 - Determine How Well Radiative Transfer Models Perform in Simulating Optically-Thin Cirrus Cloud Forcing Properties



31 July – 11 August 2017

Fu-Liou-Gu Model

State-of-the-art radiative transfer model for solving TOA forcing

- How well does model forcing verify with radiometers?
- How sensitive is model to differences in ice microphysics?

NRL Radiometer Array

Direct measurement of thin cirrus cloud TOA forcing

- Measure solar/IR irradiances above and below clouds
- Simultaneous up/down viewing
- Measure surface reflectance term

SPEC Ice Microphysics

Profile ice microphysical properties through clouds

- Ice water path
- Effective crystal sizes
- Ice crystal habits, asymmetry and single scattering albedo
- Temperature and humidity

NASA Cloud Physics Lidar

Determine cloud profile boundaries in flight and provide *control* dataset for modeled forcing calculations

- Cloud optical depth
- Light extinction coefficient
- Aerosol profile below clouds

REThinC Instrument Placement on WB-57

SPEC 2D-S, FCDP and CPI in Right Spear Pod

Bucholtz' Broadband Radiometers atop the airframe (also underneath airframe looking down