



NCAR



EOL Airborne Sounding and Ground-based Profiling Operations

- Aircraft GPS Dropsondes
- Ground-based Integrated Sounding System (ISS)

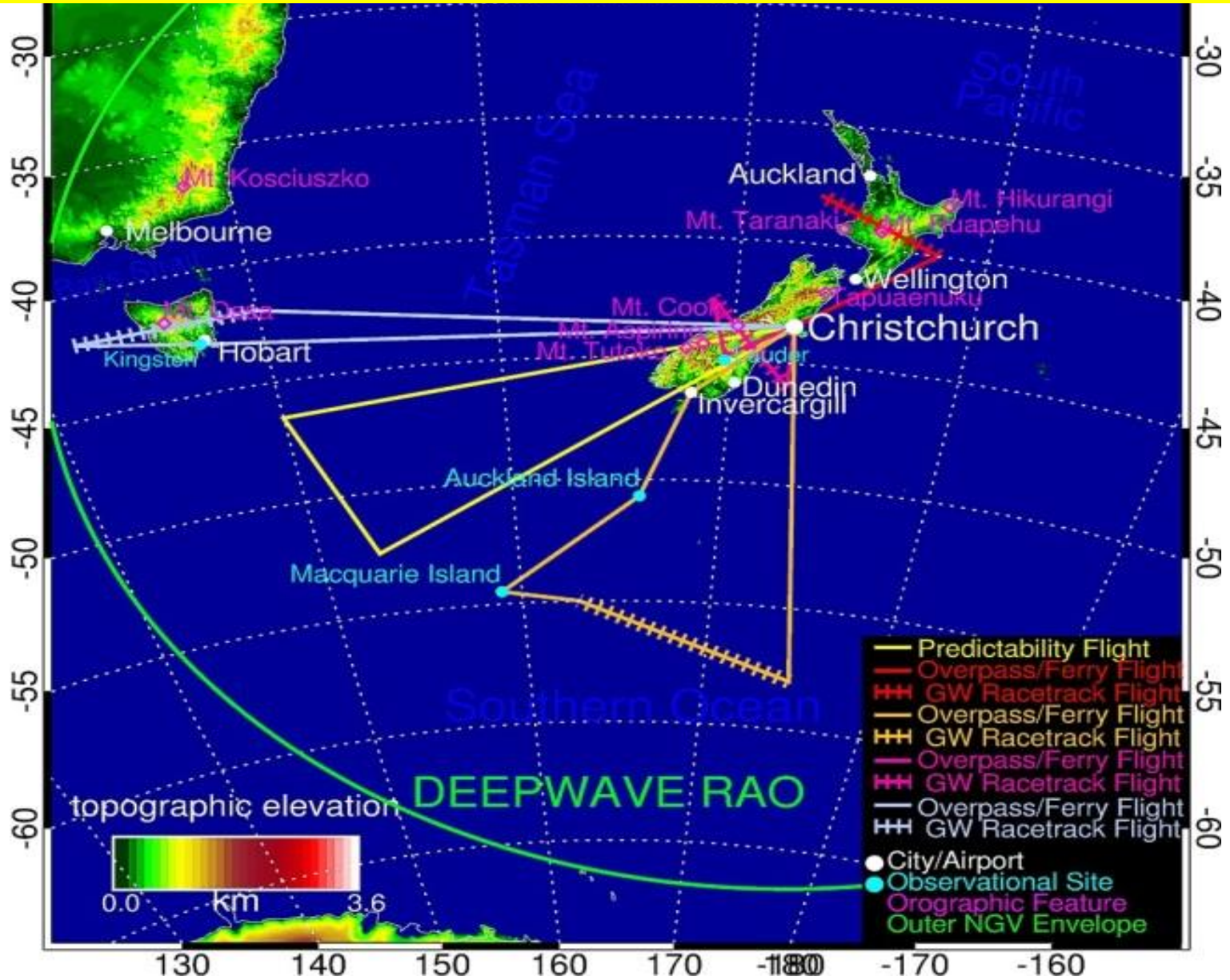
(In-Situ Sensing Facility Instrumentation - ISF)

Steve Cohn

standing in for Bill Brown and Terry Hock

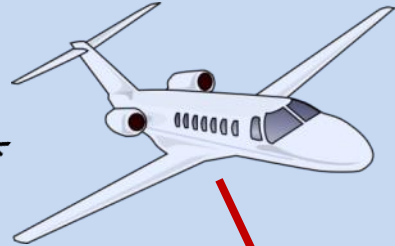
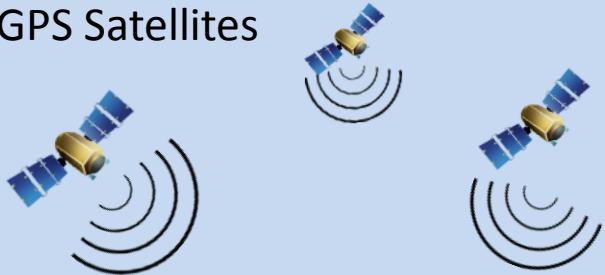
National Center for Atmospheric Research, Earth Observing Lab (EOL)

NCAR/NSF G-V Automated Dropsonde System



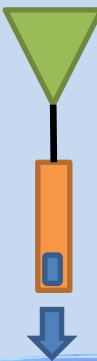
NCAR/NSF G-V Automated Dropsonde System

GPS Satellites

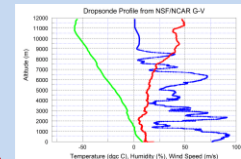
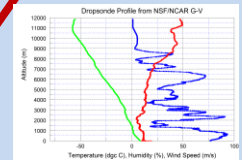


Sonde Telemetry Link

Aircraft-Satellite data link to sfc



Dropsonde



Boulder

Internet



NCAR/NSF G-V Automated Dropsonde System

Research quality measurements

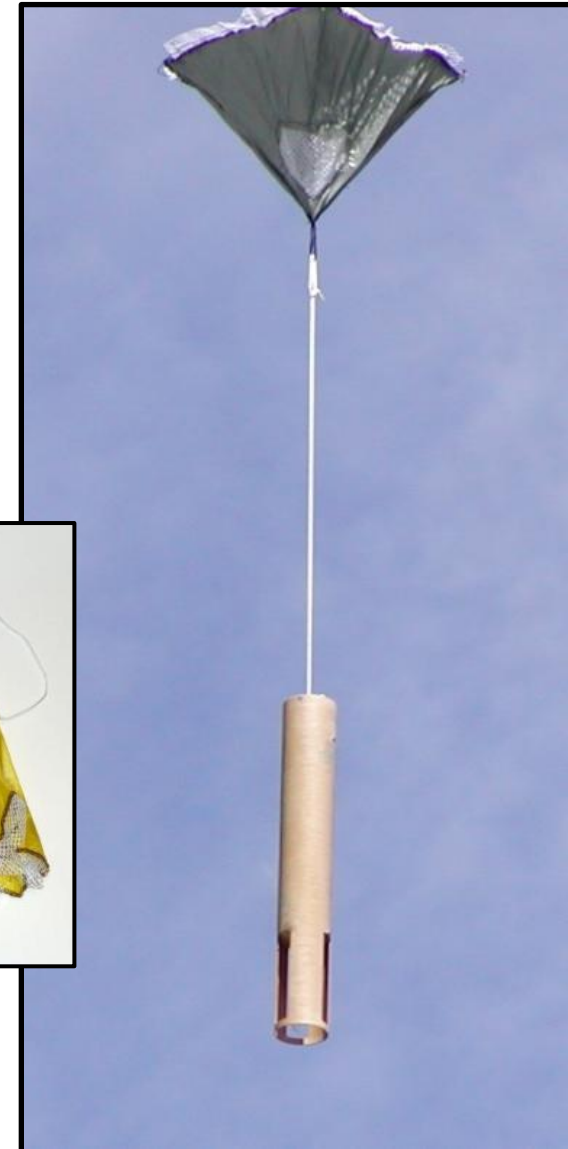
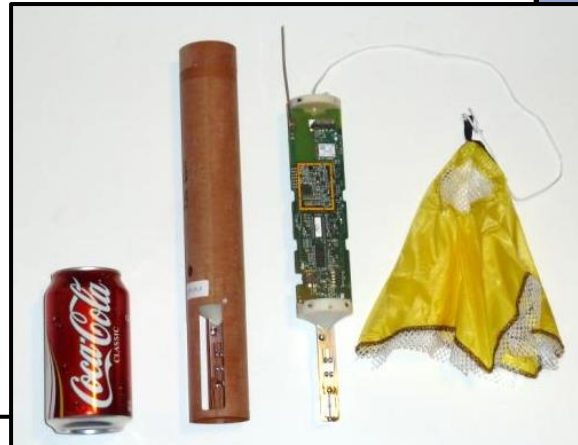
- **Pressure – Temperature – Humidity – Wind speed/direction**
- **High vertical resolution**
- **Up to 8 sondes in air simultaneously**

Performance Specs

- Fall speed: ~11 m/s near sea level
- Fall time: ~15 min from 45K ft
- Measurement rate: PTU 2 Hz; Wind 4 Hz
- **Vertical resolution near surface: PTH ~6 m, Wind ~3 m**
- Long telemetry range 300+ km

Mini sonde Size:

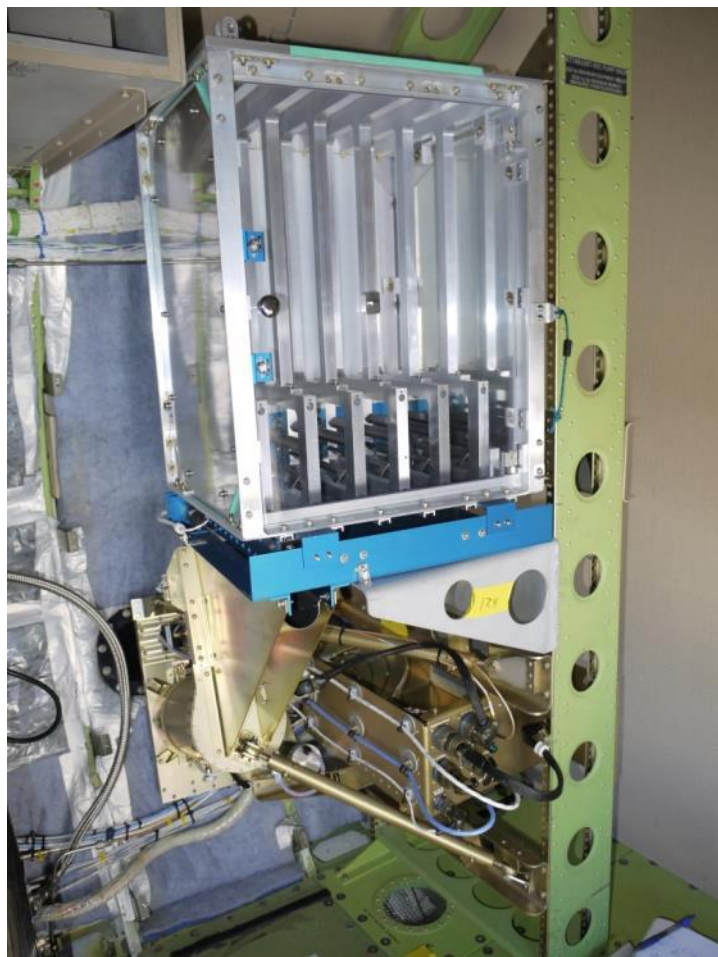
- Mass: 165 grams
- Length: 30.5 cm
- Diameter: 4.7 cm



- Pressure
 - 0.1 mb resolution, 0.5 mb repeatability, 100mb to 1050 mb range
- Temperature
 - 0.1° resolution, 0.2° repeatability, -80 ° to +40 ° range
- Humidity
 - 1% resolution, 2% repeatability, 0 to 100% range
- Horizontal wind
 - 0.1 m/s resolution

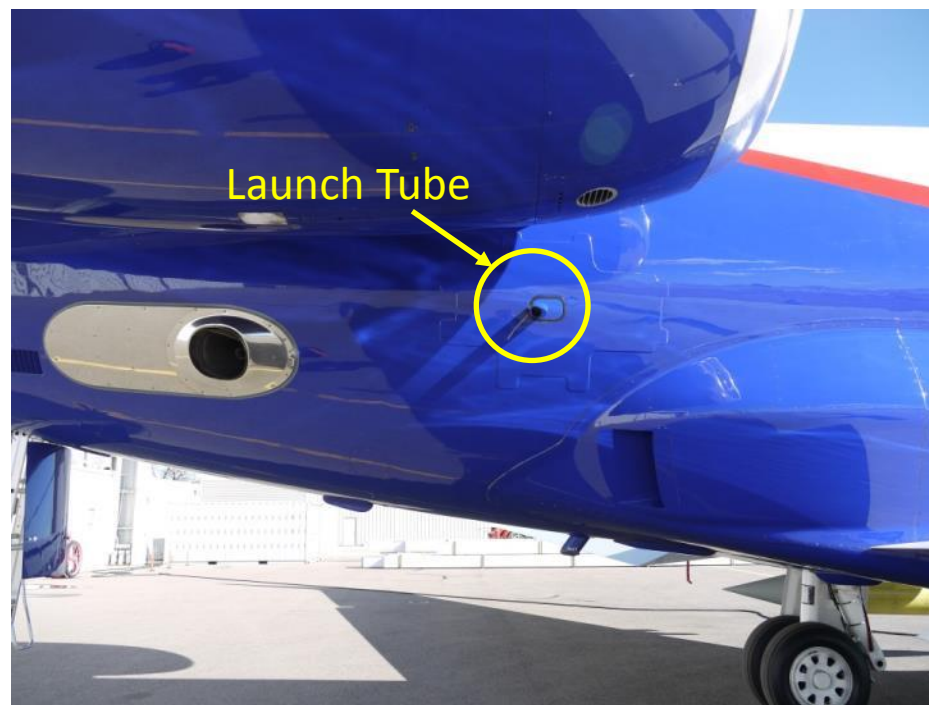
NCAR/NSF G-V Automated Dropsonde System

Automated Dropsonde Launcher
Storage: 50 Dropsondes



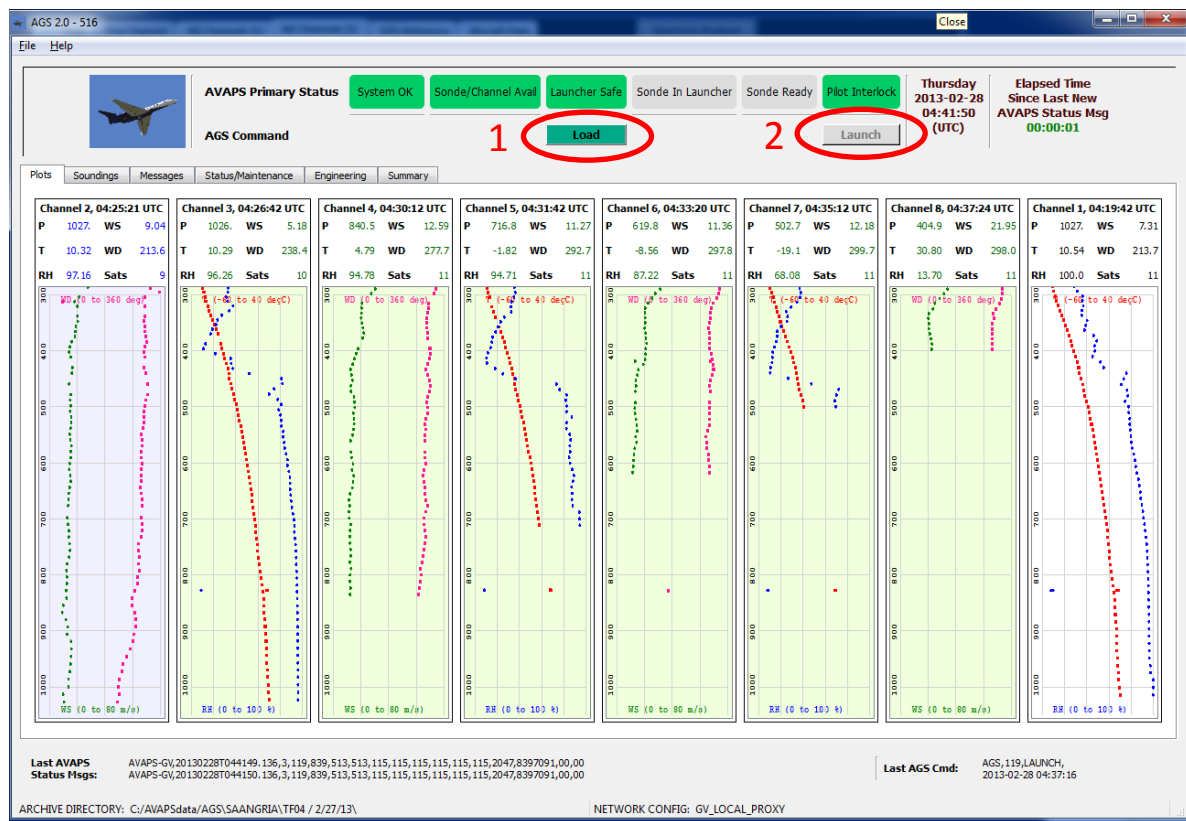
Aircraft Data System

Up to 8 Dropsondes
simultaneously



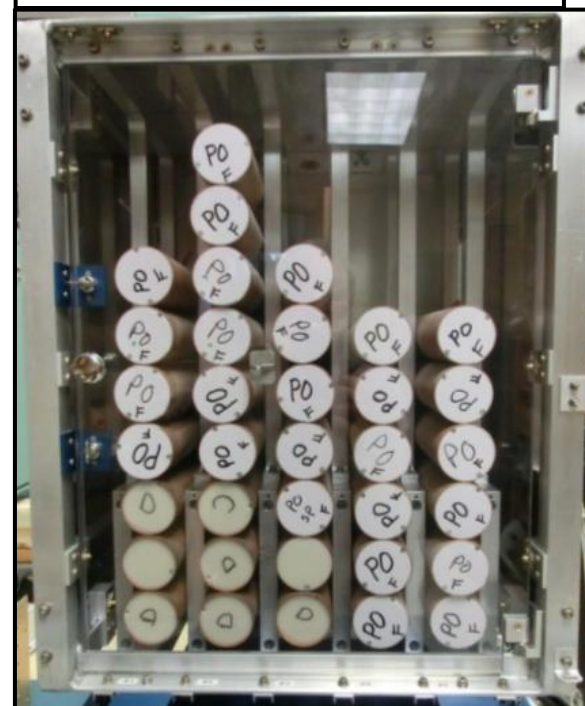
AVAPS Aircraft Real Data Display and Operator Interface

AVAPS Onboard Software (AGS)



2-button interface
 For automatic launcher

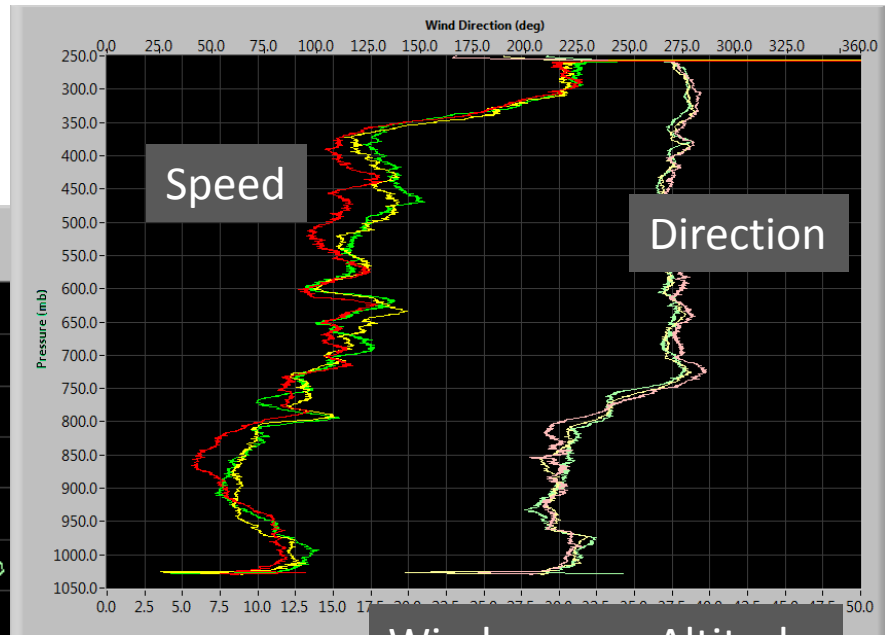
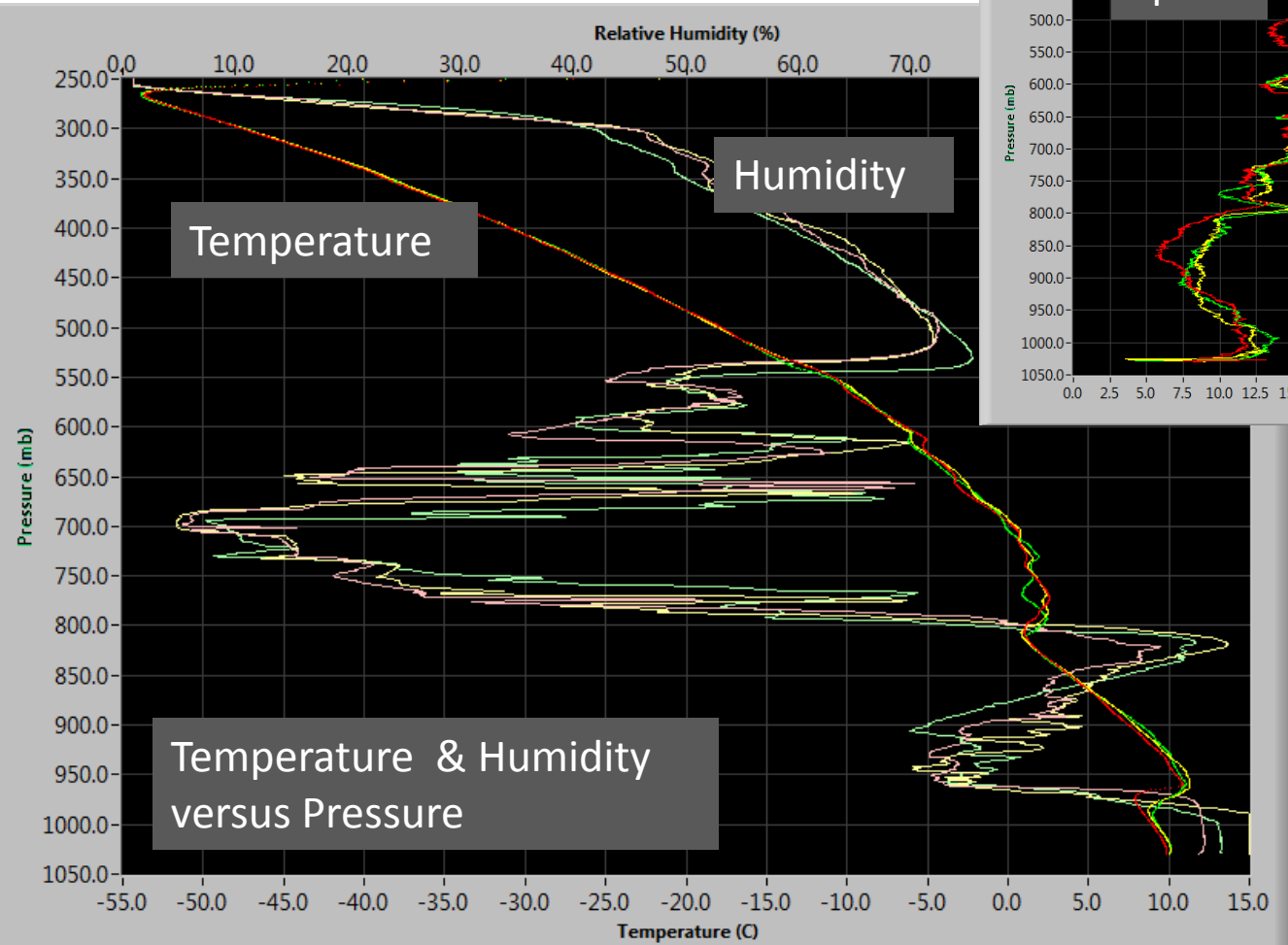
- 1) Load sonde
- 2) Launch sonde



Sonde storage in launcher

- AGS displays real-time either thermodynamic or wind plots for each of the 8 channels
- Engineering status monitor of automatic launcher

Typical Dropsonde Profiles: Three rapid drops



Winds versus Altitude

-- PRE-SAANGRIA Flights
-- 1 March 2013
-- Pacific Ocean near Oregon coast
-- Less than 3 minutes between drops

DEEPWAVE-NZ DROPSONDE OPERATIONS

- 280 dropsondes
- Estimated 12 - 20 dropsondes released per flight
- Sonde releases every 10 minutes (approx)
 - AVAPS system is capable of releases every 150 seconds
- 2 ISF field support staff (one onboard G-V for drop operations)
 - Can support back-to-back flights. System fairly new.
- Skew-T plots in near real-time in the Field Catalog.
- Temp Drop messages (preliminary QC) available via FTP if needed.
- Data QC: Post-processing by ISF scientists
 - Six months or less after DEEPWAVE completion

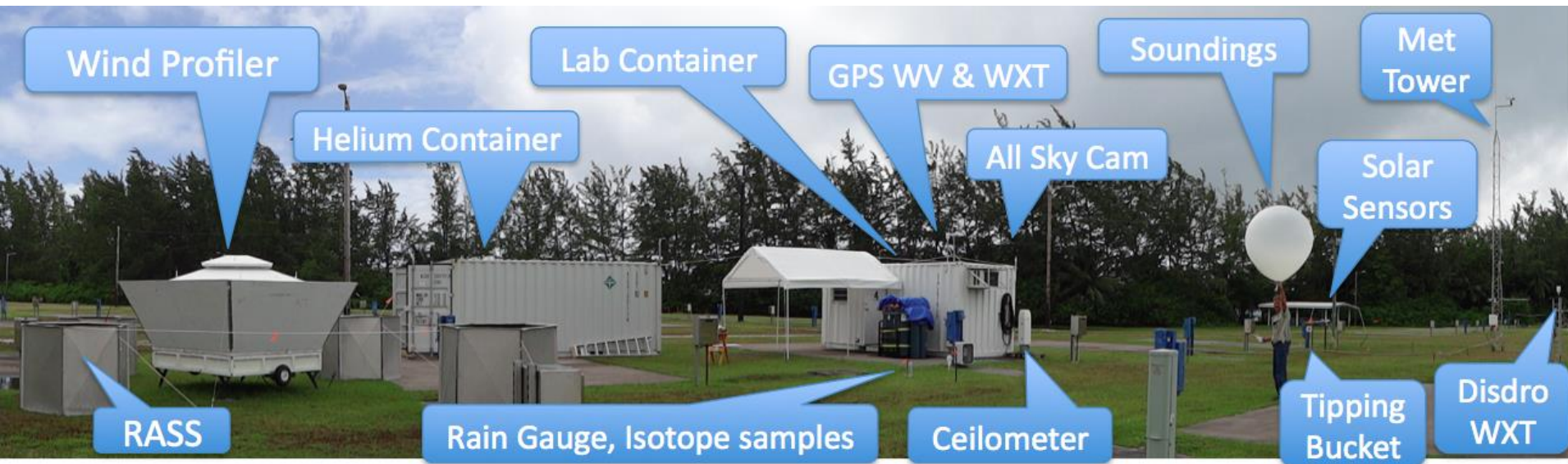
Integrated Sounding System (ISS)

Ground-based. Suite of instruments to measure detailed profiles of the atmosphere

ISS Components:

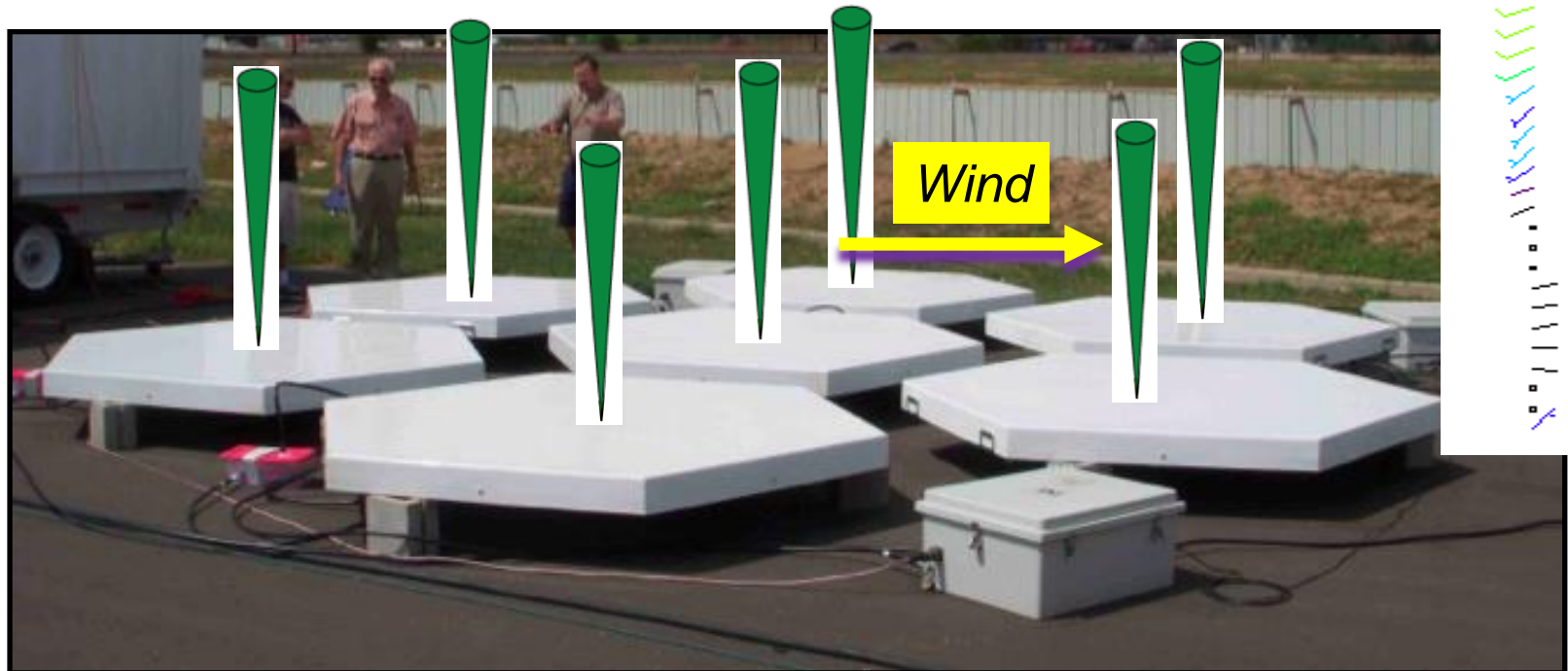
- Wind profiler radar
- Radiosonde soundings
- Surface meteorology
- Lab space: integrate measurements, communications

West coast site. Will continuously monitor upstream flow (on-shore flow upwind of mountains).



Radar Wind Profiler

- Vertically looking radar to measure wind profile
- Also observes precip and clear-air turbulence
- 449 MHz (66 cm), 4 – 8 kW (new design)
- NZ radio frequency allocation approved
- Likely range 200 m up to 5 – 8 km AGL
- Rapid winds (spaced antenna technique; 1-5 minute updates)



GPS Radiosonde Soundings

Research quality measurements

Pressure – Temperature – Humidity – Wind speed/direction

High vertical resolution

- 150 soundings
- Daily launches
- IOP launches
 - 12-hourly prior to GV flights
 - 3 – 6 hourly during GV flights
 - episodic launches
- Data sent to WMO-GTS
- Real-time plots on the website
- Mix of EOL staff and student operators



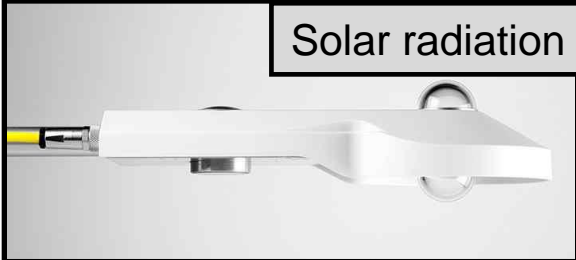
ISS Data QC: Post-processing by ISF scientists

Six months or less after DEEPWAVE completion

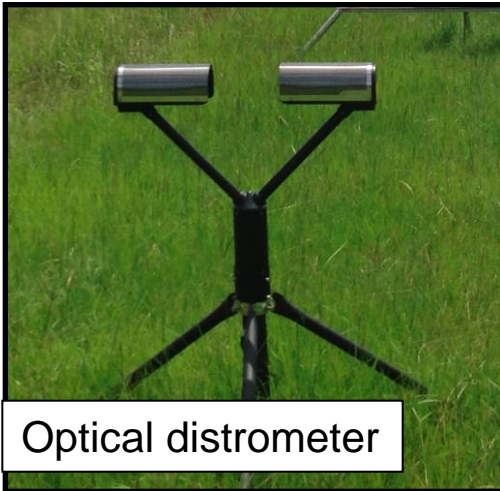
Other sensors



ceilometer



Solar radiation (4-comp.)



Optical distrometer



rain gauge



GPS water vapor



webcam



10m met tower

ISS Site

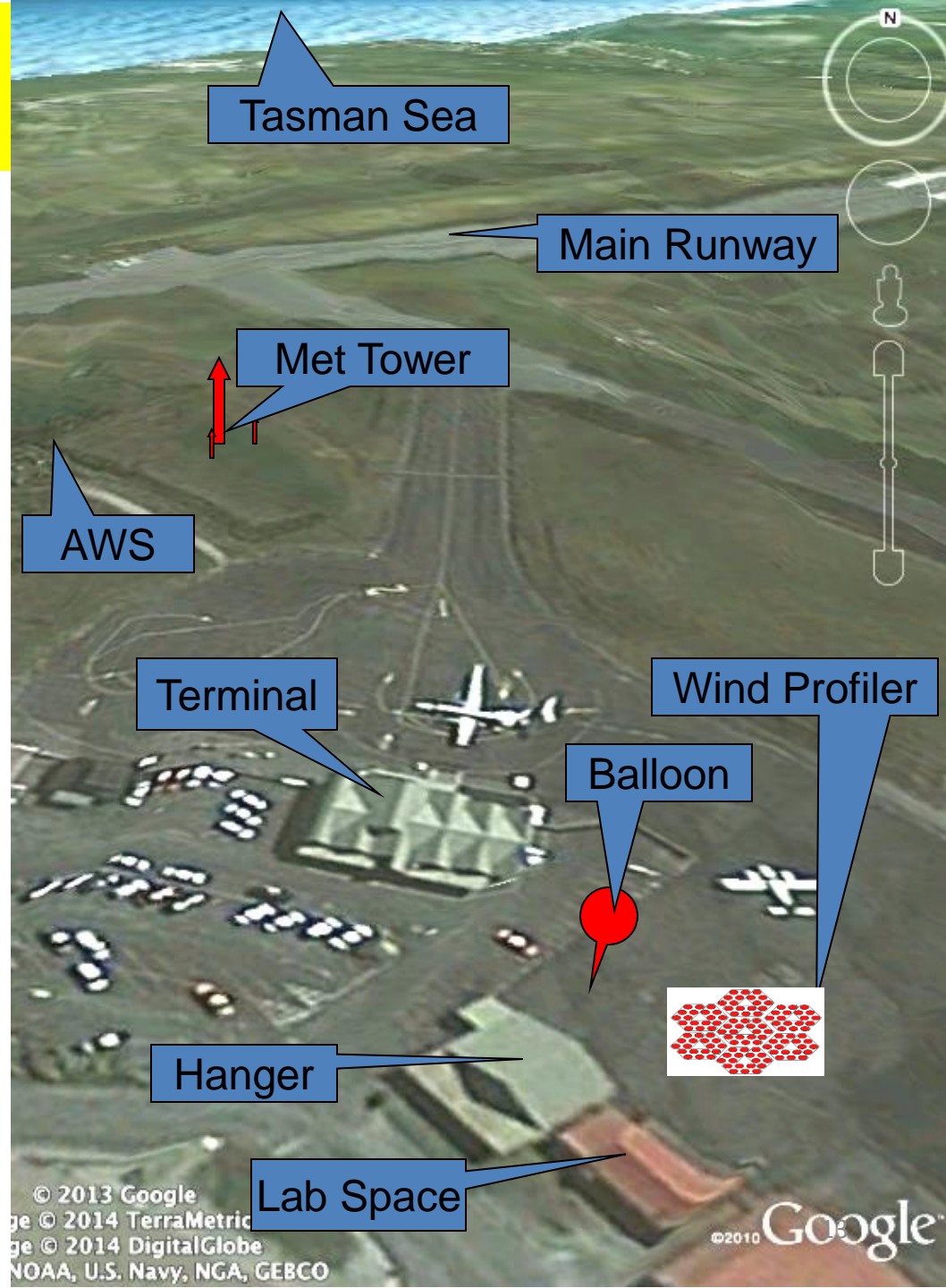
ISS to be sited at **Hokitika airport**

West side of mountains

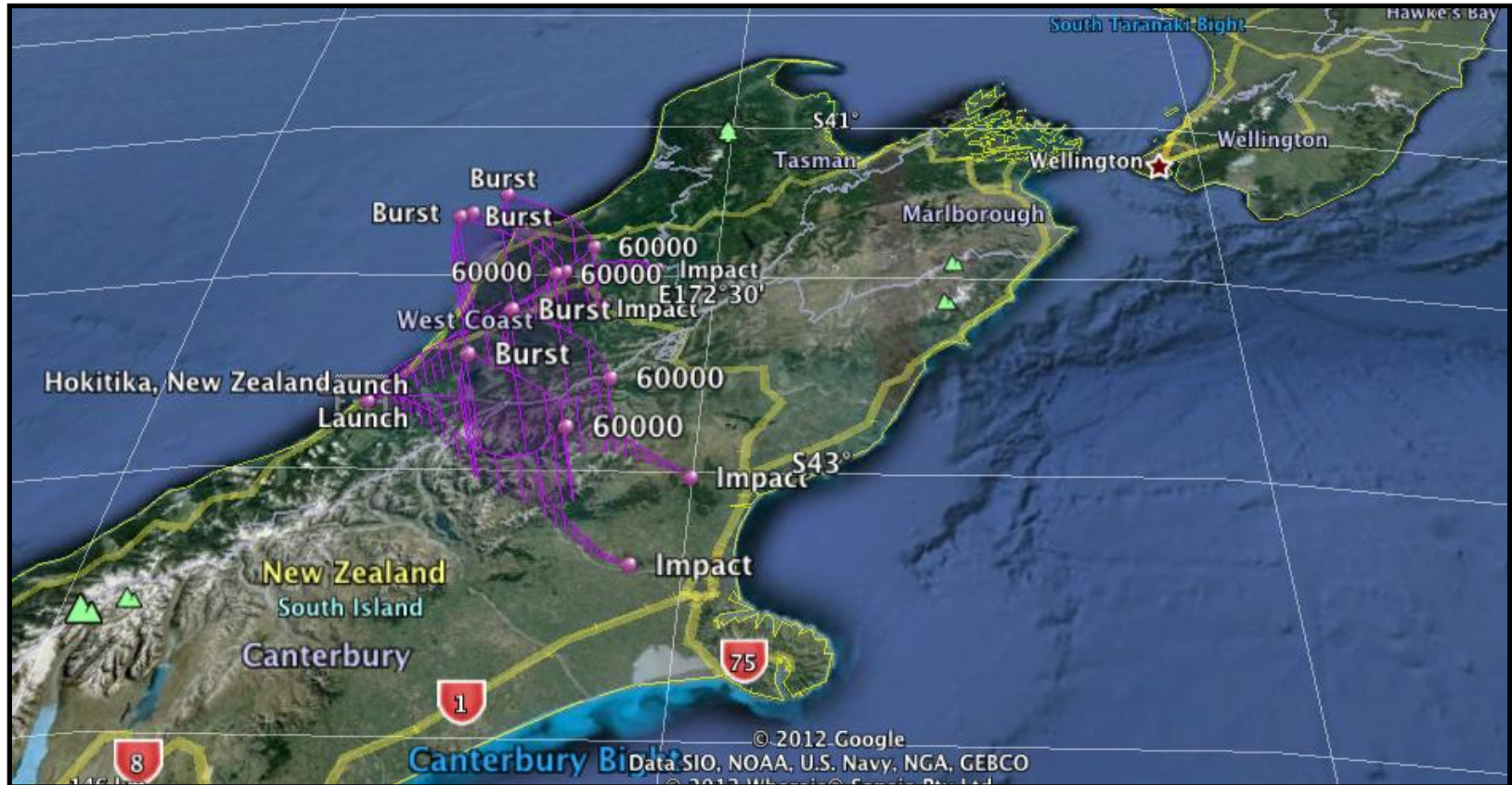
~5 commercial flights daily

NZ AWS & manual climate obs.

- Lab space in Aeroclub building
- Wind profiler on apron
- Inflate balloons in hanger
- Web cam & antenna on roof
- ISS met tower near AWS

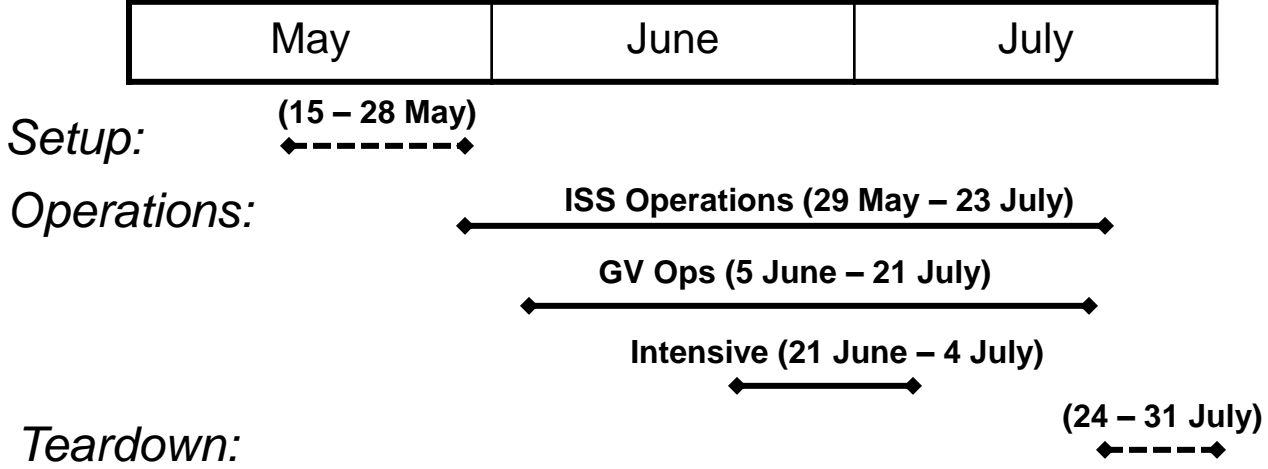


Potential Sonde Tracks



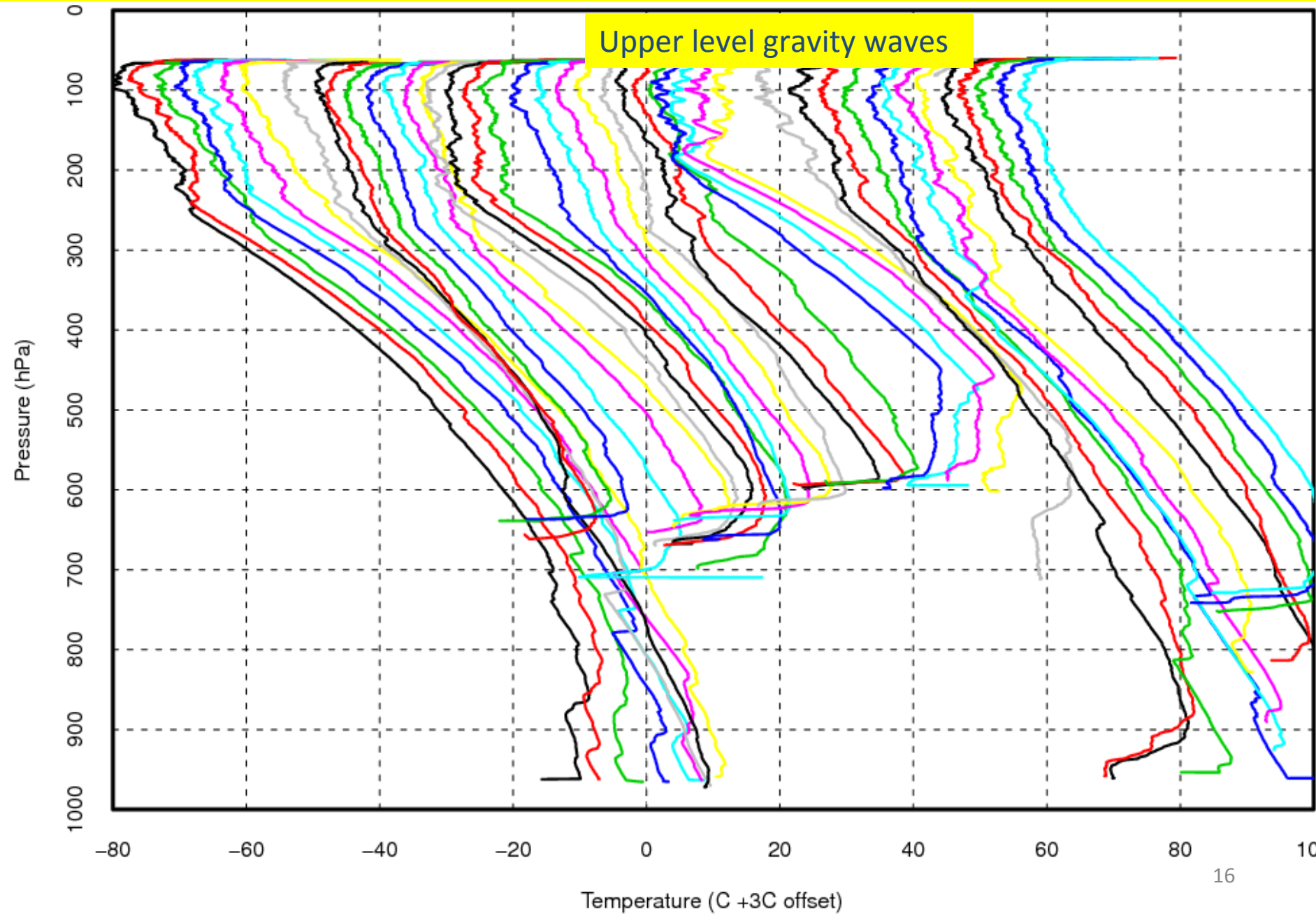
We expect some radiosondes to go out of range in IOPs.
 Second receiving station at University of Canterbury (hosted by Adrian McDonald)

Operations Schedule (ISS)

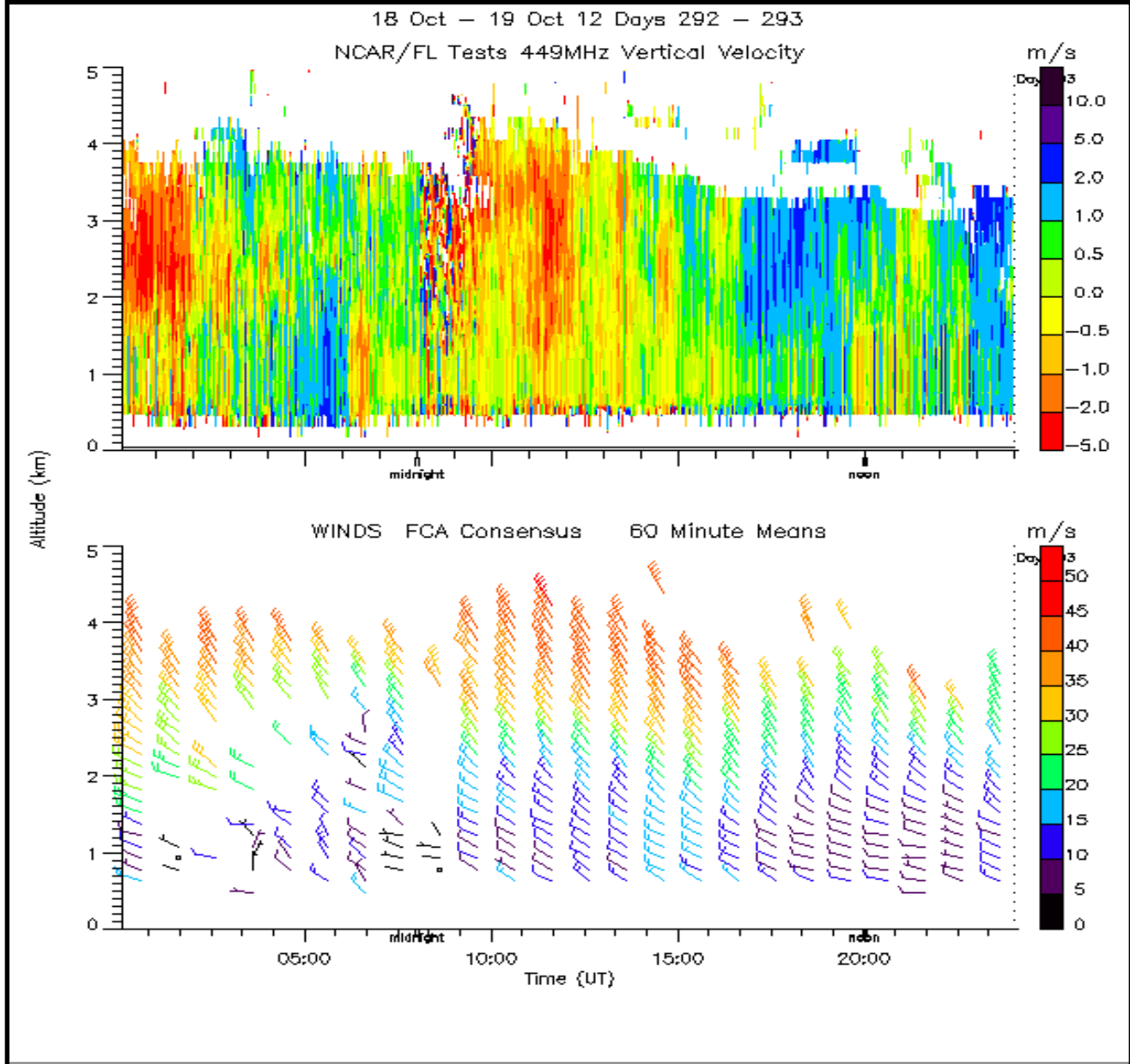


Activity	Staff	Approx. Dates
Set-up	4 or 5 Staff	15 – 28 May
Ops (pre-GV)	2 staff	29 May – 5 June
Ops (pre-intensive)	1 staff + 2 students	5 – 20 June
Ops (intensive)	2 staff + 3 students	21 June – 4 July
Ops (post-intensive)	1 staff + 2 students	5 July – 23 July
Tear-Down	4 Staff & students	24 – 31 July

CONCORDIASI (Antarctica Driftsonde): Temperature Profiles (3°C offset)



Wind Profiler time-height data



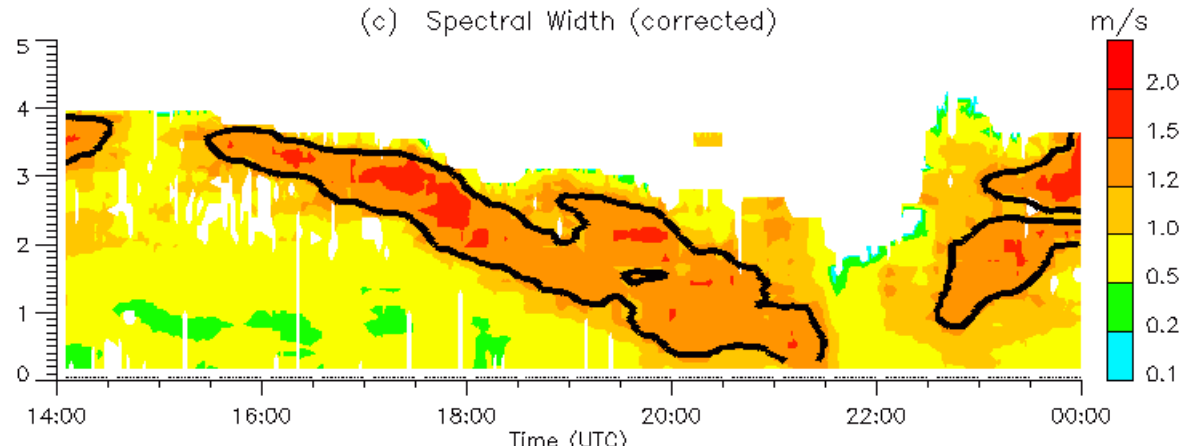
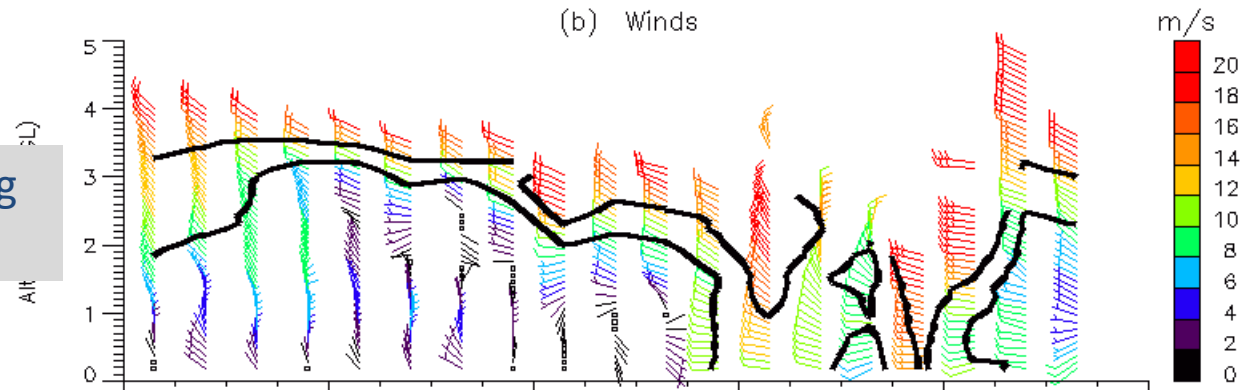
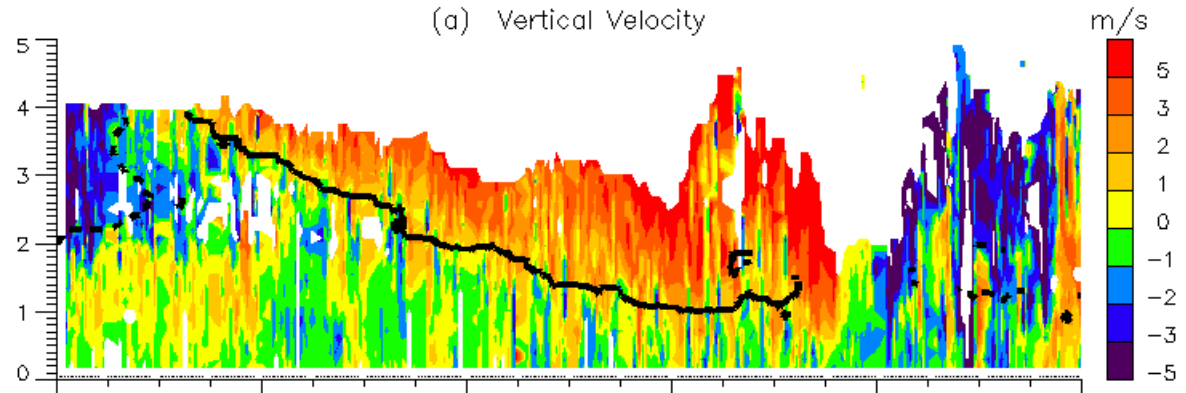
T-REX (2006, Owens Valley, CA): Wind Profiler parameters

If there is easterly flow...

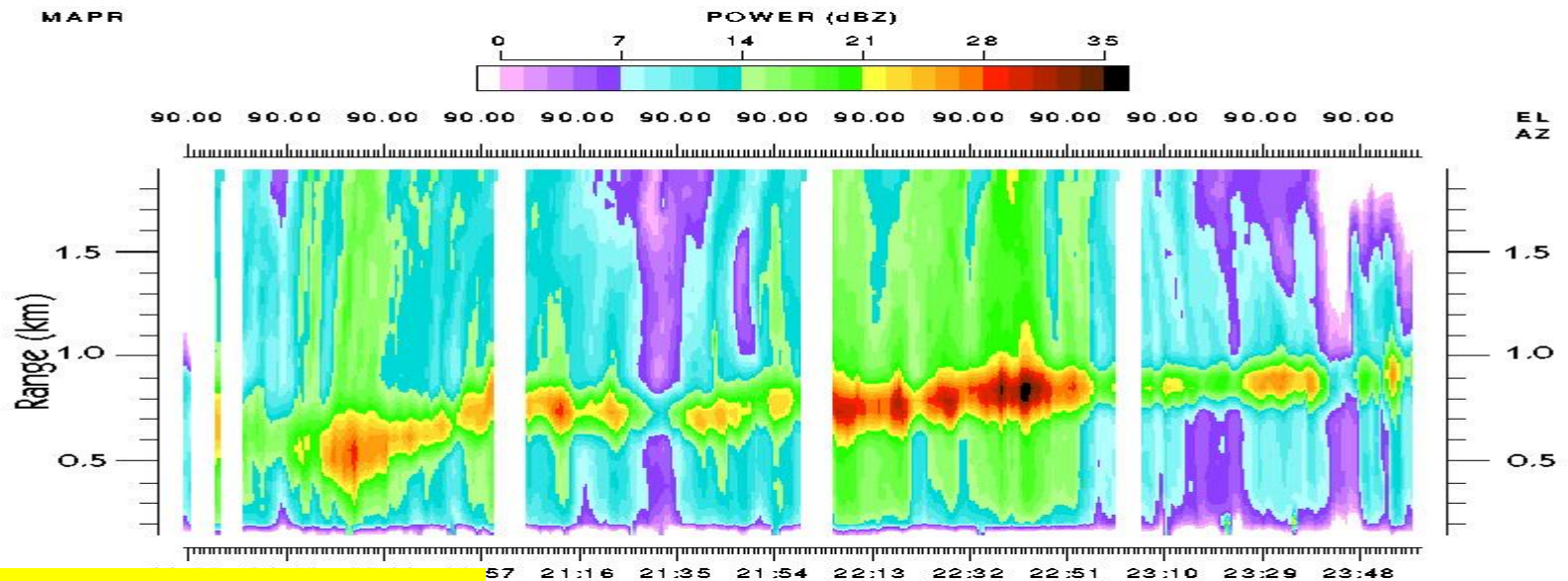
Persistent downdraft
within a wave

High-momentum air intruding
to the surface

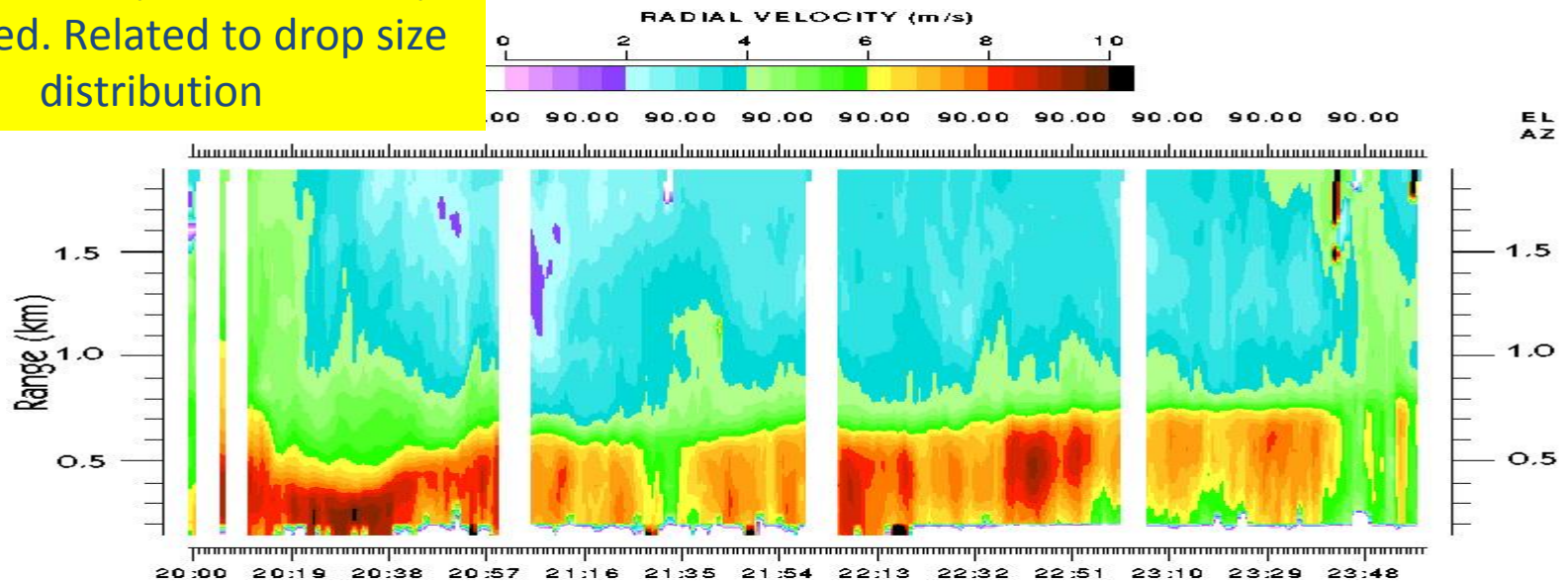
Larger spectral width indicating
region of turbulence



NCAR MAPR Wind Profiler: Precipitation fall speed

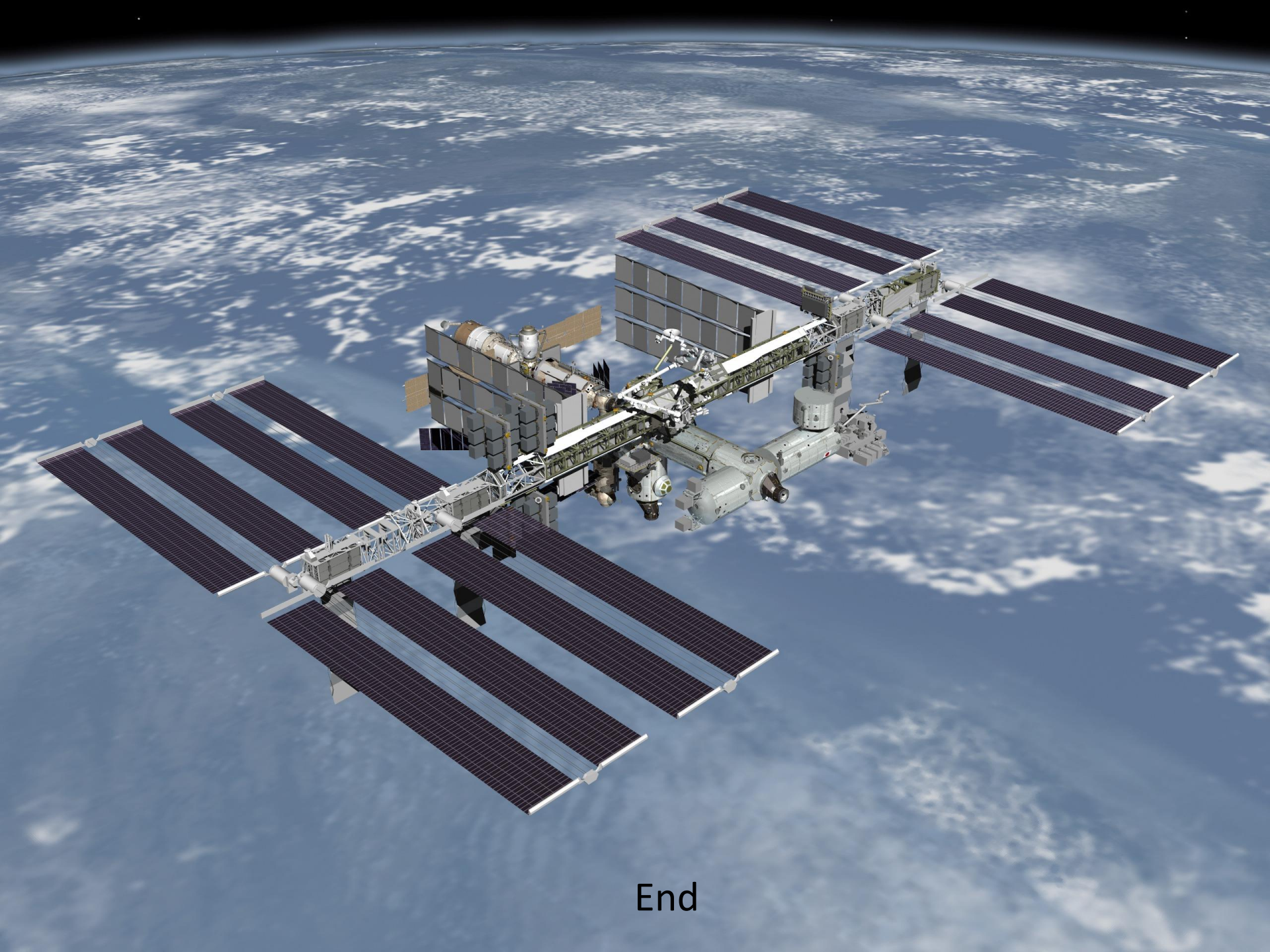


Precipitation (snow and rain) fall speed. Related to drop size distribution



EOL/ISF Collaboration Interests

- Advancing radar wind profiler technology
 - Improving wind measurements
 - Comparisons with nearby Hokitika Met Service radar
 - Winds and precipitation and reflectivity
 - Precipitation characteristics measurements
- Orographic flow
 - Measurement of wave characteristics during easterly wind events
- Improved vertical velocity from dropsondes



End