DEEPWAVE Debrief Agenda

1300	*Brief Introduction and Participants* Opening Comments by NSF Program Managers	Jim Moore
1305	*Overview of Project by Science Team and Questions*	Ron Smith, Dave Fritts, Other PIs
1325	*Review of EOL Project Support Components*	
	RAF NSF/NCAR GV	Pavel/Lou
	RAF Data Quality	Jorgen
	CDS In-Field Support	Greg/Ted
	CDS Data management	Steve
	ISF ISS deployment Hokitika	Bill
	ISF dropsondes	Terry/Kate
	Education/Outreach	Alison
	PMO	Jim/Vidal

(Keep summary comments to ~5 min to allow time for questions/clarification.
Please focus on highlights, challenges and lessons learned)

1415 *EOL-NSF Discussions (restricted)*

(This is the opportunity to discuss any items brought up in the previous section that might require additional explanation or cover other questions from NSF for EOL staff).

1455 *Concluding Remarks* NSF Managers

NSF Deepwave de-brief: Preliminary Science Results

Nov 10, 2014
(See Debrief Supplement for further info)

Dave Fritts, Biff Williams, Katrina Bossert and others from GATS
Mike Taylor, Dominique Pautet and others from Utah State
Steve Eckermann and Jim Doyle and others from NRL,
Ron Smith, Chris Kruse, Alison Nugent and others from Yale
Steve Smith from Boston Univ.
Andreas Doernbrack and others from DLR

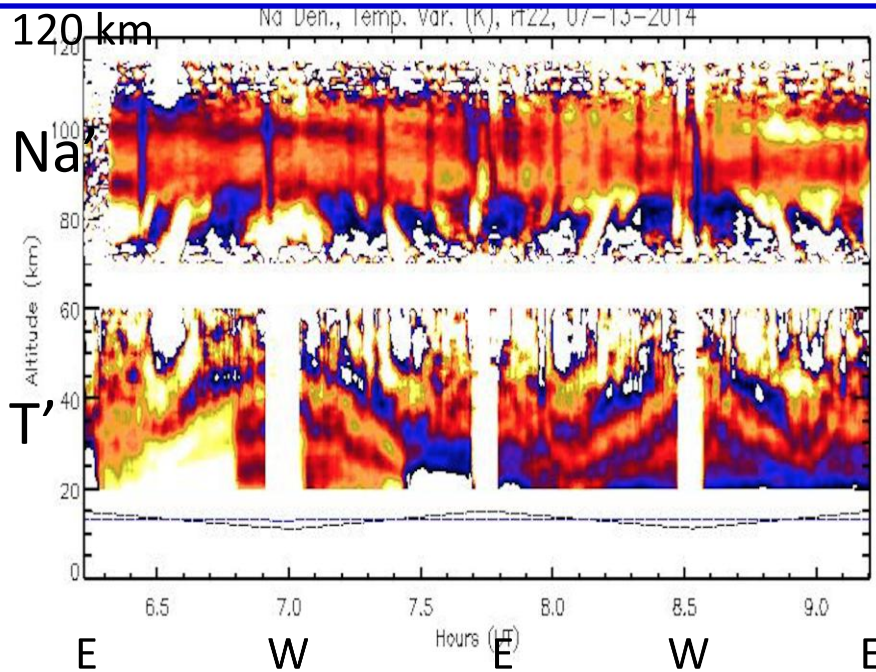
GATS Na and Rayleigh Lidar Highlights

Rayleigh lidar: T, T’, ρ’, cloud height
20-40km: 13km hor., 1km vert. res.
40-60km: 30km hor., 3km vert. res.

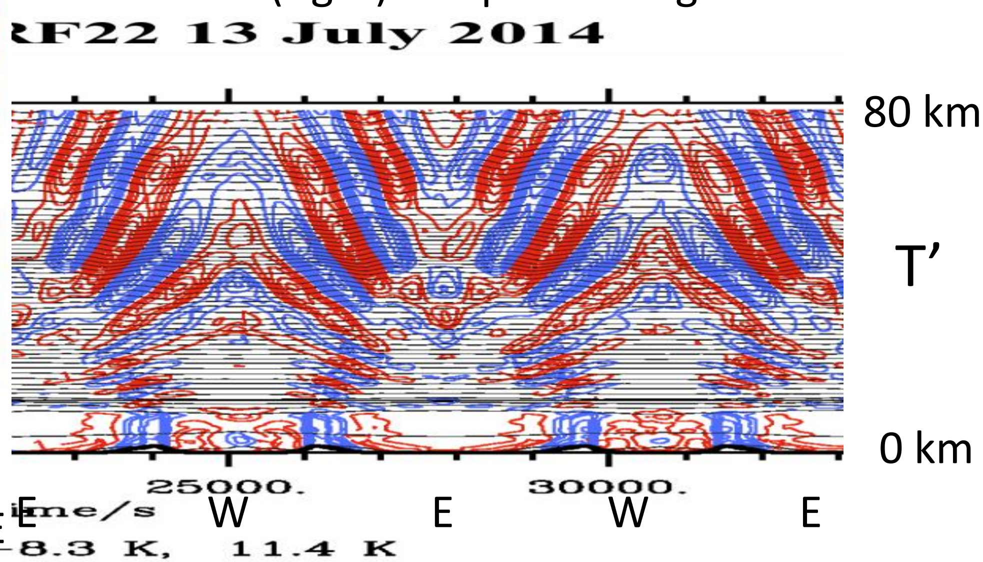
Na lidar: 0.2W beam, 9.8W beam
15-25km: w’, 30km hor. 3km vert.
80-100km: Na, Na’, 5km H, 1km V
T, T’: 100km H, 3km V

DEEPWAVE Operations
- Lidar data: 130 hrs on 24 flights
- No laser failures
- No viewport: rf01
- Daytime flight: rf15
- Na laser freq. locking issue rf20-26, just Na, no T

Lidar system on GV

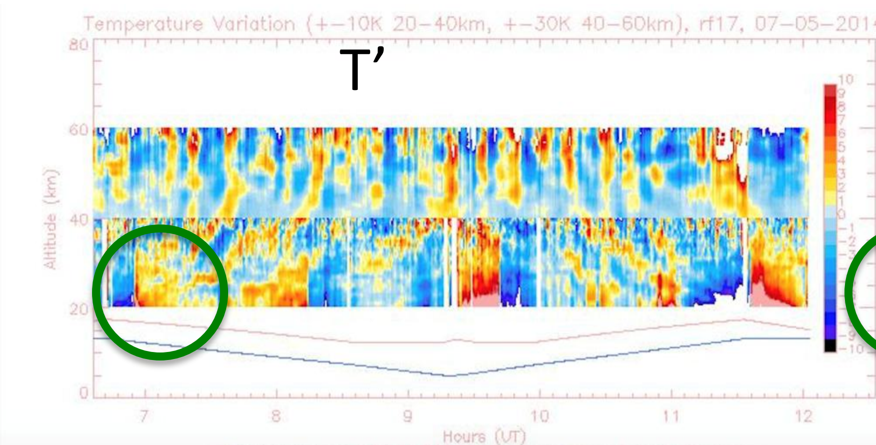


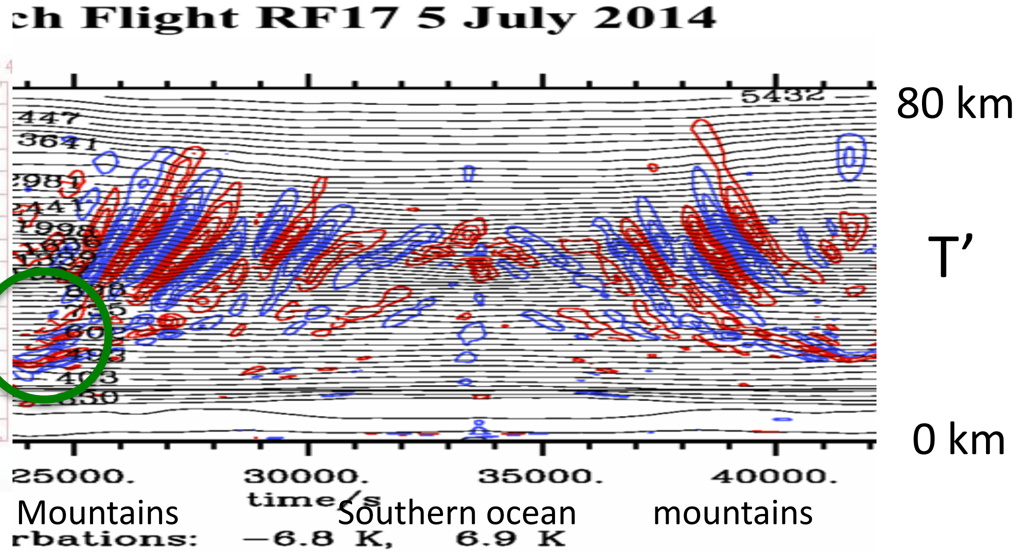
RF22: strong MW propagation to 85km
ECMWF (right) sampled on flight track



RF17: Trailing wave SE of South Island

Rayleigh T’ (left), ECMWF (right) sampled on flight track

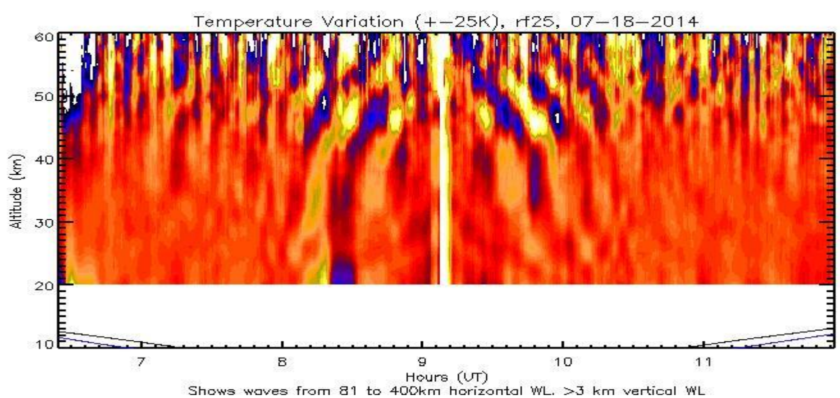


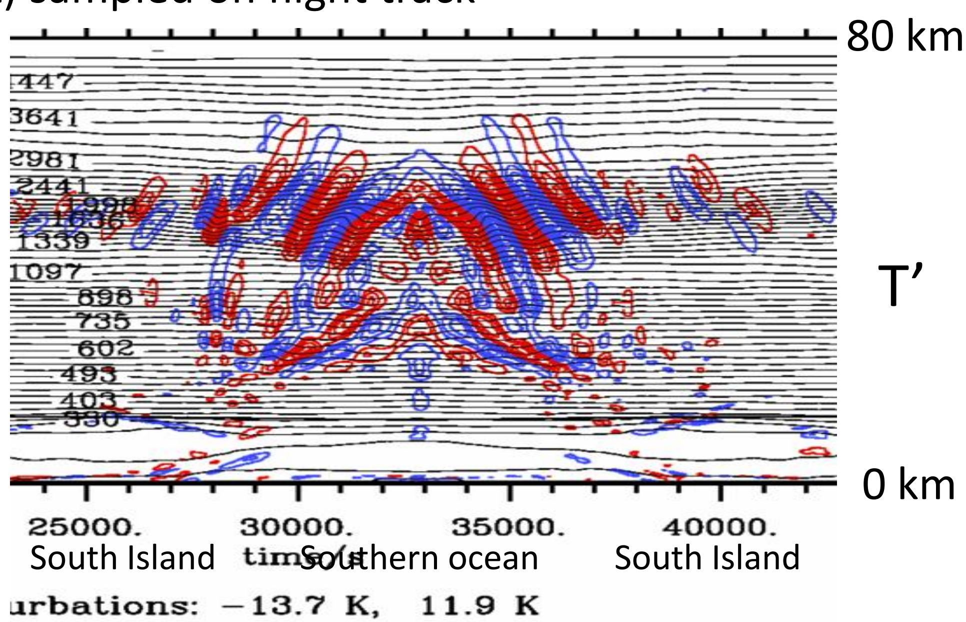


Mountains | Southern ocean | mountains | Mountains | Southern ocean | mountains

RF25: Southern Ocean Wave

Lidar T’ (left), ECMWF (right) sampled on flight track

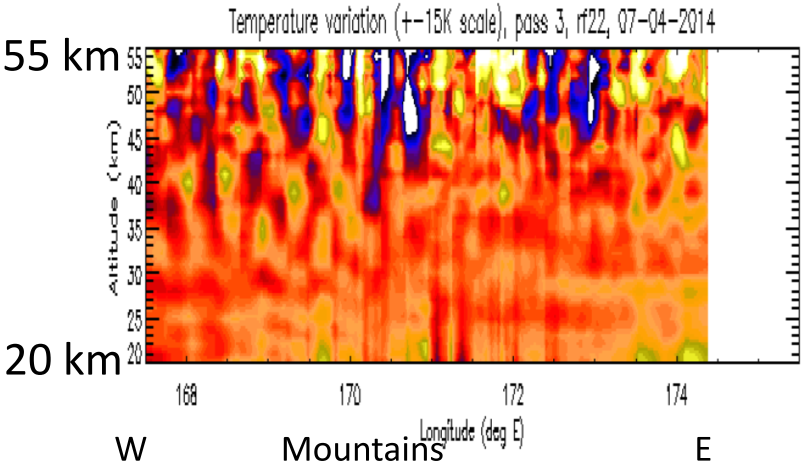


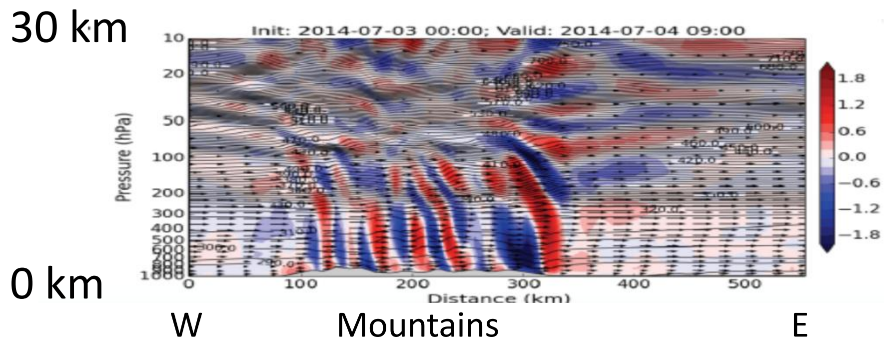


South Island | Southern ocean | South Island | South Island | Southern ocean | South Island

RF16: Strong MW in troposphere, breaking -> strat. secondary waves?

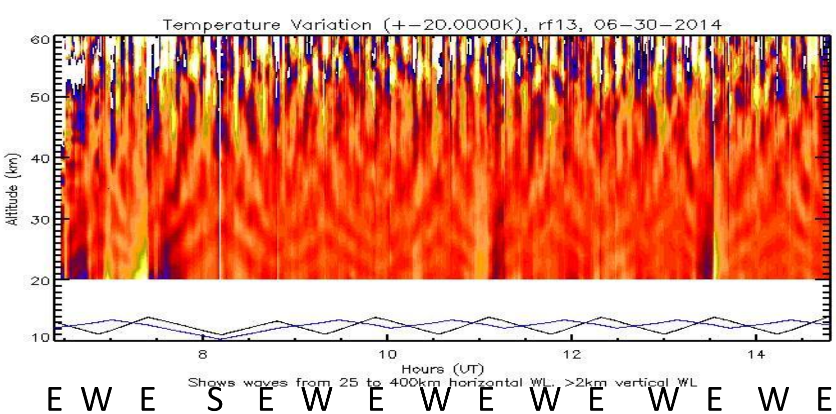
Rayleigh T' (left), WRF w' model (right)

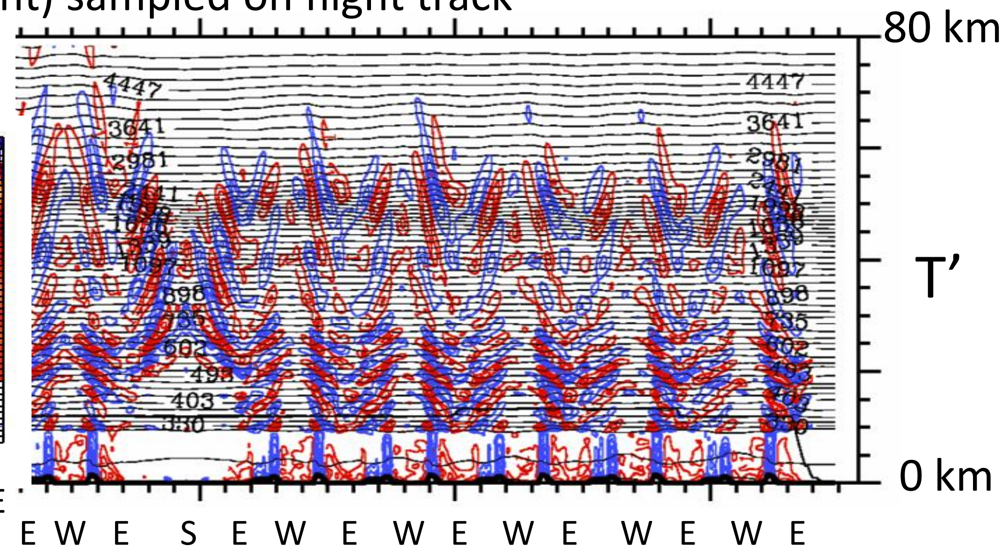




RF13: Persistent Mountain Wave for 12 mountain passes, 1 trailing leg

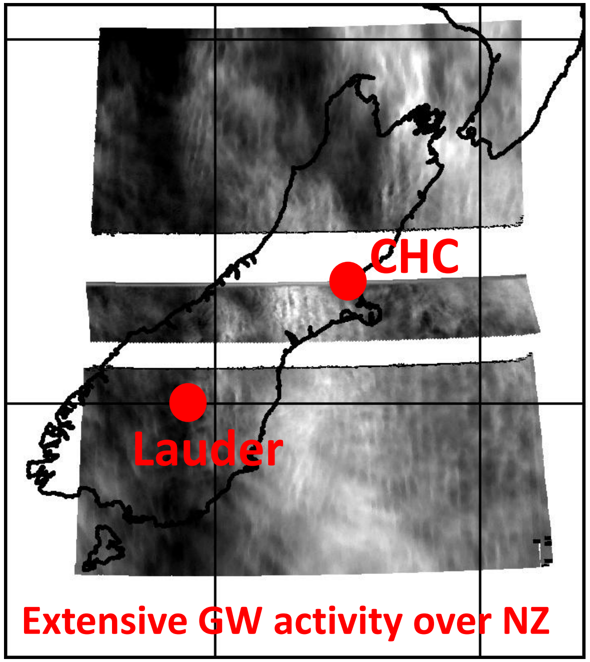
Lidar T' (left), ECMWF (right) sampled on flight track





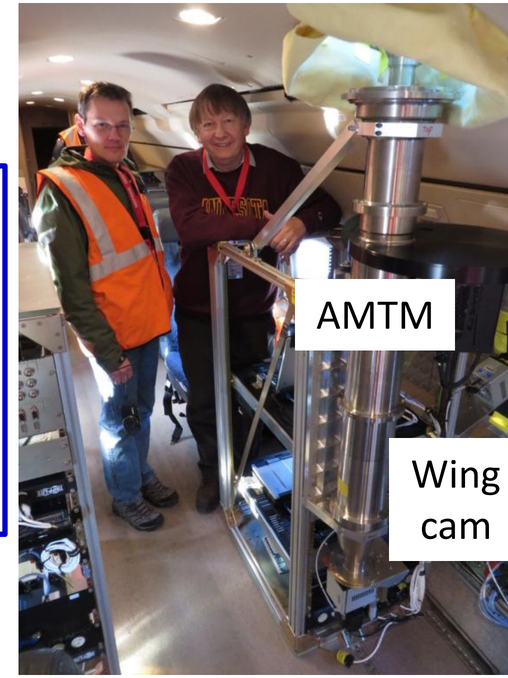
USU Mesospheric GW Highlights

RF 22

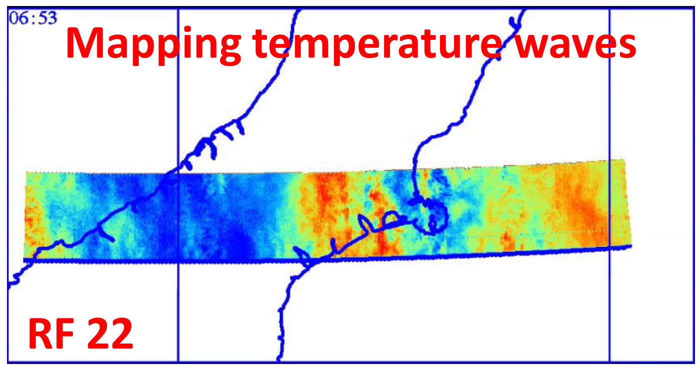


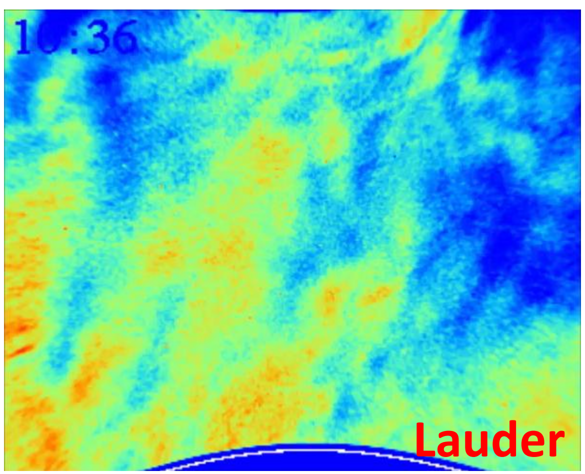
Extensive GW activity over NZ

GV: Precision (2K) temperature mapper and 2 side viewing GW imagers for large spatial coverage, ~180 hrs of high-quality data
Lauder: second AMTM with 33 clear nights of GW and MW data



AMTM instrument Suite



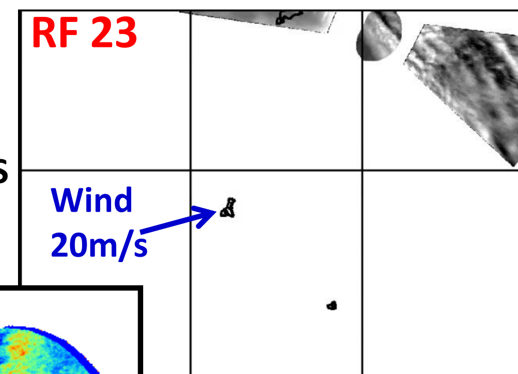


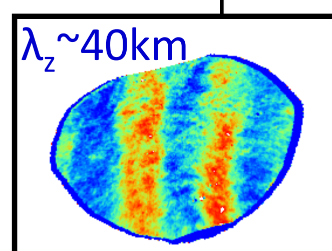
Mountain wave development under variable forcing

- Rich spectrum of MW over NZ and SO islands
- Extensive large and small-scale GW over open oceans
- Strong evidence for deep GW propagation

Detection of MW over Auckland Islands (700m)

55°S





Strong Temperature perturbation (20K)

All-sky Imaging of Breaking Mountain Gravity Waves Mt. John Obs. and Lauder

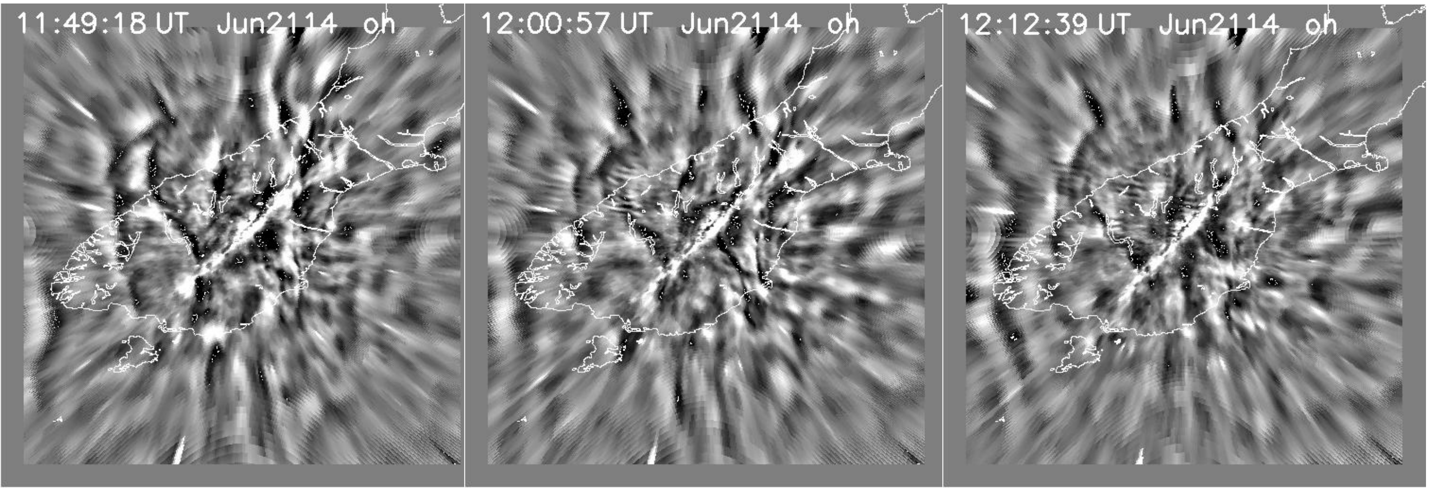
BOSTON UNIVERSITY

21 June 2014

Four emissions: OH Na O_2 O(^{1}S)

PI: Steven M. Smith

OH 80-85 km



OH: λ_h= 98 km I/I_0 = 8%

O_2: λ_h= 108 km I/I_0 = 16%

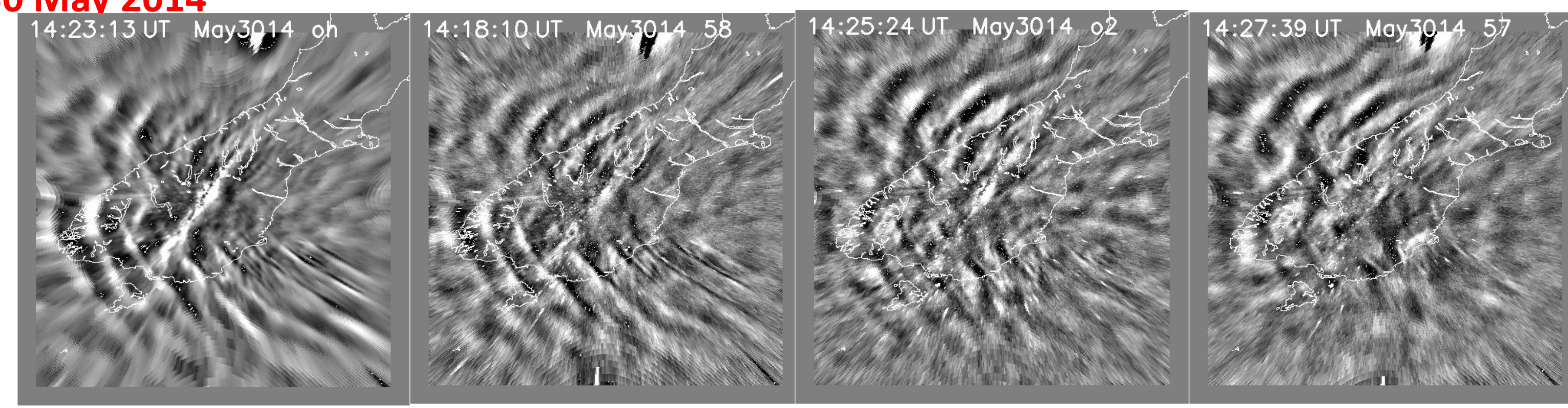
FPI winds (U = 58 ms^{-1})

λ_z= 15-18 km (N=0.025 s^{-2})

OH: F_m = 150 – 300 m^2s^{-2}

O_2: F_m = 40 – 60 m^2s^{-2}

30 May 2014



OH 80-85 km | Na 90 km | O_2 94 km | O(^{1}S) 96 km

Small-scale waves: λ_h = 20 ± 2 km I/I_0 = 3-5%

Large-scale waves: λ_h = 51 ± 2 km I/I_0 = 3-17%

F_E = 15 – 45 Wm^{-2} (λ_z= 13 km, N=0.025 s^{-2})

F_M = 55 – 180 m^2s^{-2}

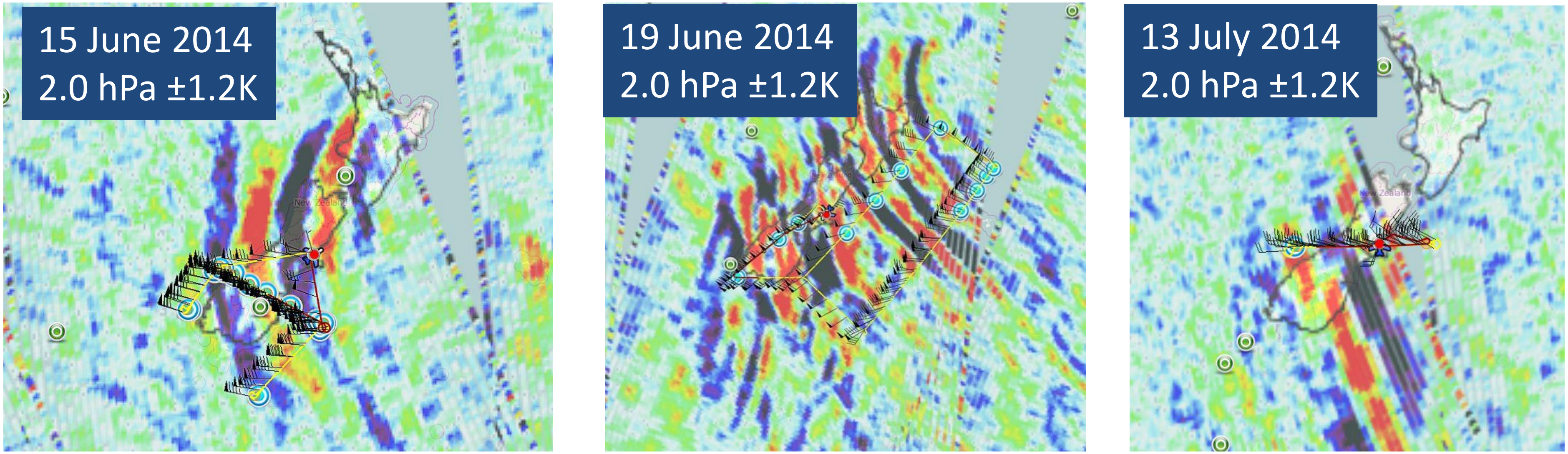
Large-scale waves: λ_h = 43 ± 4 km I/I_0 = 3-18%

F_E = 5 – 80 Wm^{-2}

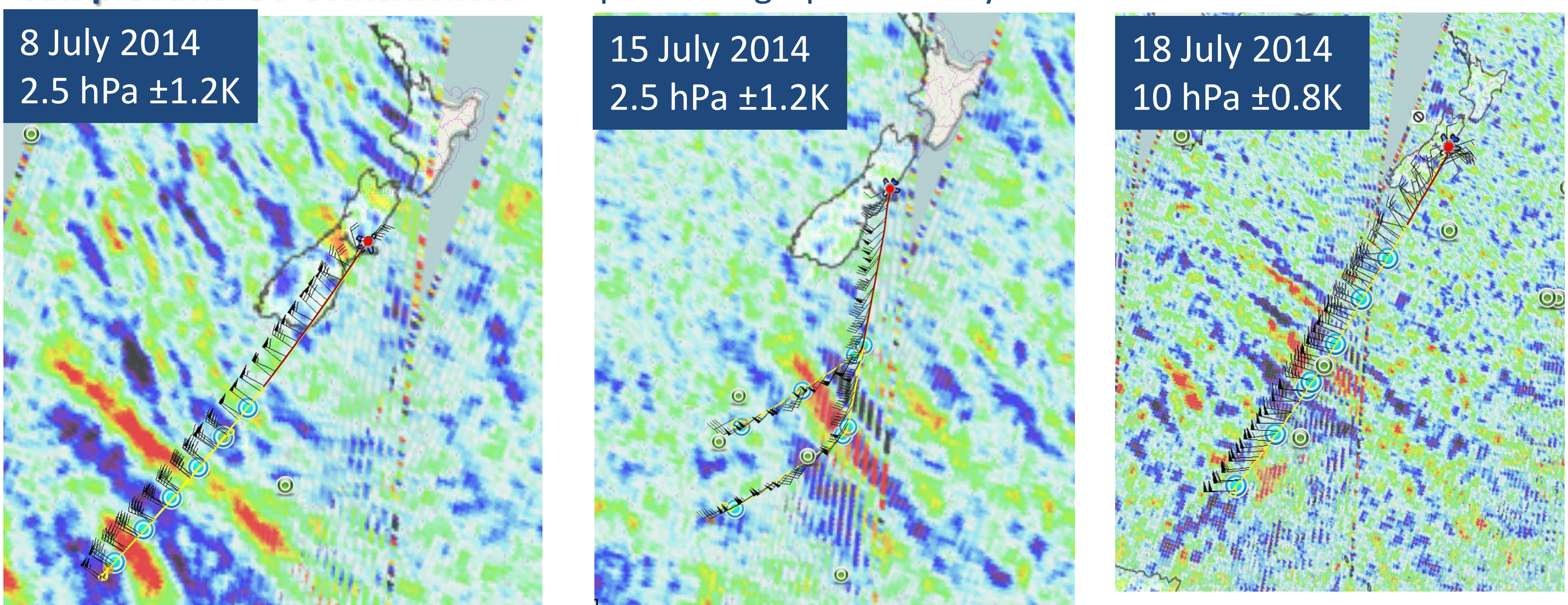
F_M = 10 – 345 m^2s^{-2}

Sample AIRS-GV Coincidences: Deep Orographic Gravity Waves

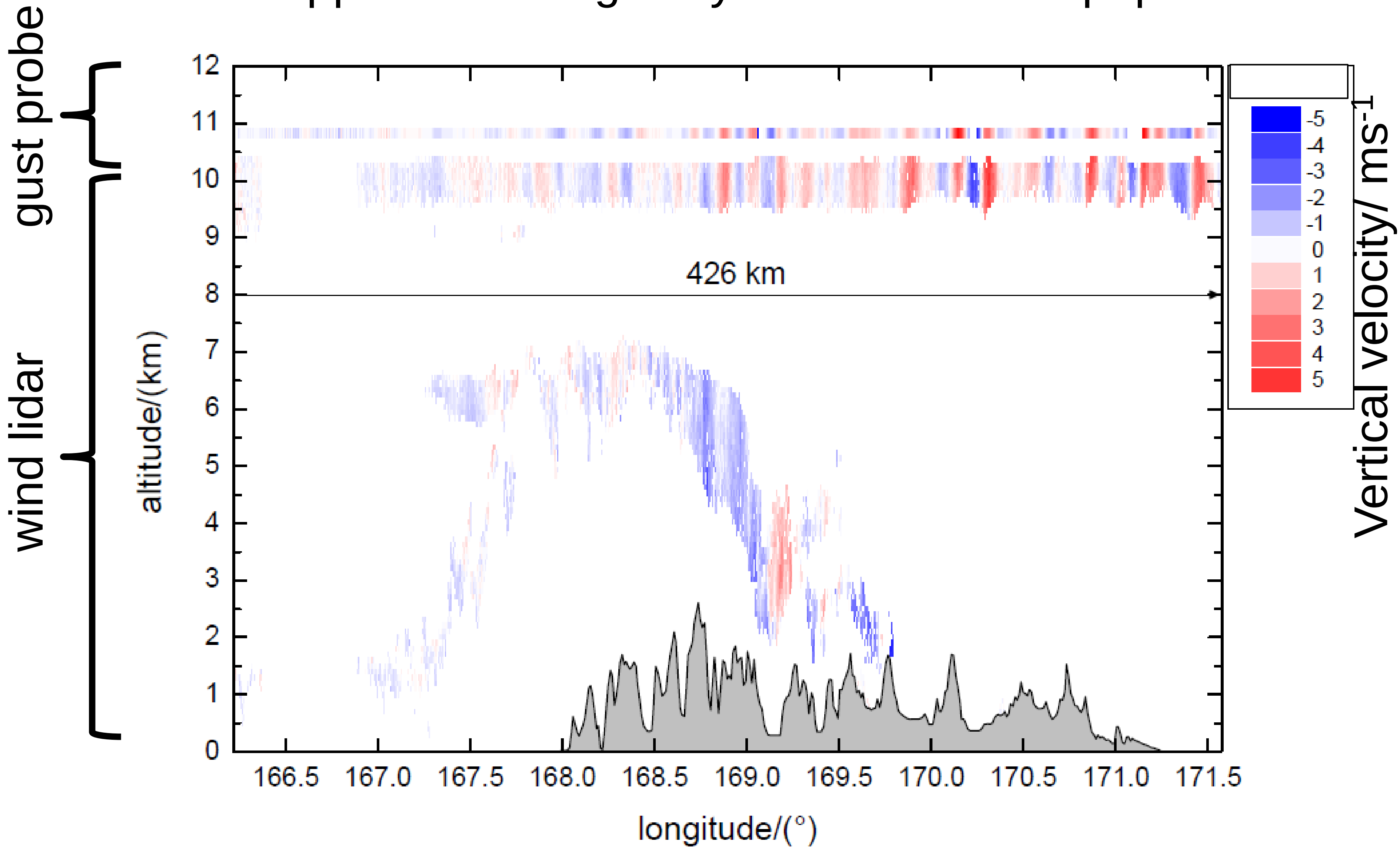
NRL: DC



Sample AIRS-GV Coincidences: Deep Nonorographic Gravity Waves



DLR Falcon in-situ and remote-sensing observations of trapped internal gravity waves at the tropopause

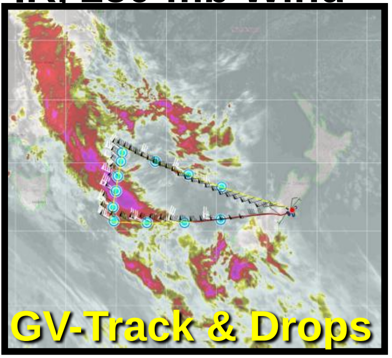


Predictability of Deep Propagating GWs

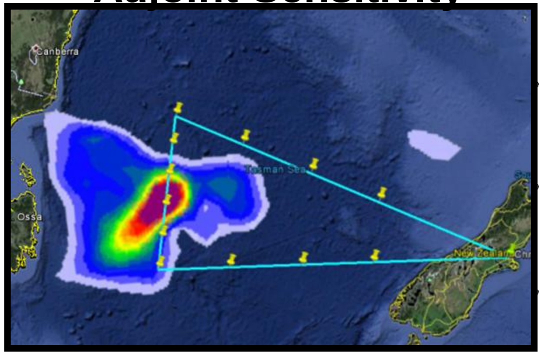
James Doyle, Alex Reinecke, Carolyn Reynolds, and DeepWave PIs

RF03 (13 June)

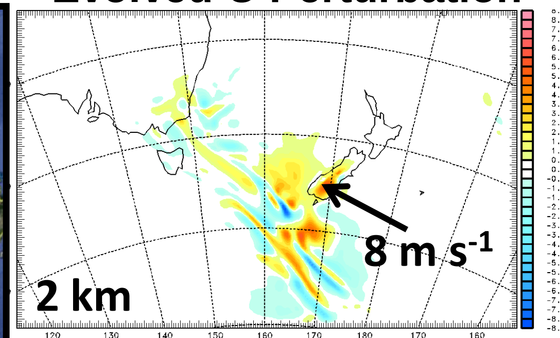
IR, 250-mb Wind



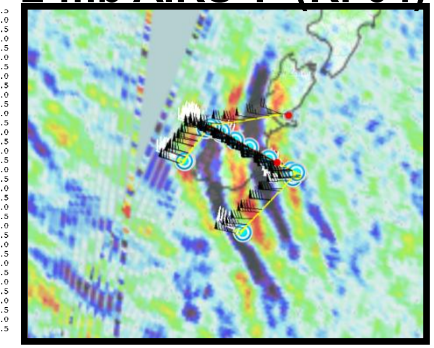
Adjoint Sensitivity



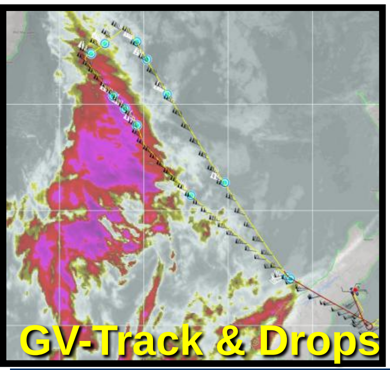
Evolved U Perturbation

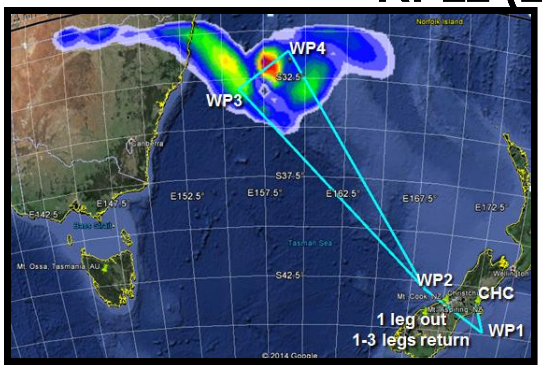


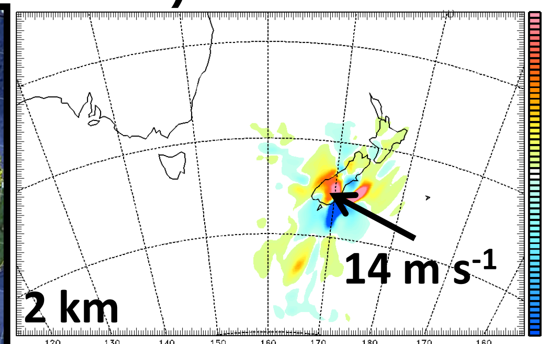
2-mb AIRS T' (RF04)



RF11 (28 June)







AMTM OH (87km) (RF12)

- G-V predictability flights (w/ drops) sampled initial condition sensitivity regions upstream of the S. Alps prior to gravity wave (GW) events (3 flights)
- Sensitivities located in dynamically active regions (jet, front, convection).
- Evolved adjoint perturbations are large enough to impact wave launching.
- G-V gravity wave "verification" flights (following day) observed deep propagating waves and will be used to quantify the predictability relationship between lower and upper levels of the atmosphere.

NRL: Monterey