DEEPWAVE Mesospheric Temperature Mapping: Preliminary Results

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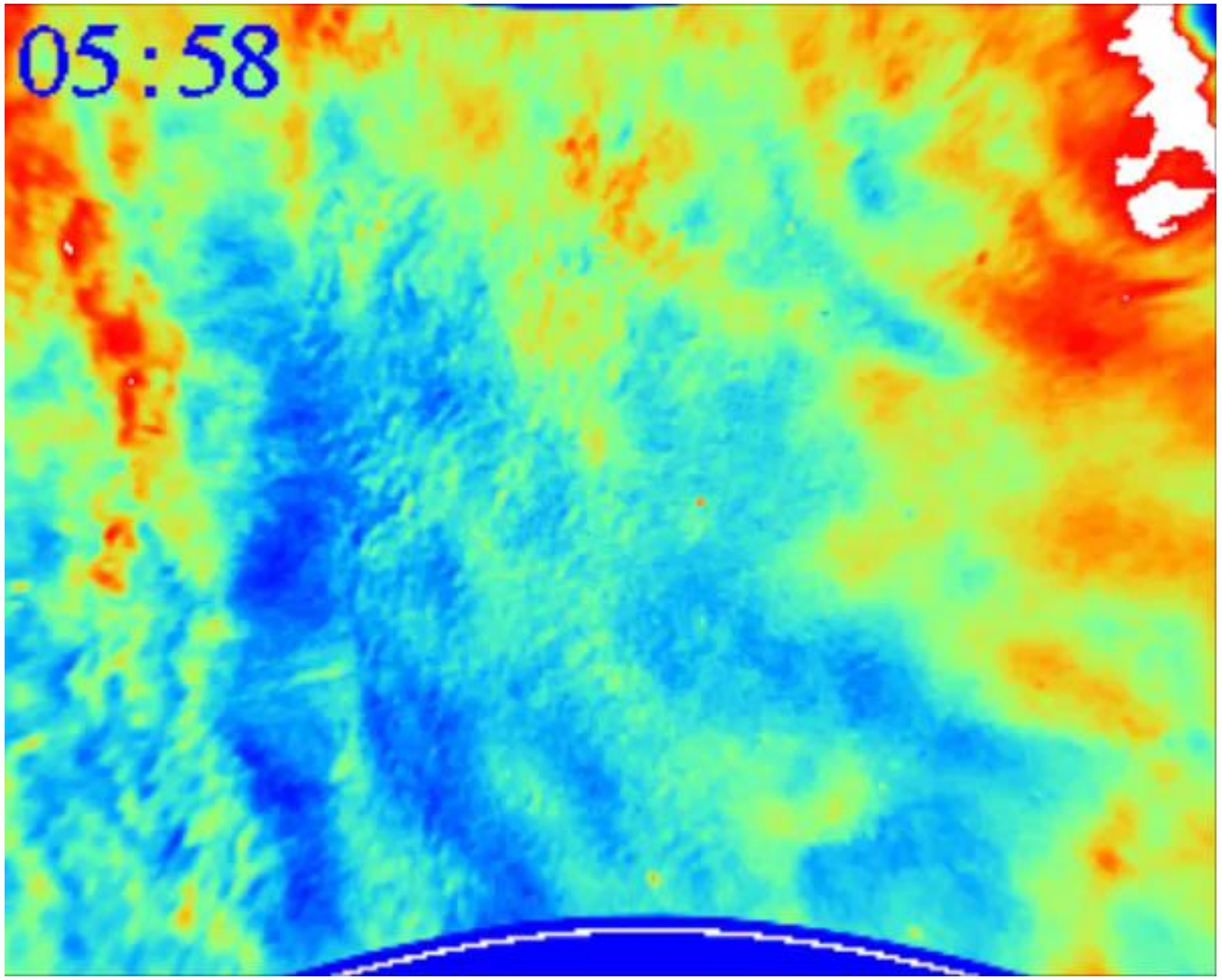
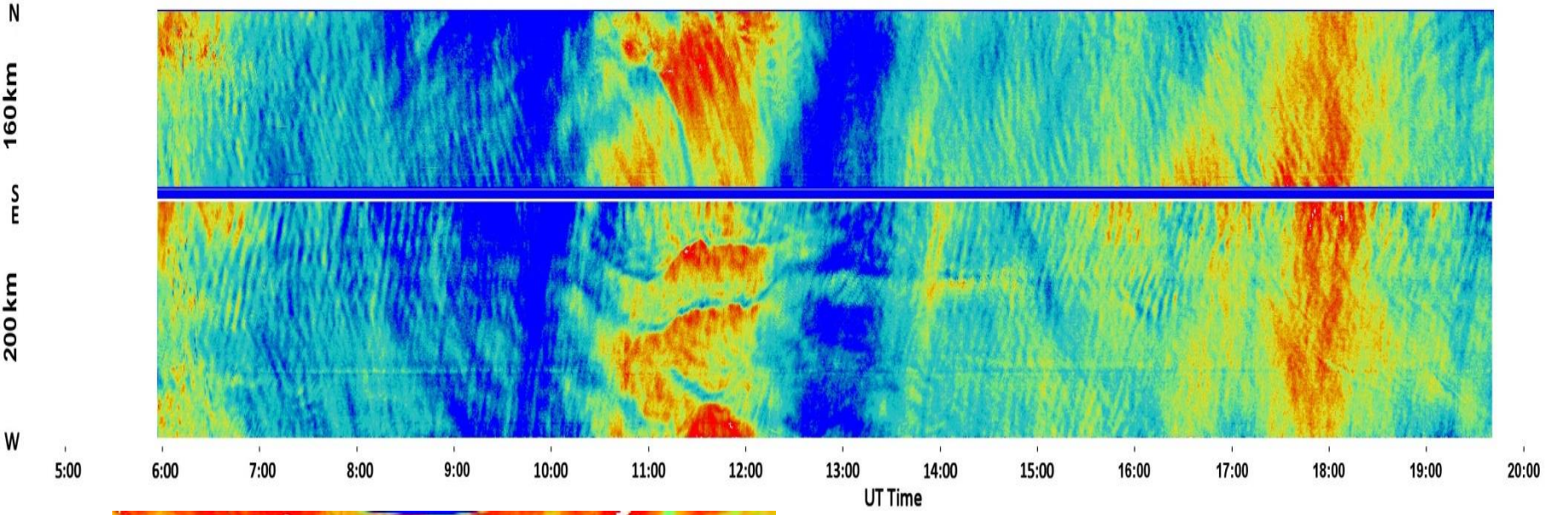
5th July, 2014, DEEPWAVE Mission, Christchurch, New Zealand

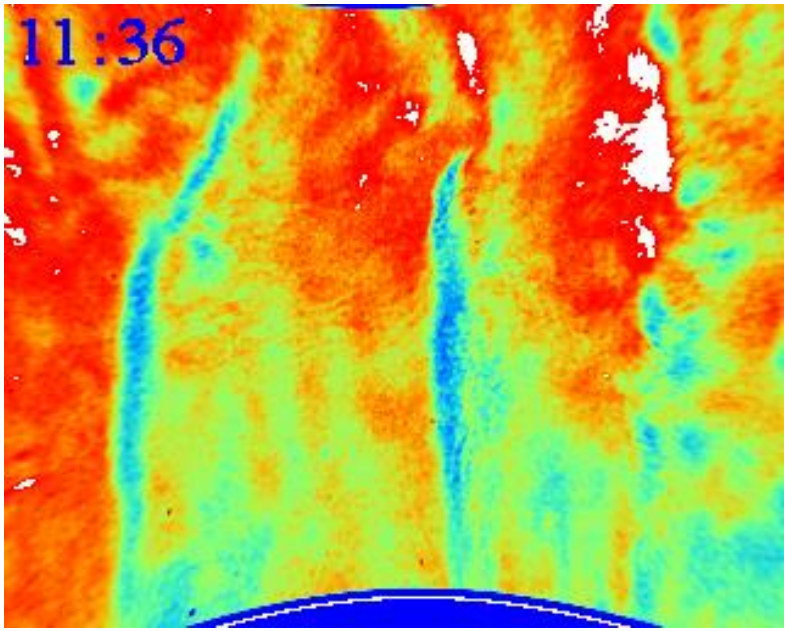
Standing "Mountain" Waves – AMTM Lauder, 21-22 June, OH Temperature

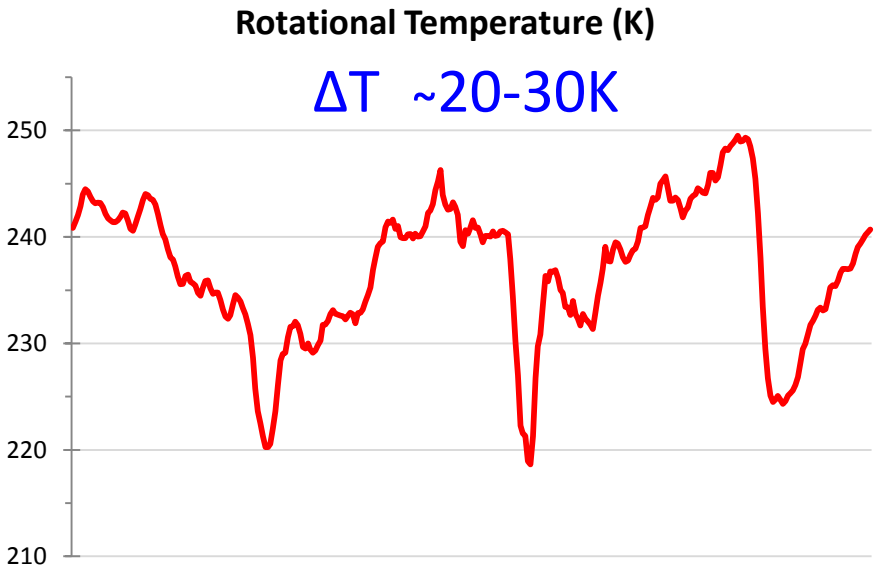


Time lapse movie ~13 hrs. Temperature range 185-225 K

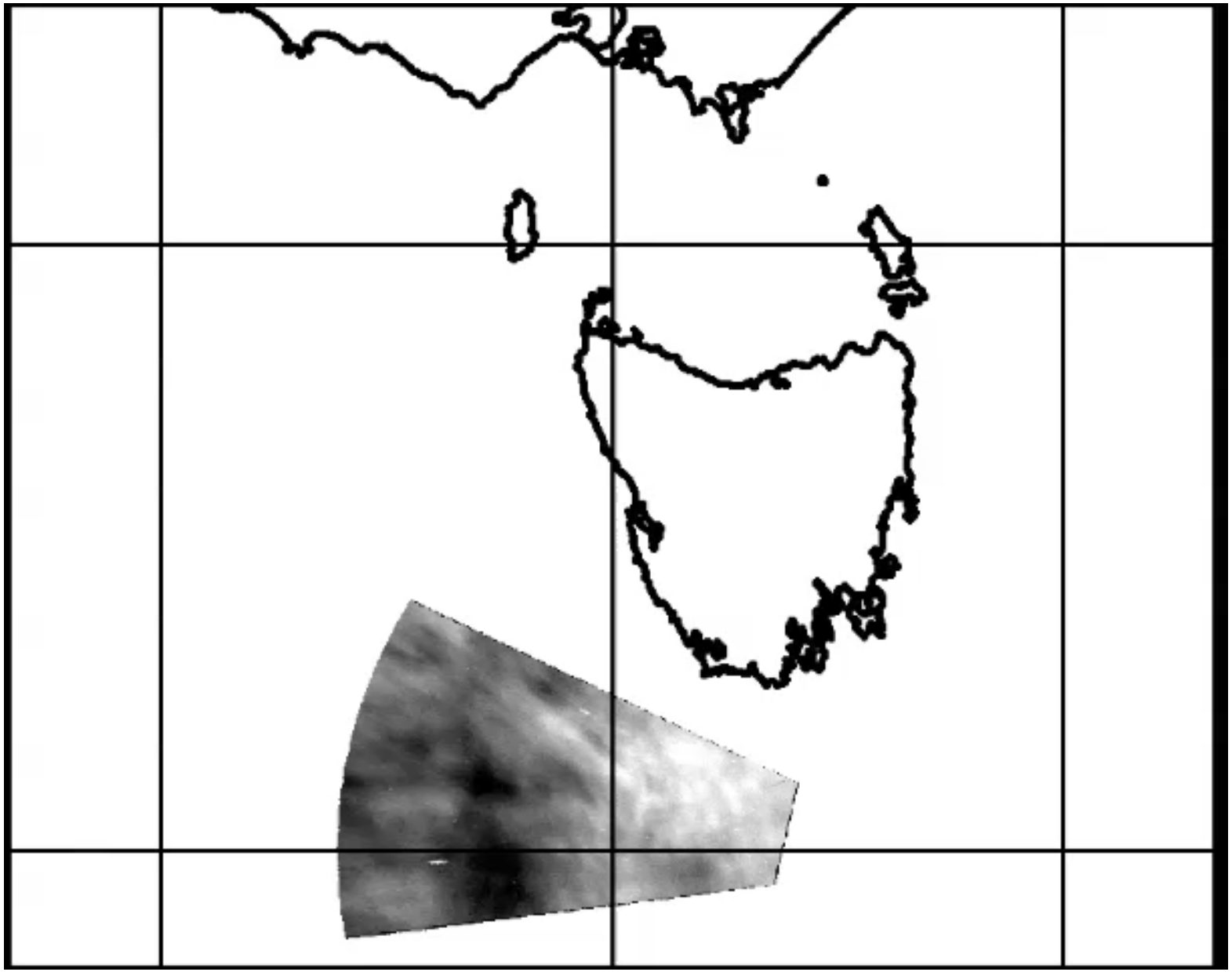
Temperature Keogram RF-13, Jun 21-22



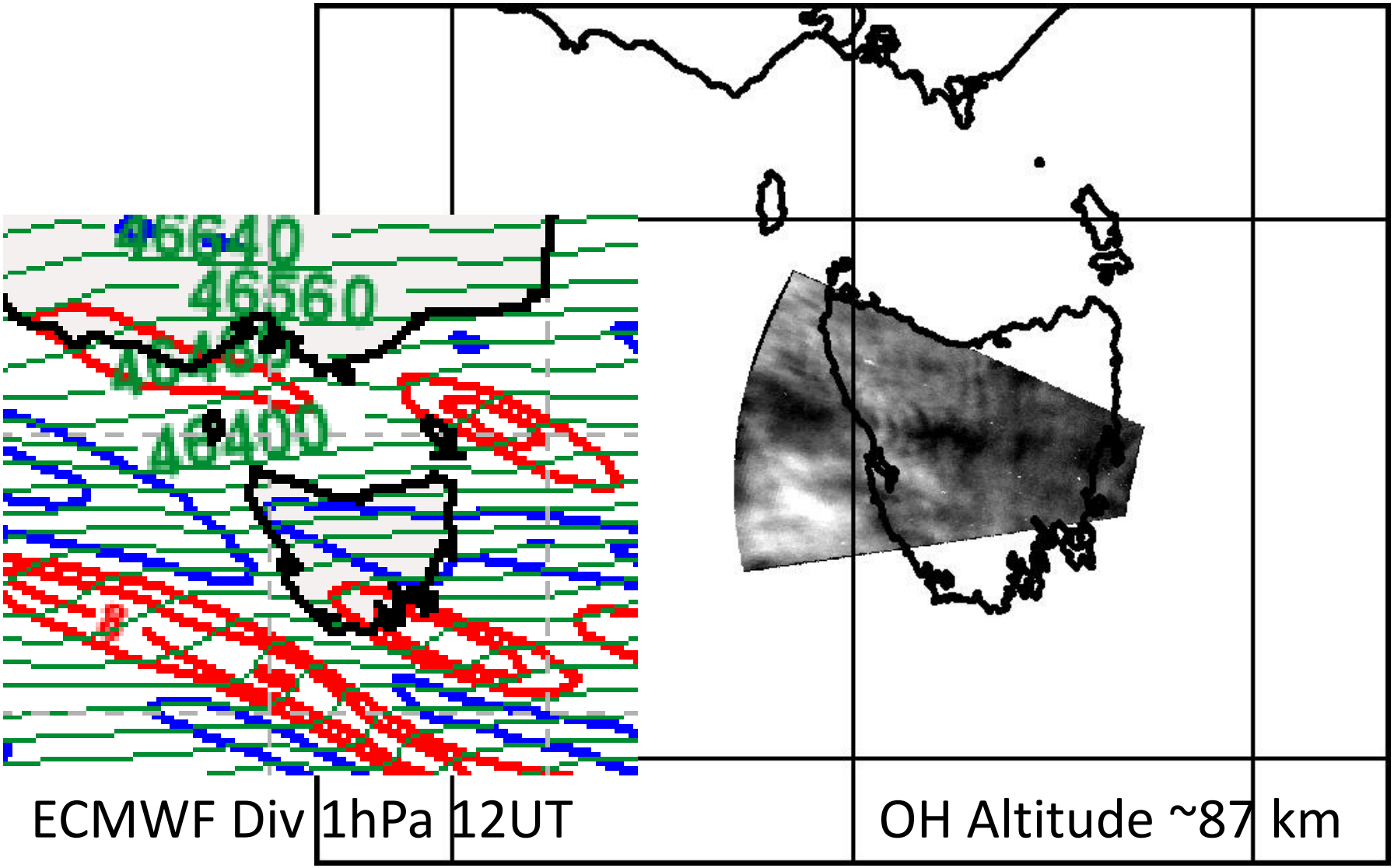




Flight Over Tasmania – RF-02

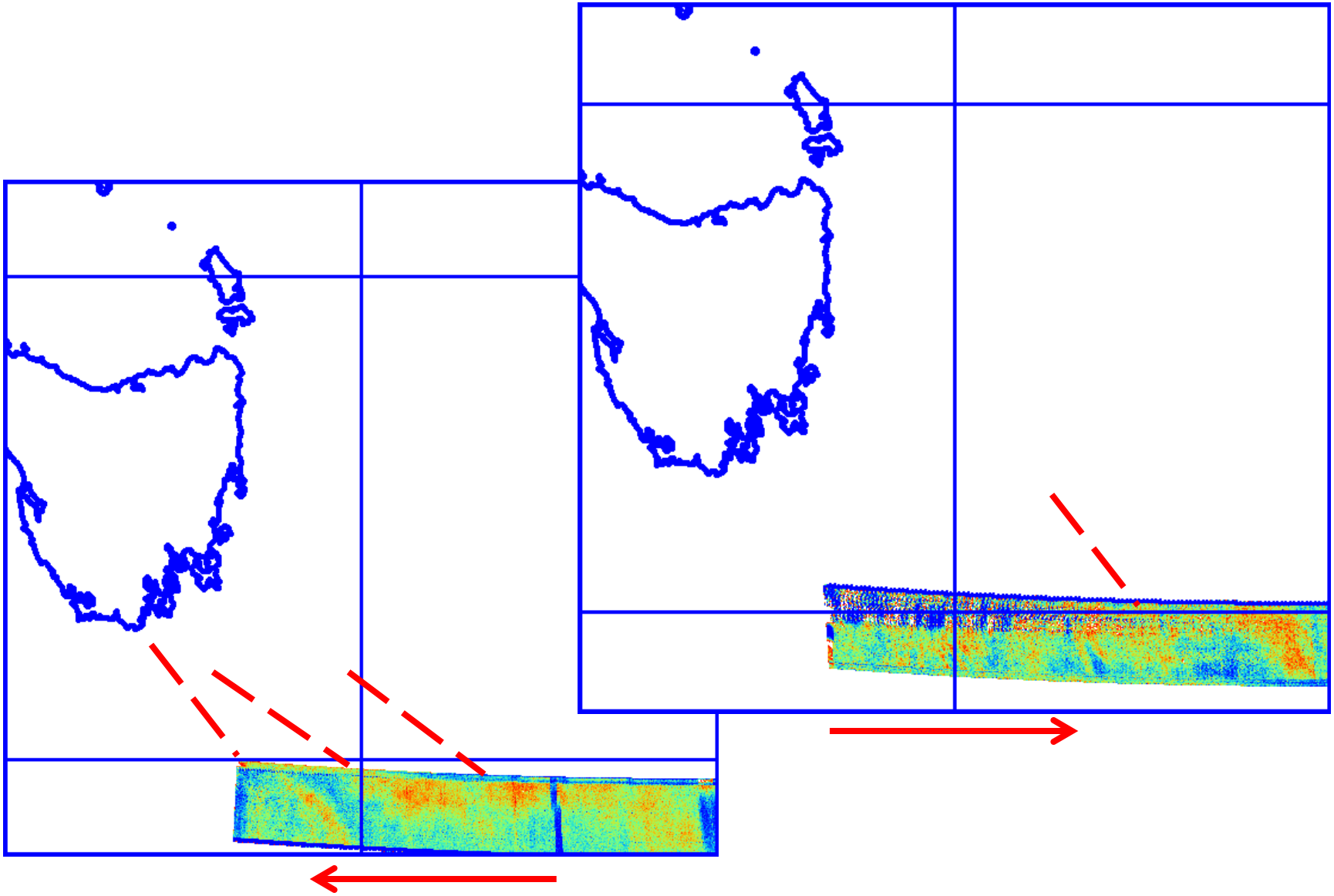


Flight Over Tasmania, RF-02

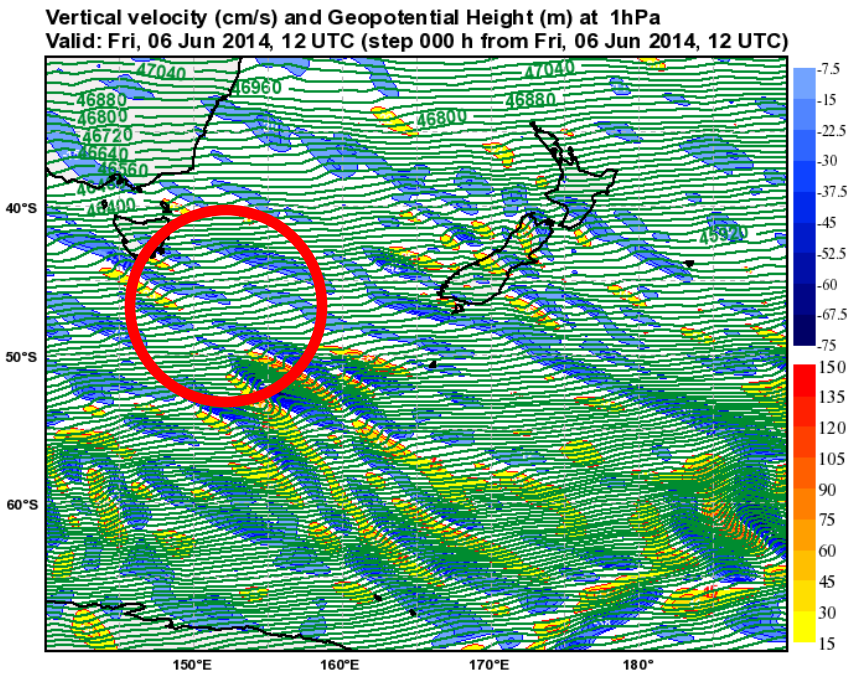


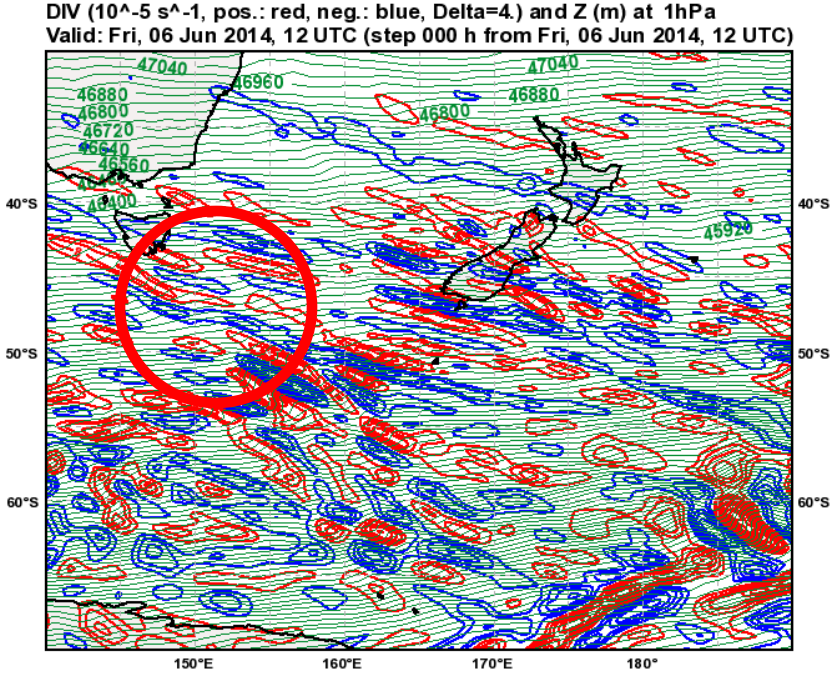
Similar orientations of stratospheric and mesospheric waves

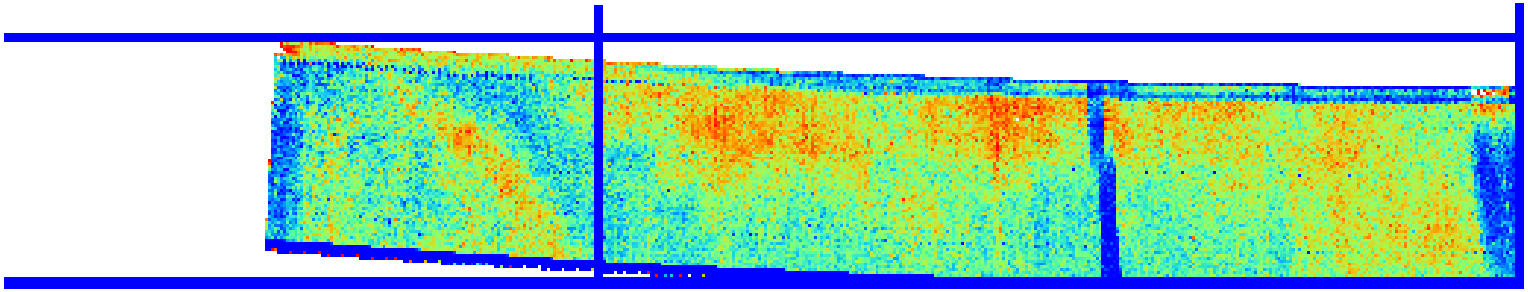
Extensive Waves -Tasman Sea, RF-02



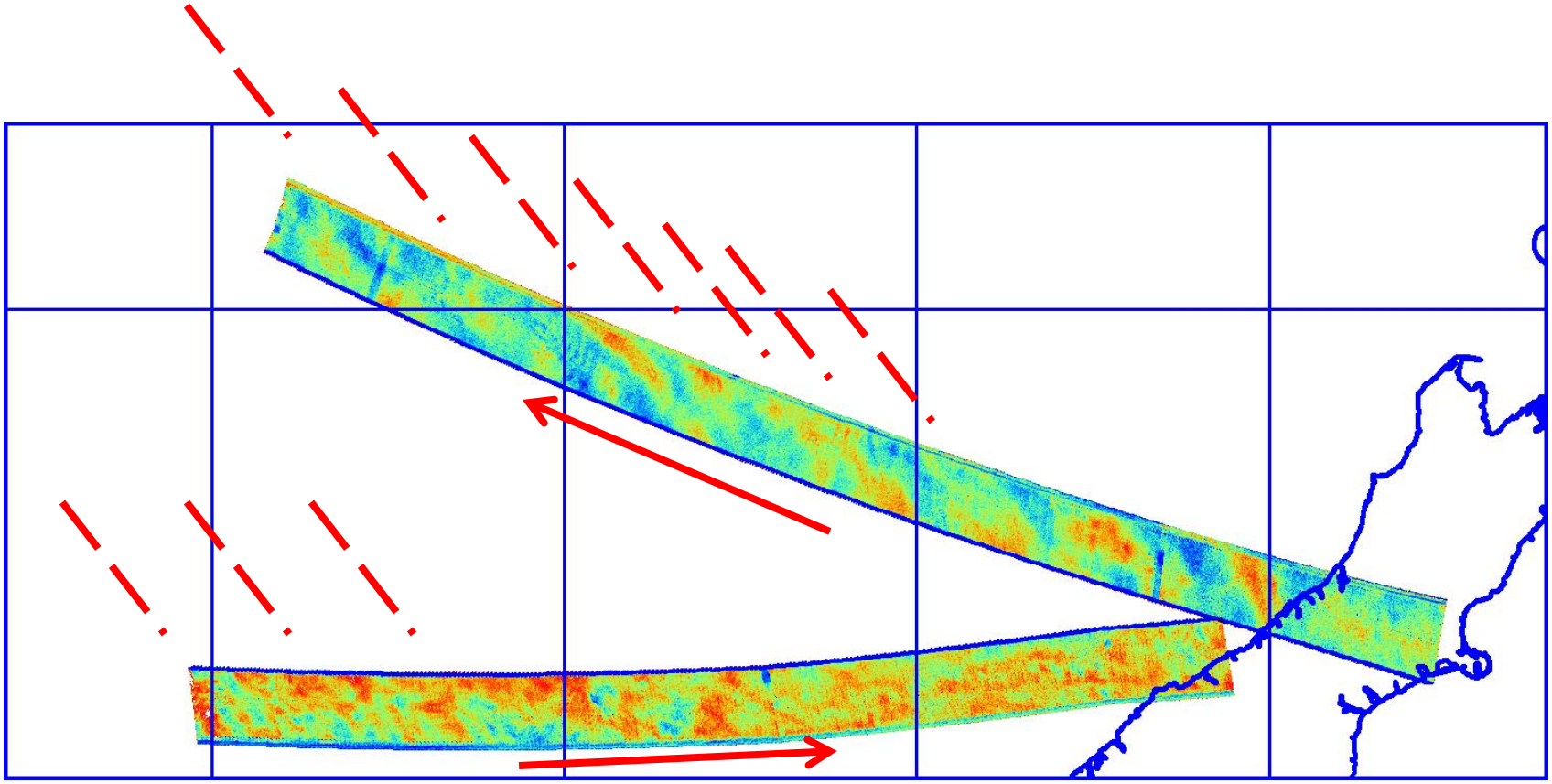
Flight Over the Tasman Sea, RF-02
ECMWF Vertical Velocity and Div at 1hPa



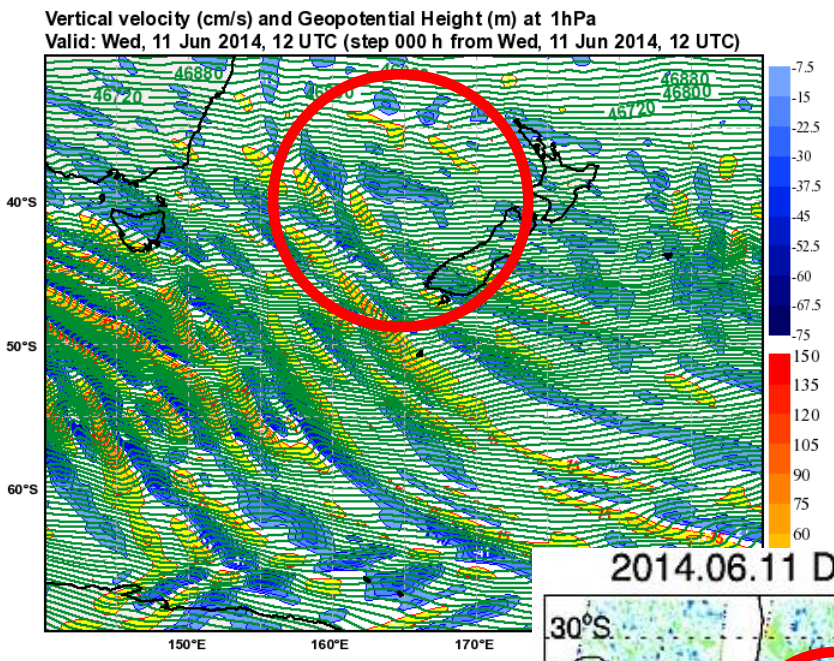


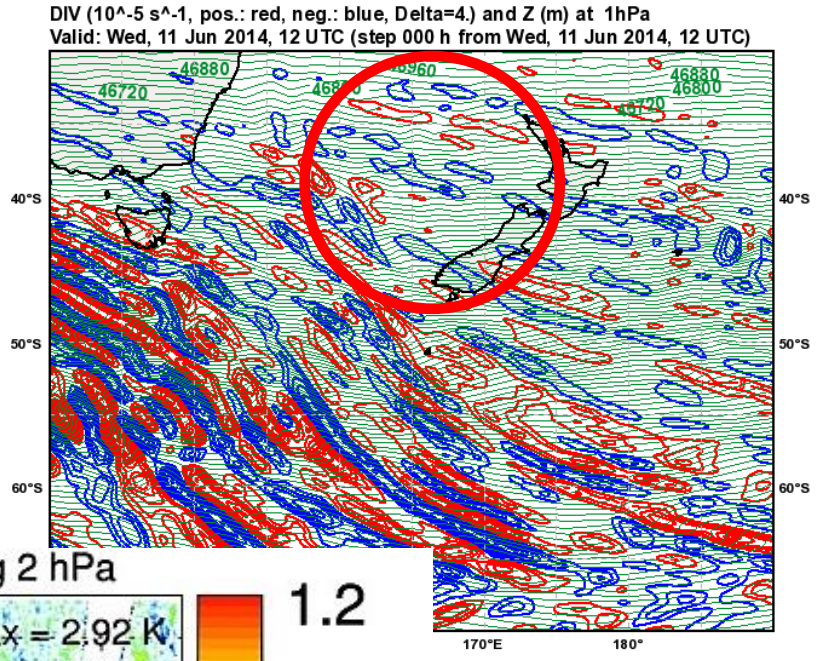


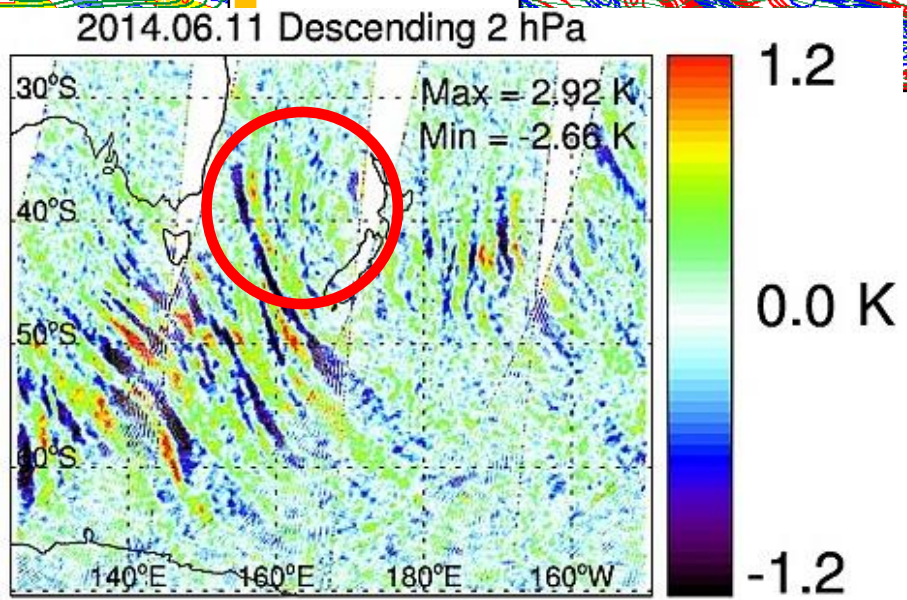
Flight Over the Tasman Sea, RF-03



Flight Over the Tasman Sea, RF-03
ECMWF Vertical Velocity and Div at 1hPa

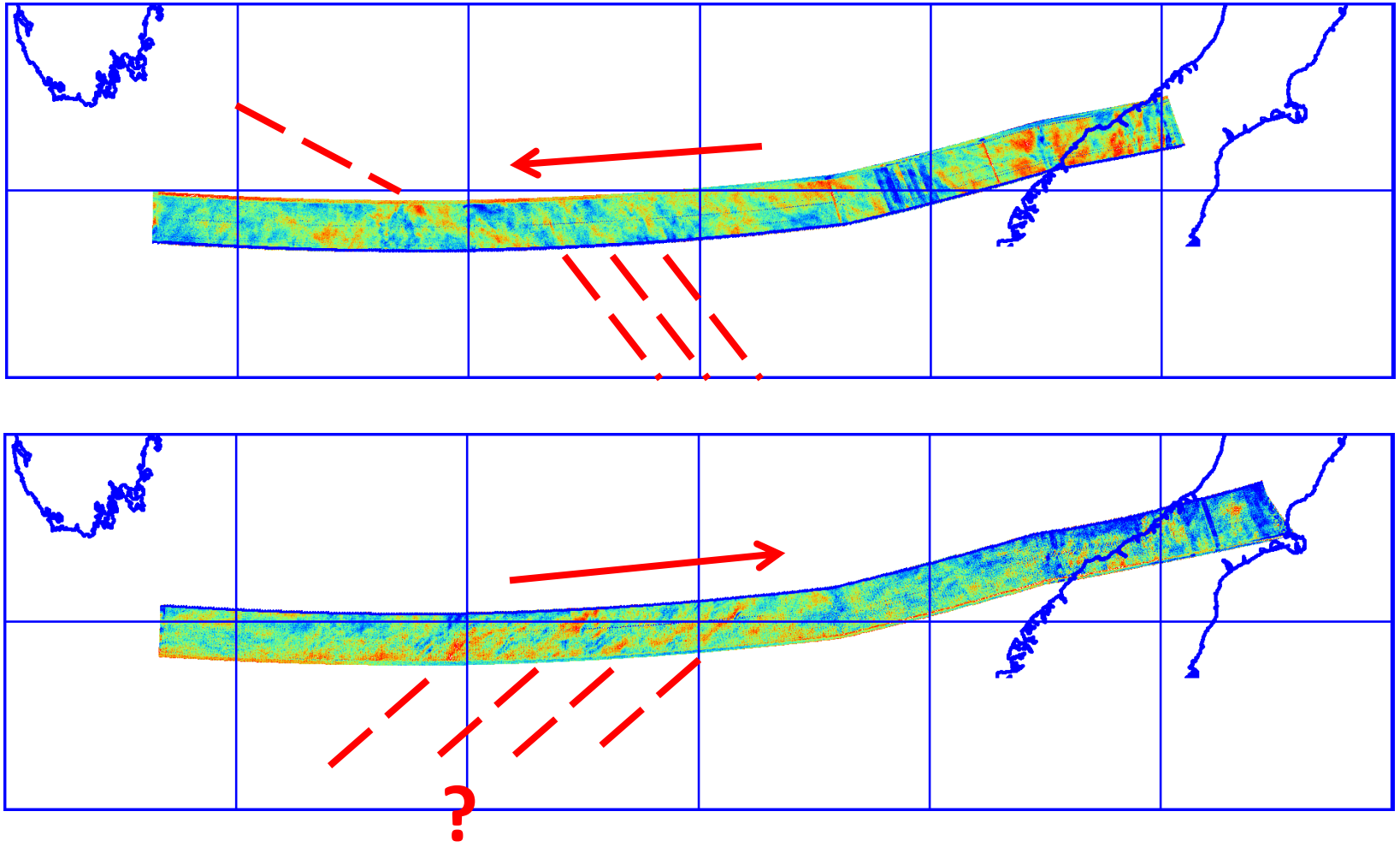




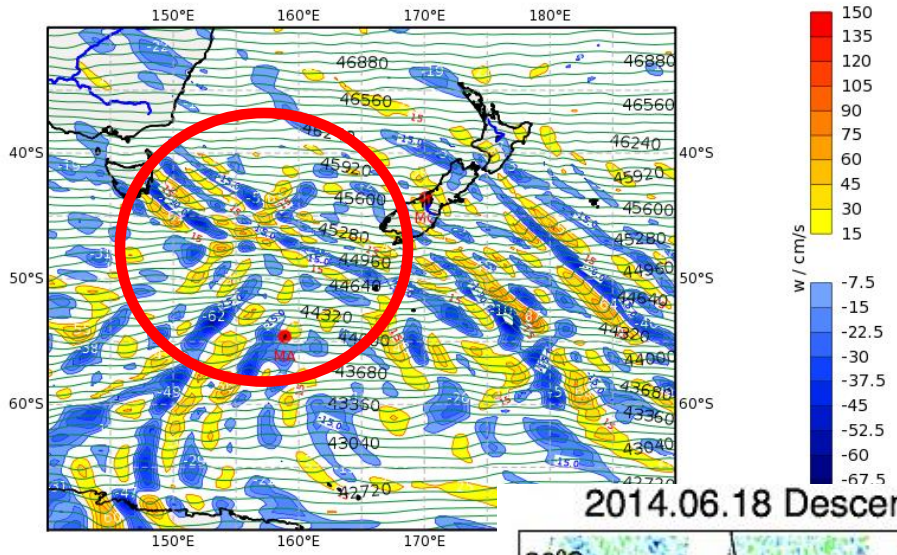


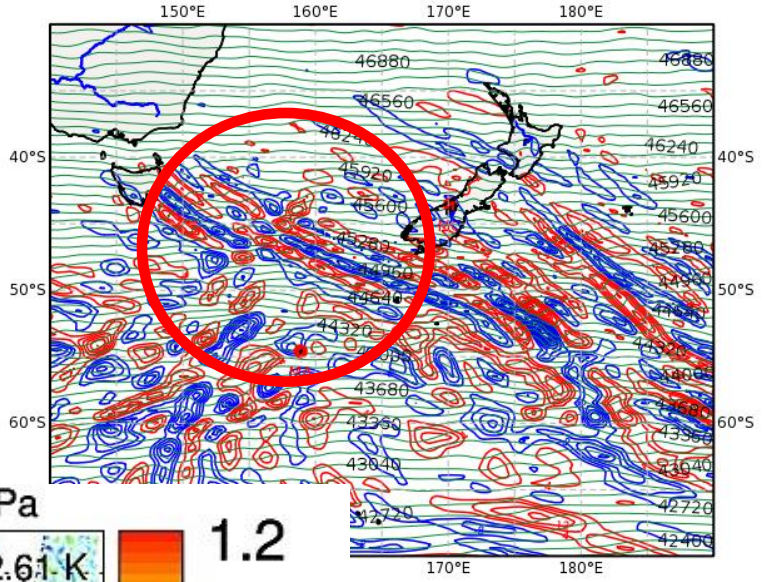
AIRS upper stratosphere radiances

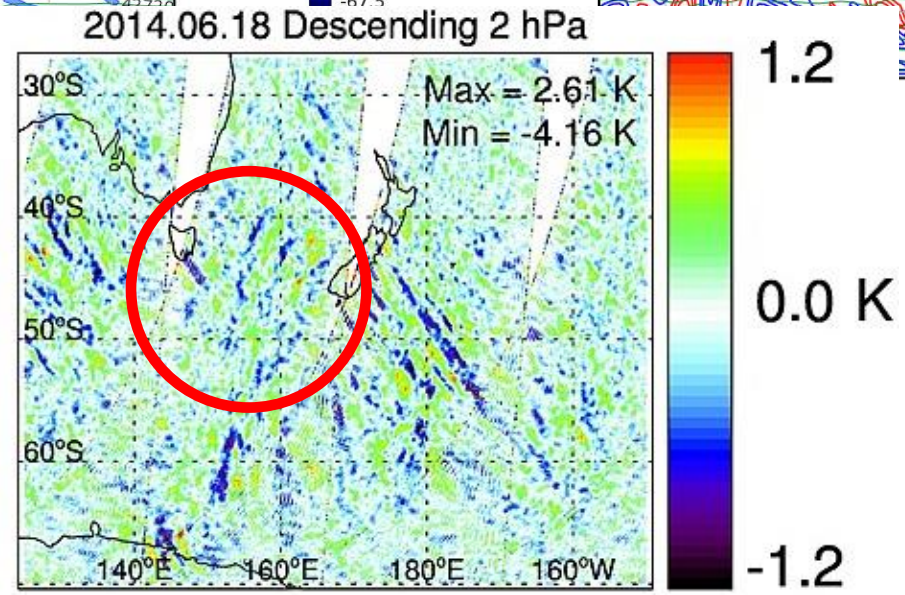
Flight Over the Tasman Sea, RF-06



Flight Over the Tasman Sea, RF-06
ECMWF Vertical Velocity and Div at 1hPa

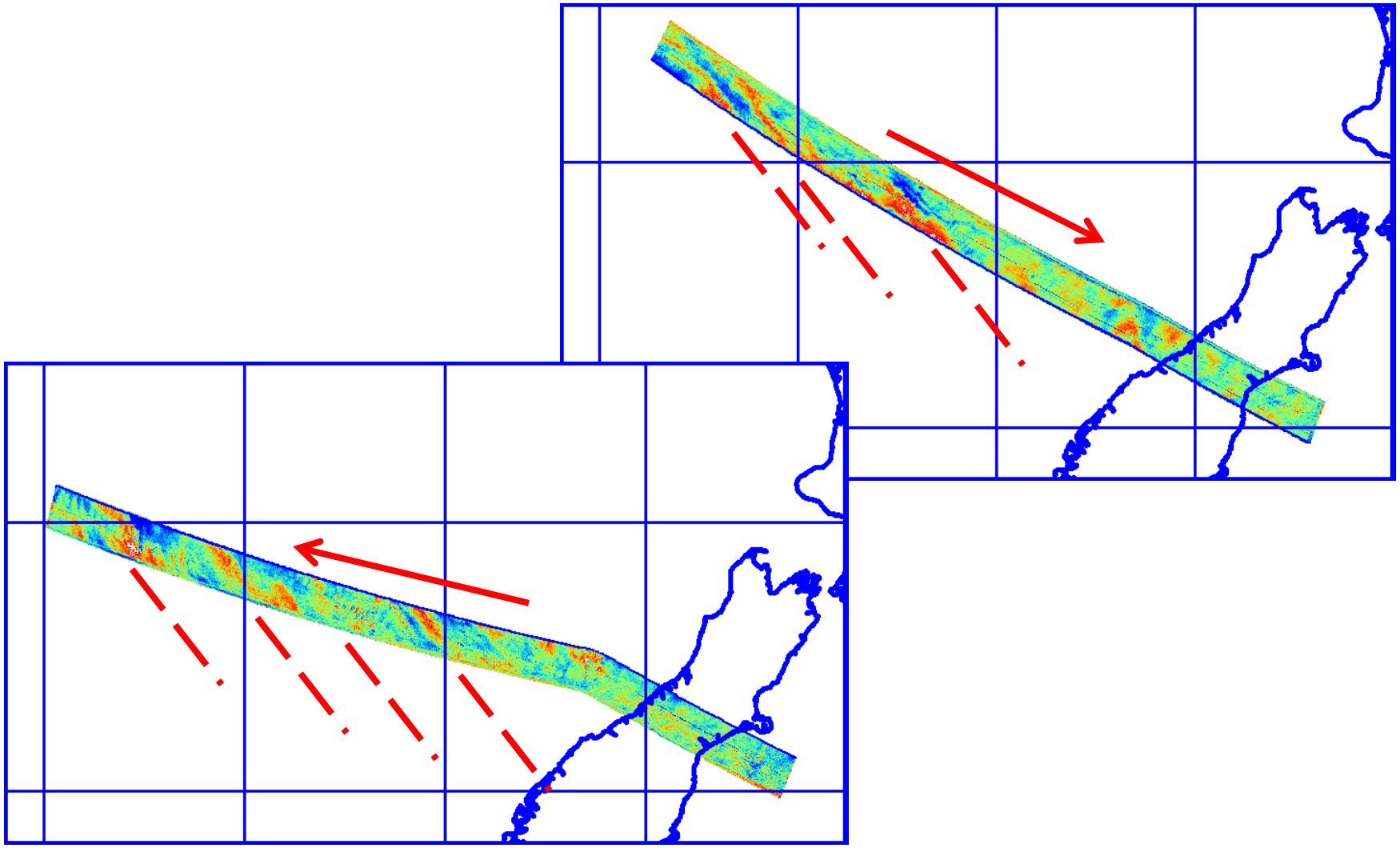




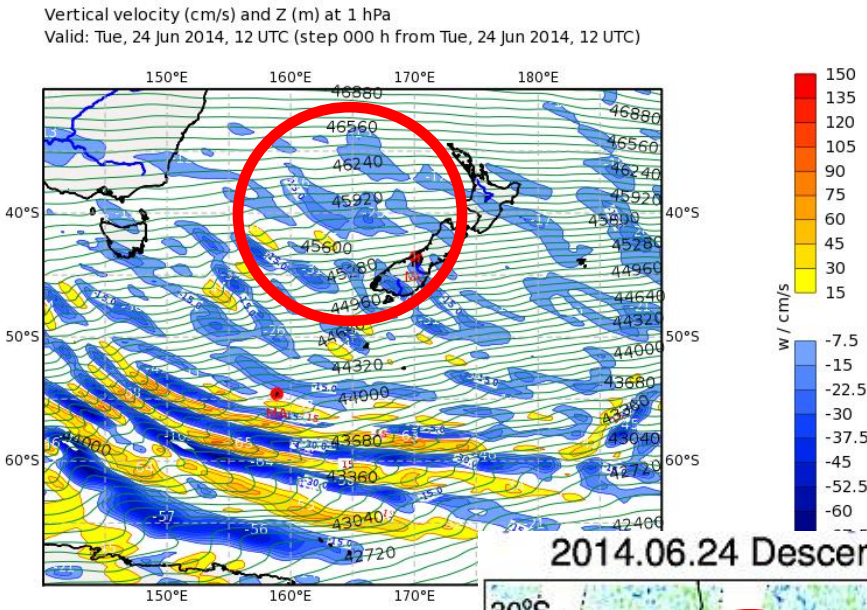


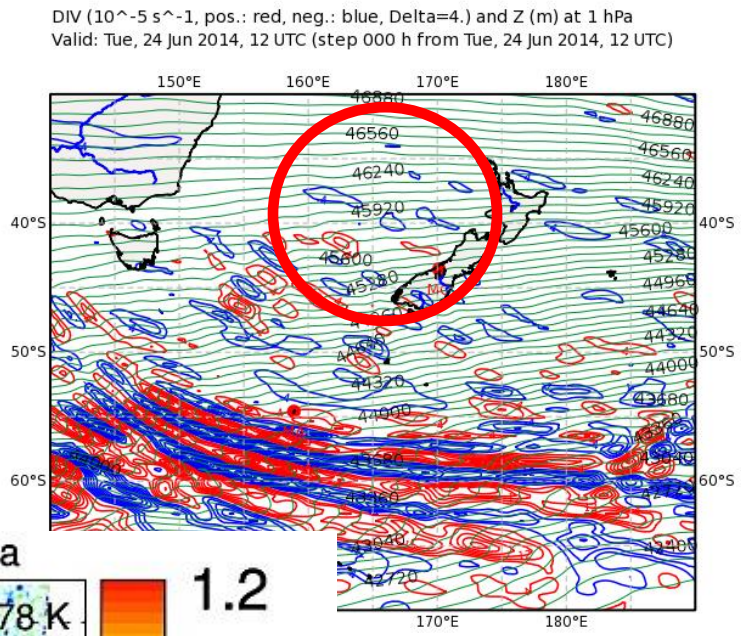
AIRS upper stratosphere radiances

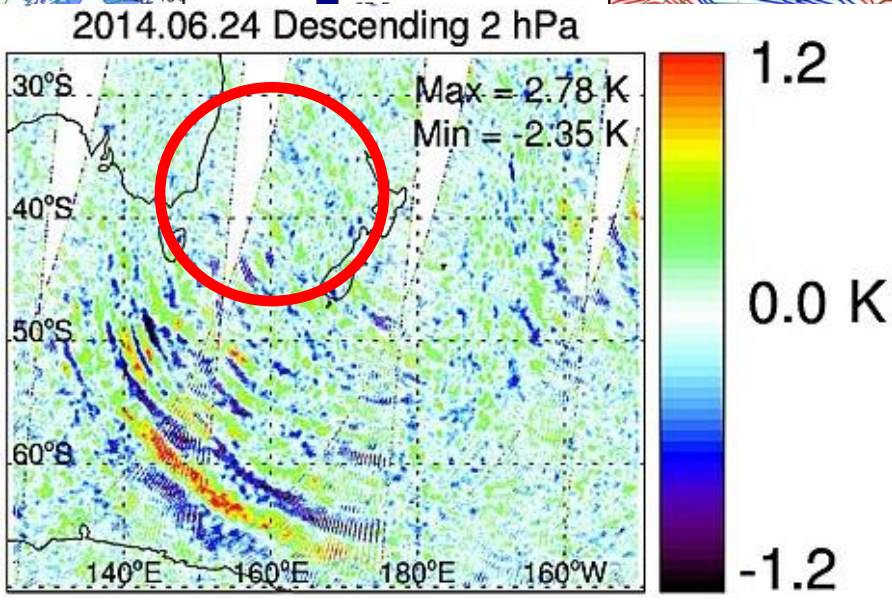
Flight Over the Tasman Sea - RF09



Flight Over the Tasman Sea, RF-09
ECMWF Vertical Velocity and Div at 1hPa

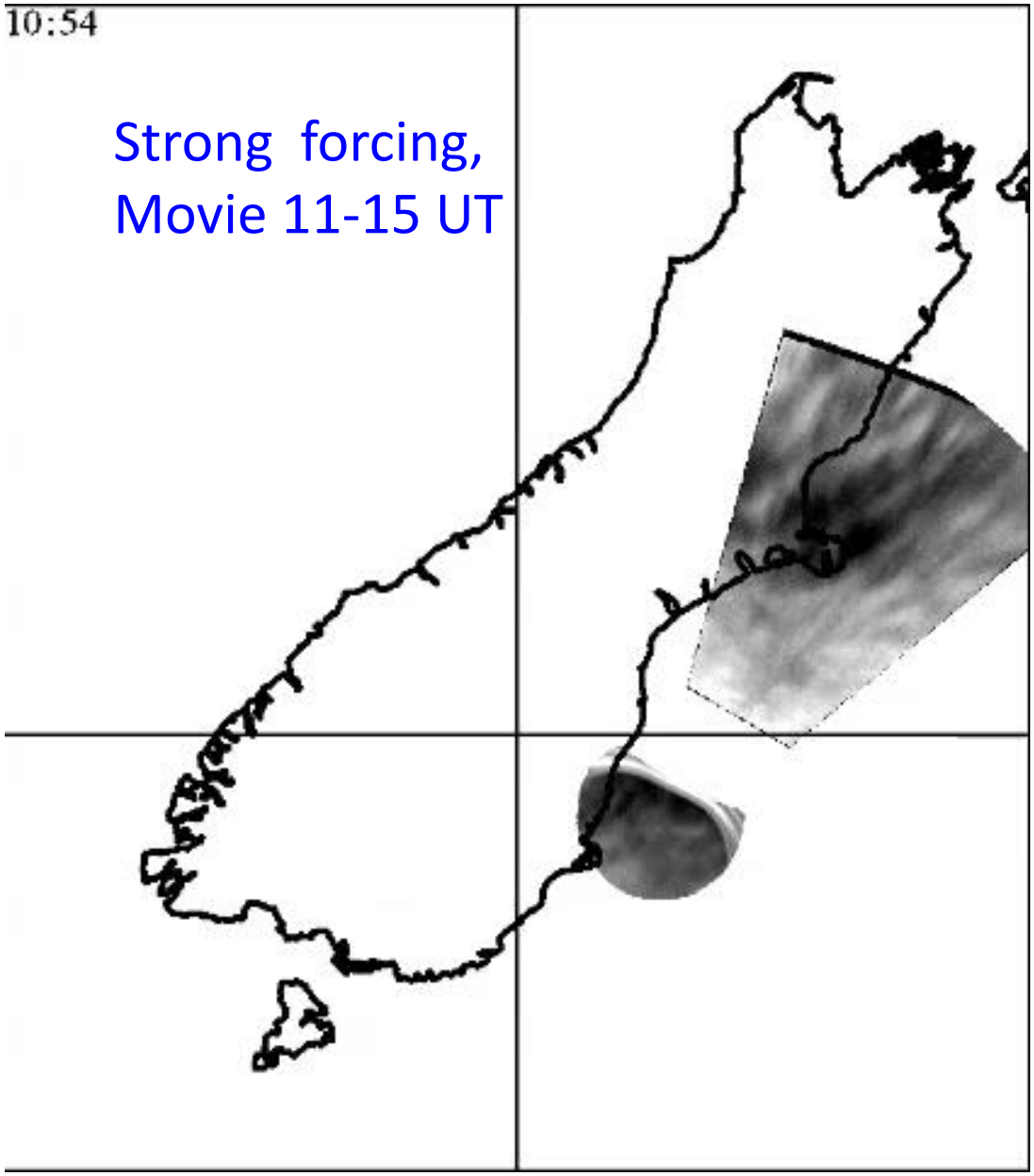




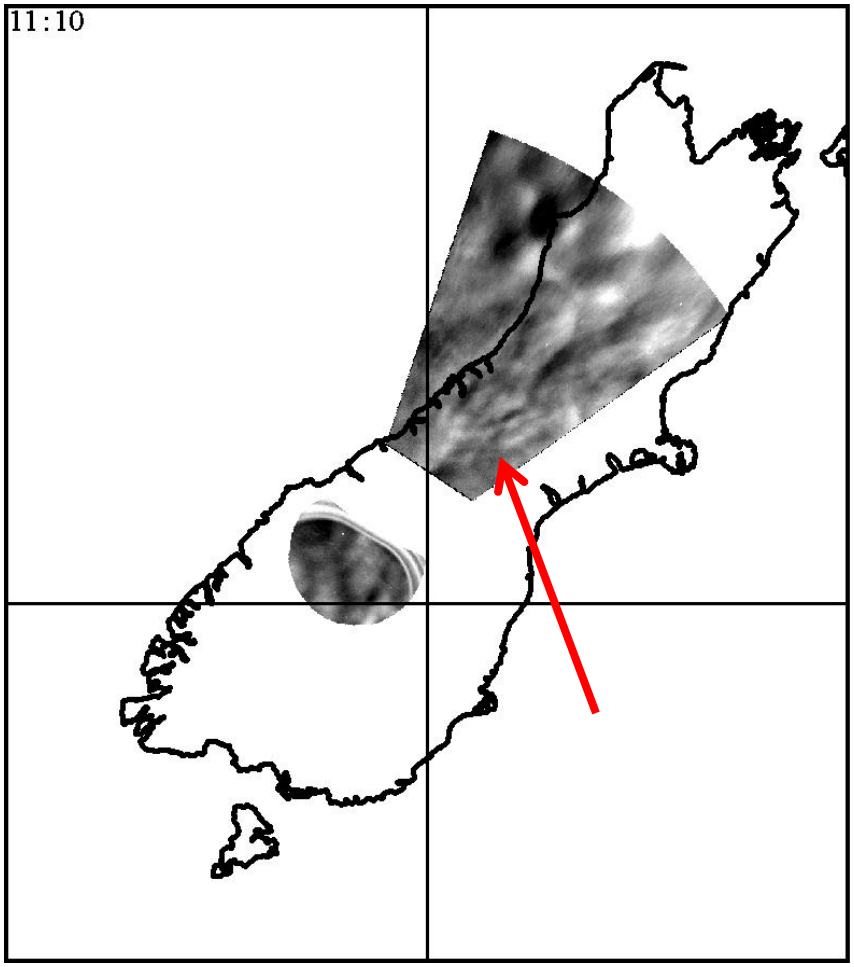


AIRS upper stratosphere radiances

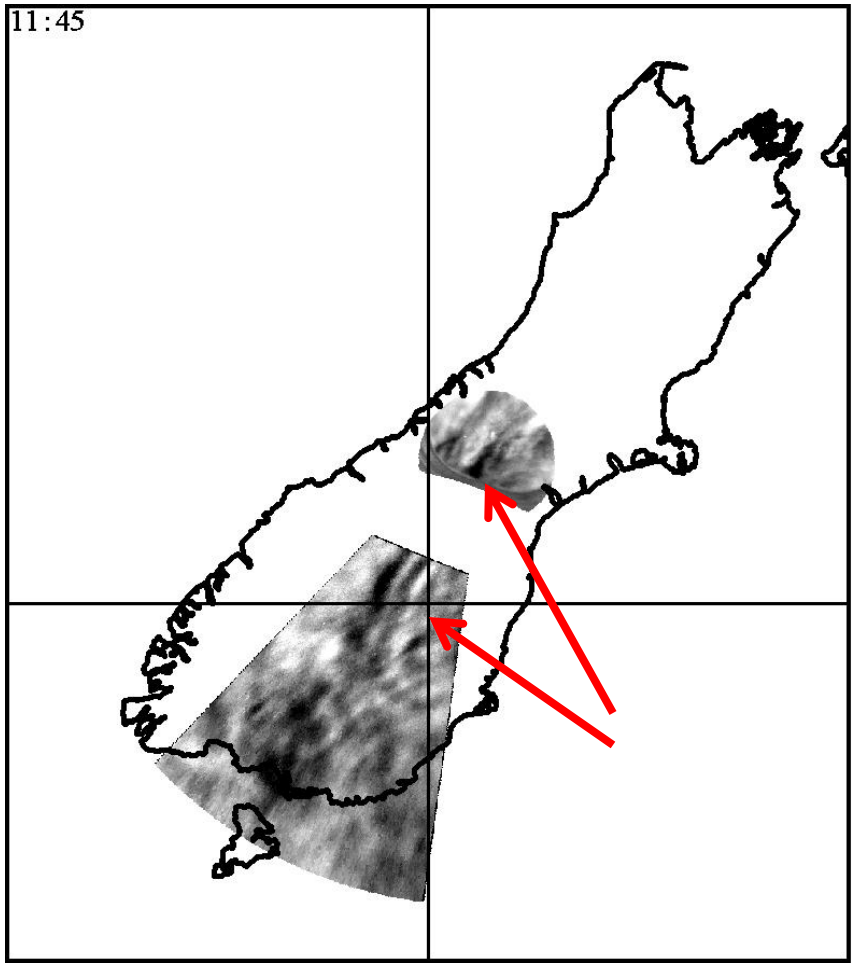
Mountain Waves from the GV, RF-12



Evolution of Mountain Waves, RF-12

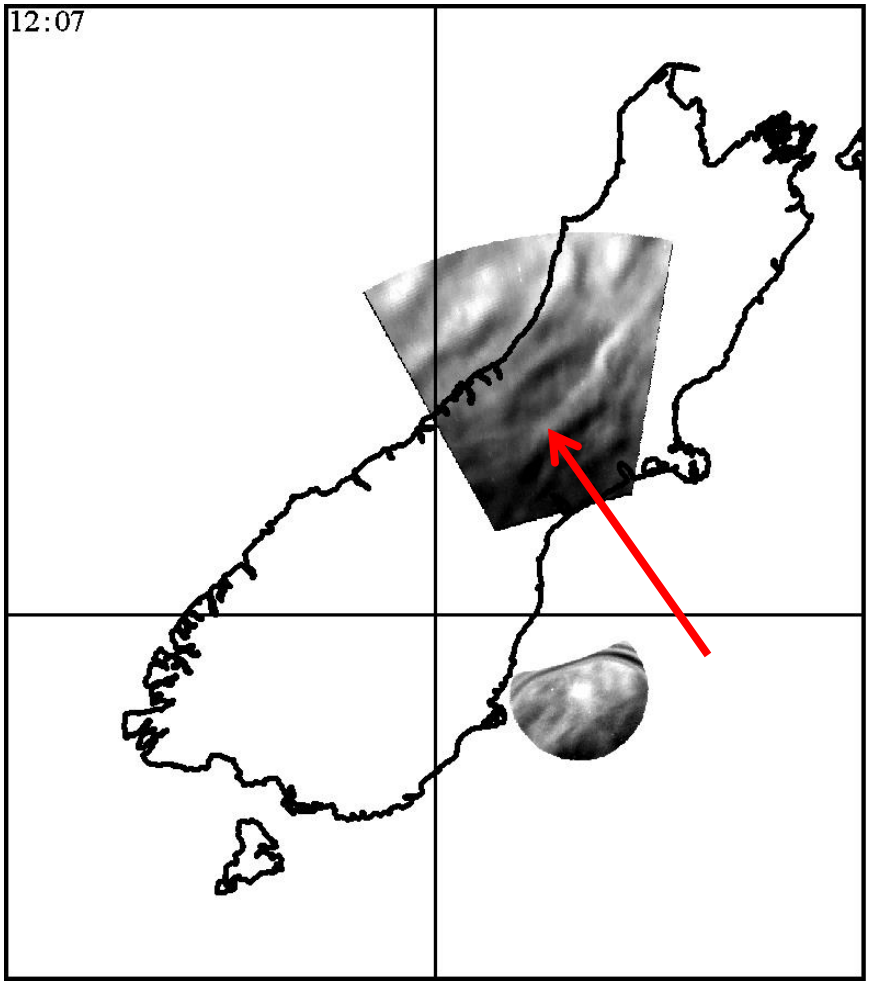


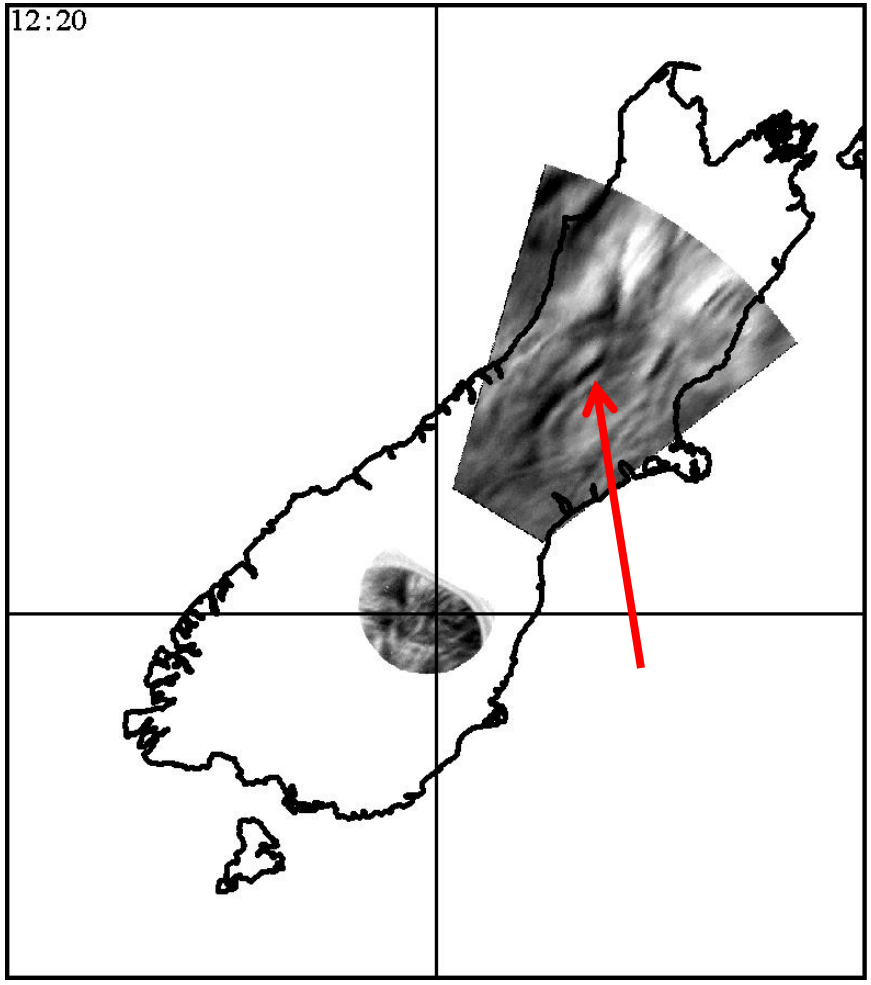
11:10 Beginning to appear



11:45 Over Mt Cook and Mt Aspiring, limited extension

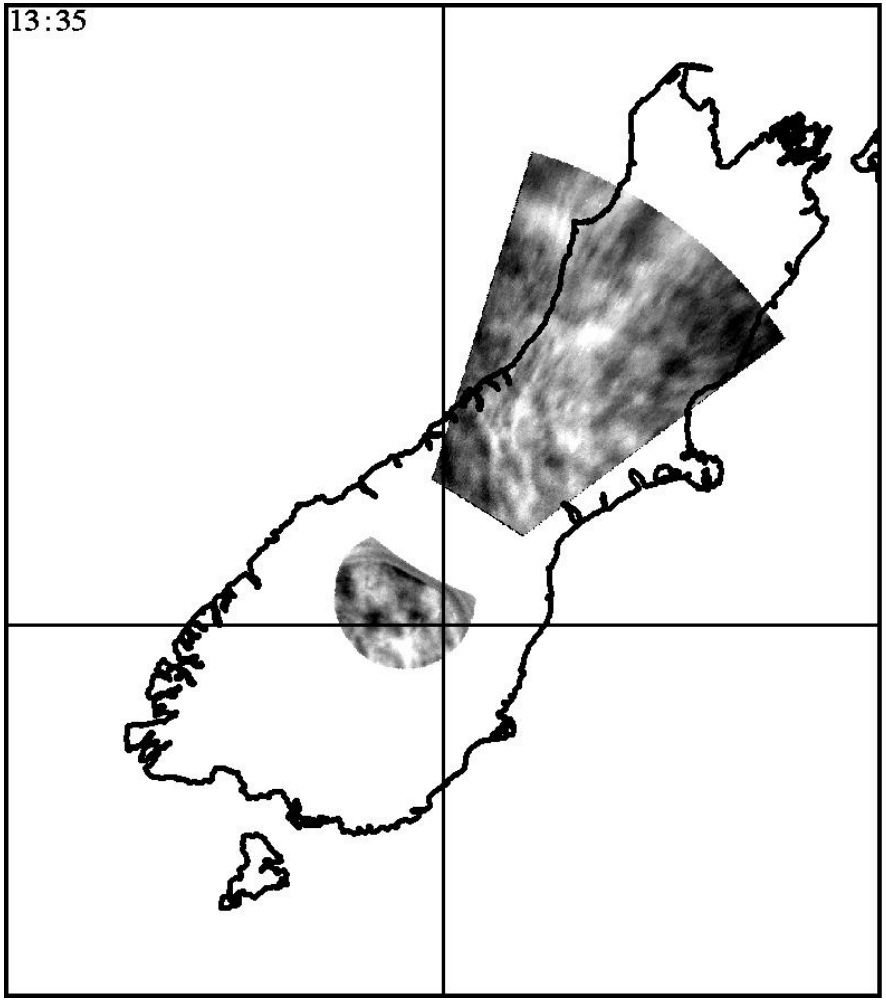
Evolution of Mountain Waves, RF-12



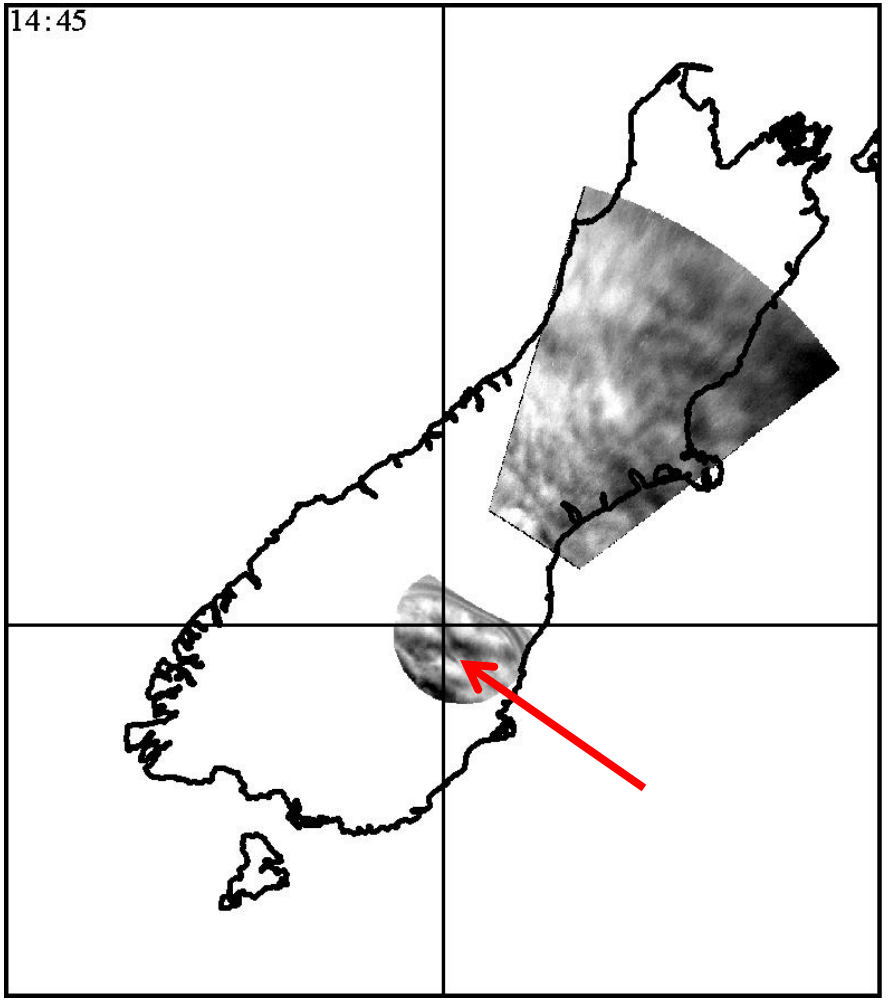


12:00-12:30 Waves extensive and well developed

Evolution of Mountain Waves, RF-12

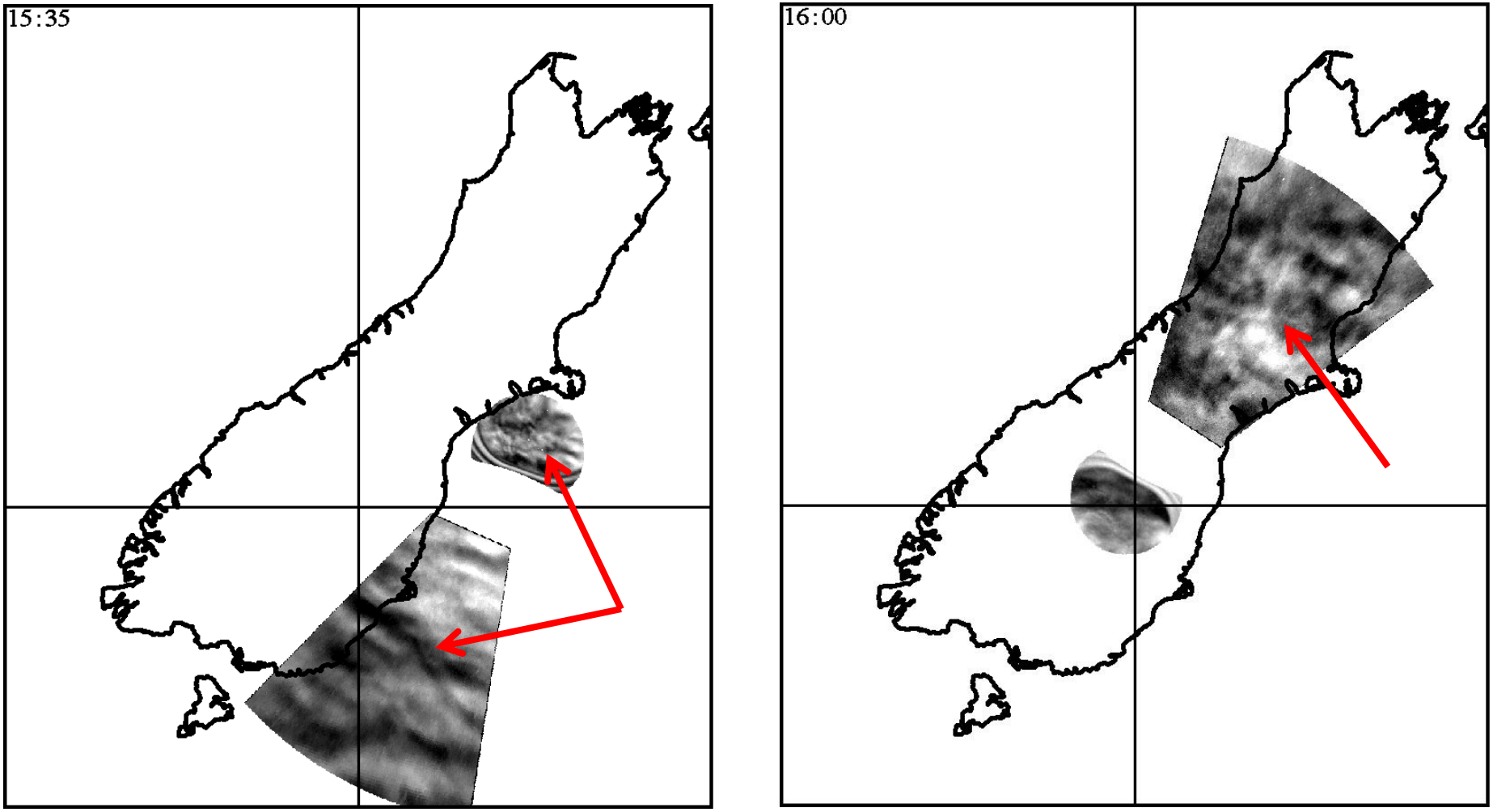


13:35 MW event fading



14:45 Different waves forming - coming from the South

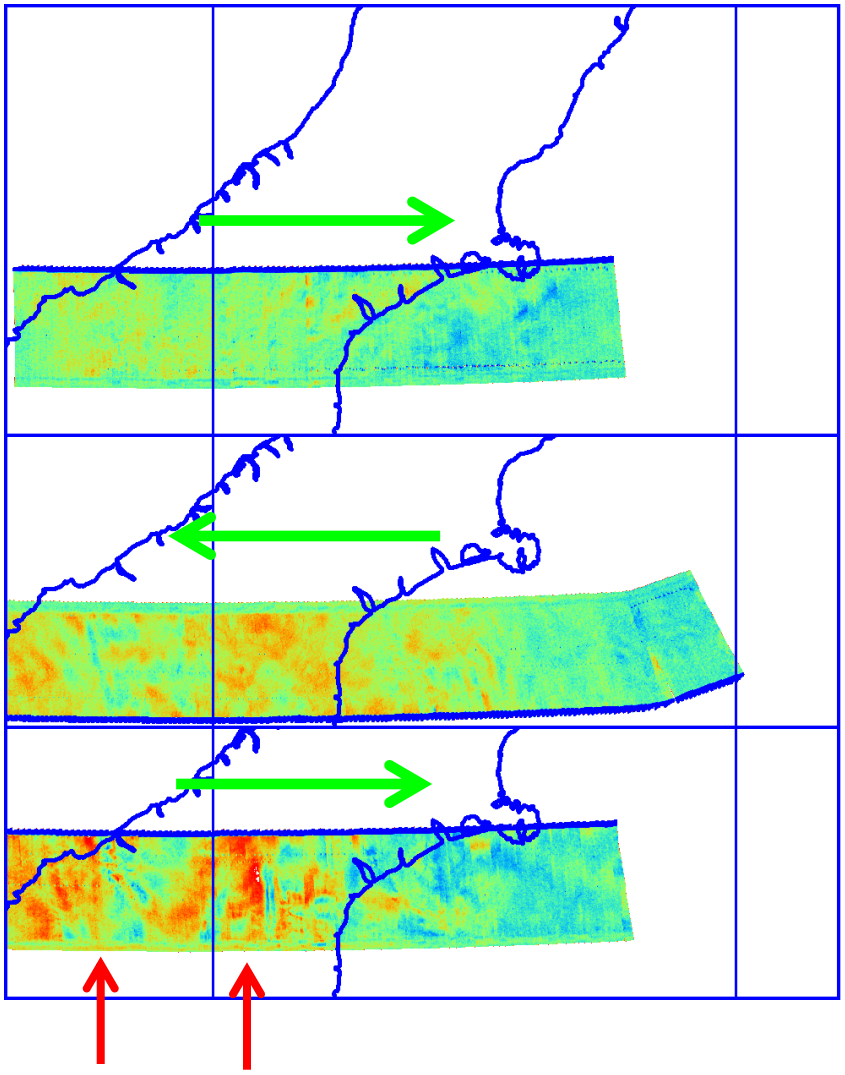
Evolution of Mountain Waves, RF-12

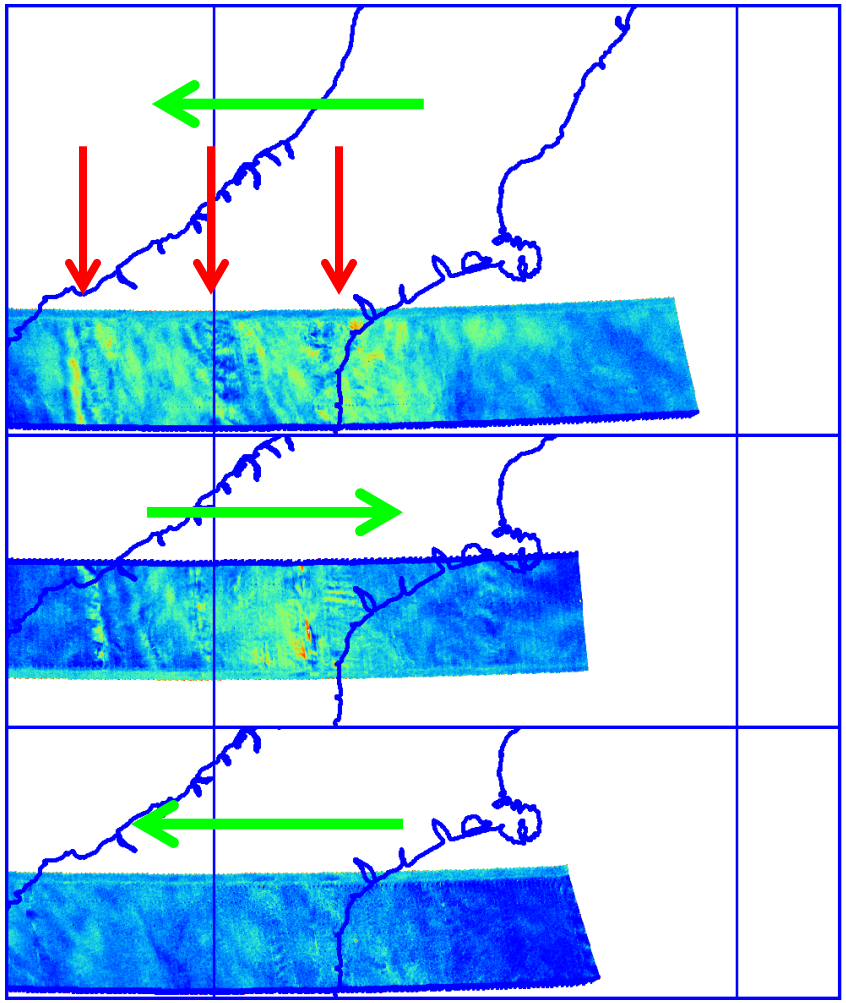


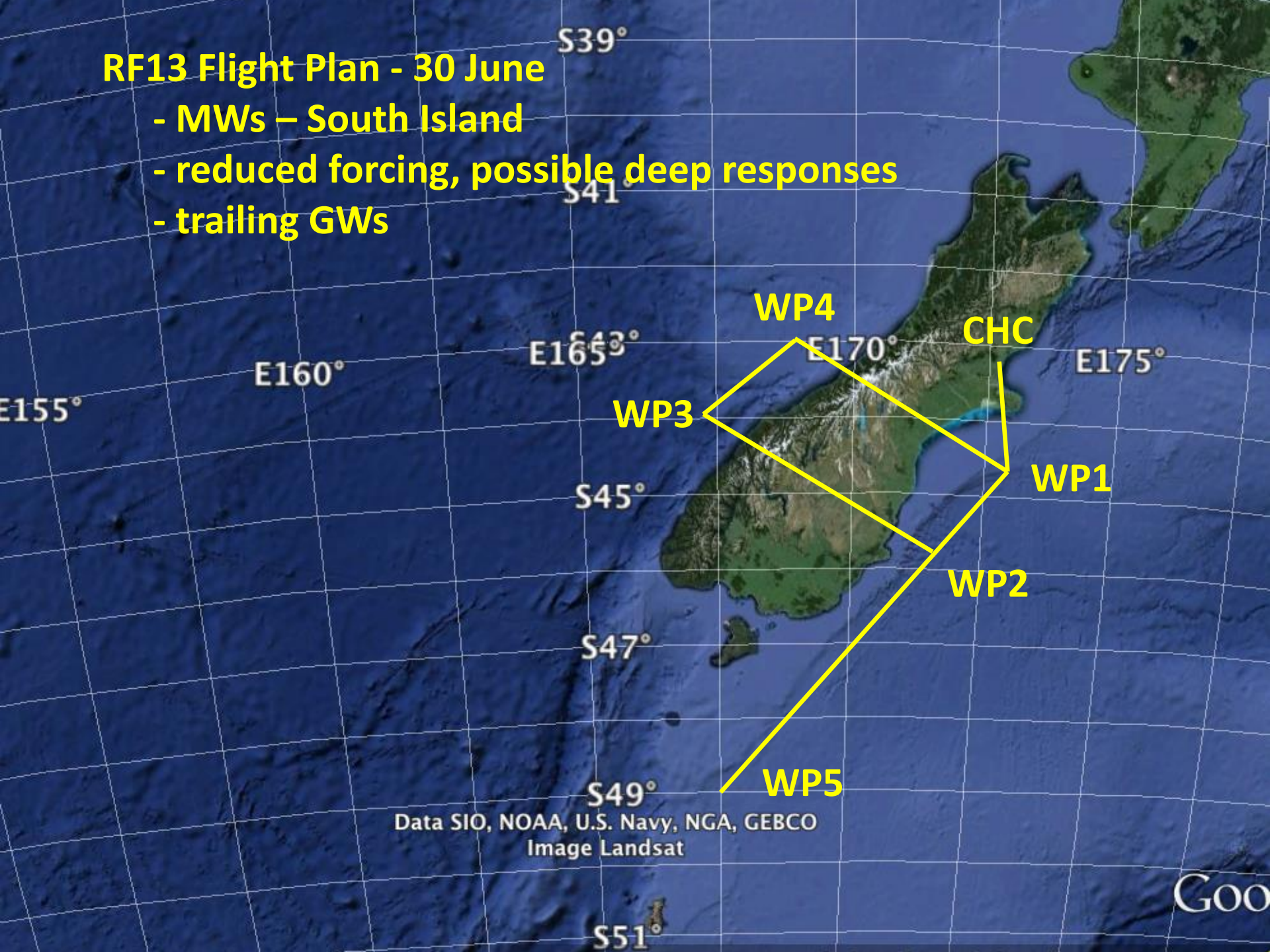
15:00-Landing, NW-SE aligned waves covering the whole region

New Mountain Waves, RF-16 4/5 July

Turbulent Mountain Waves measured for over 3 hours!

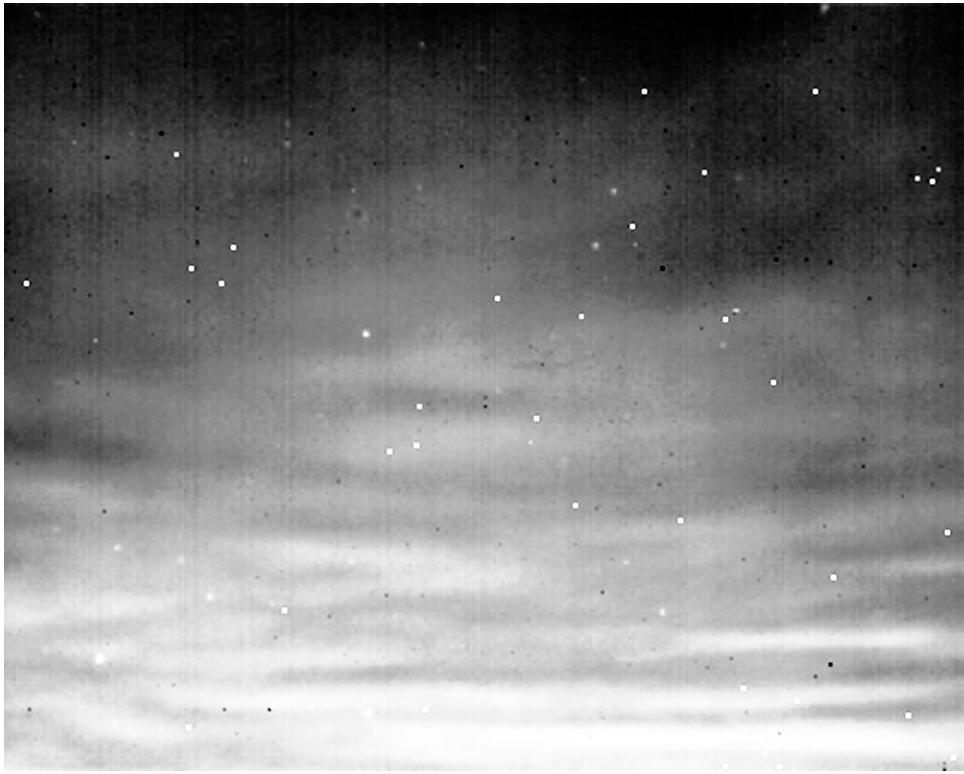





RF13 Flight Plan - 30 June
- MWs – South Island
- reduced forcing, possible deep responses
- trailing GWs
S39°
S41°
S43°
S45°
S47°
S49°
S51°
E155°
E160°
E165°
E170°
E175°
WP4
CHC
WP3
WP1
WP2
WP5
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Coincident Views of OH GW from Left and Right "Wing" Cameras at 07:53 UT

View over ocean to east (left camera)

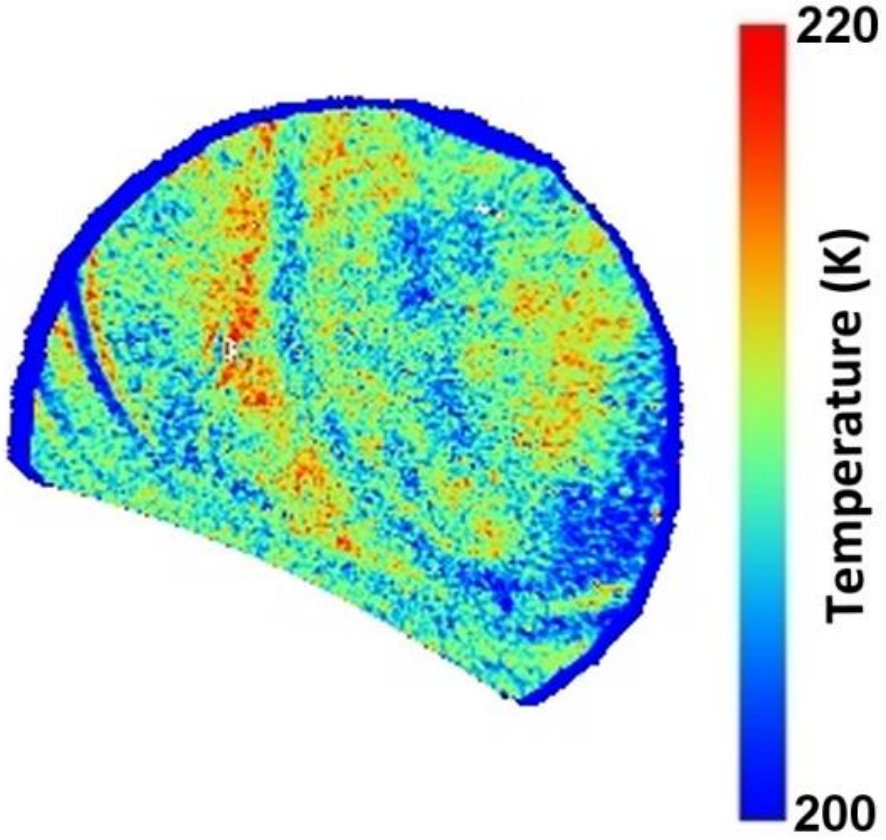


View over South Island (right camera)

Note the strong differences observed in the GW data over SI and over Ocean while on route to WP-5

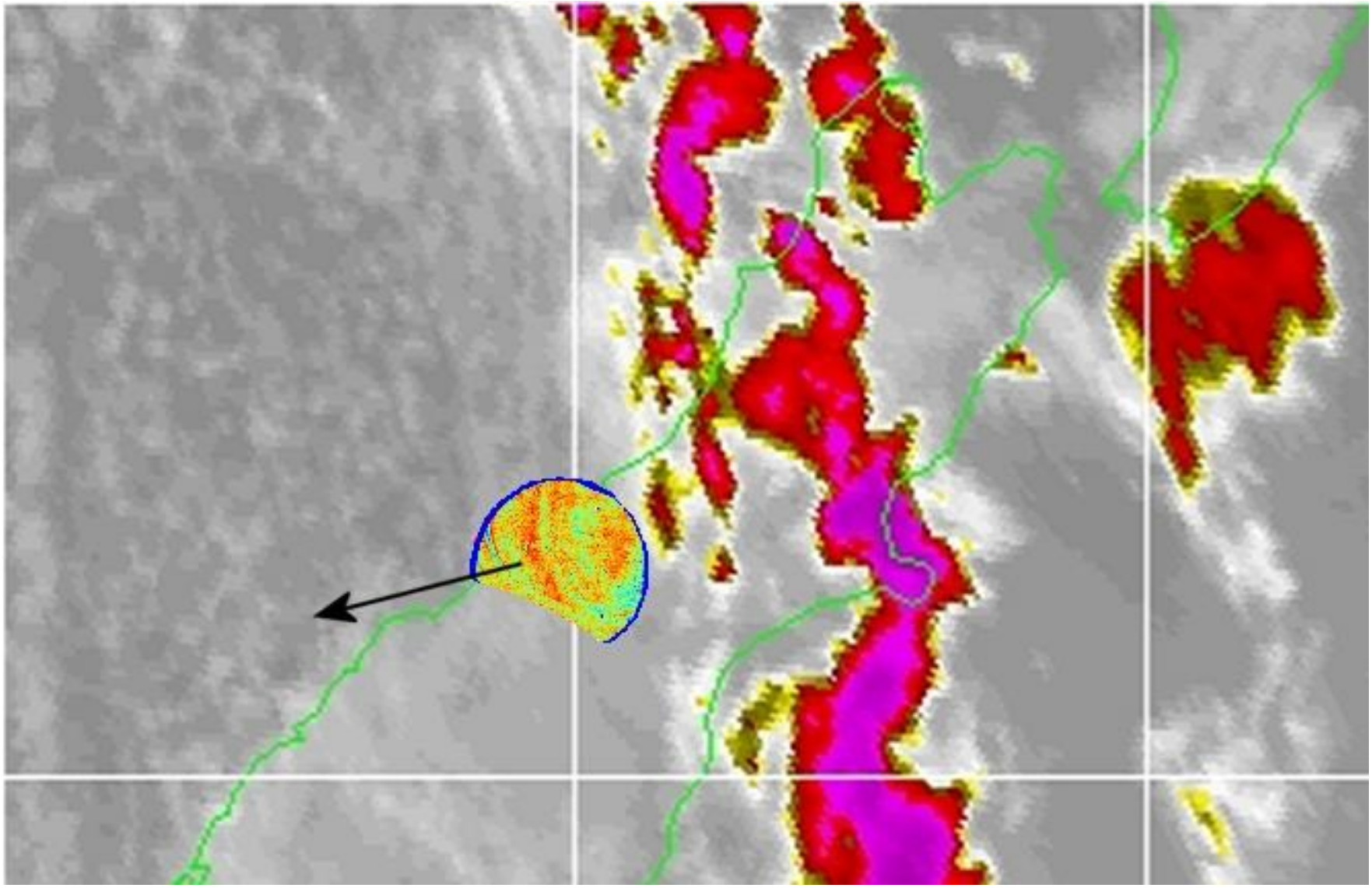
Circular Gravity Waves, RF-13

Relative OH (3,1) band intensity

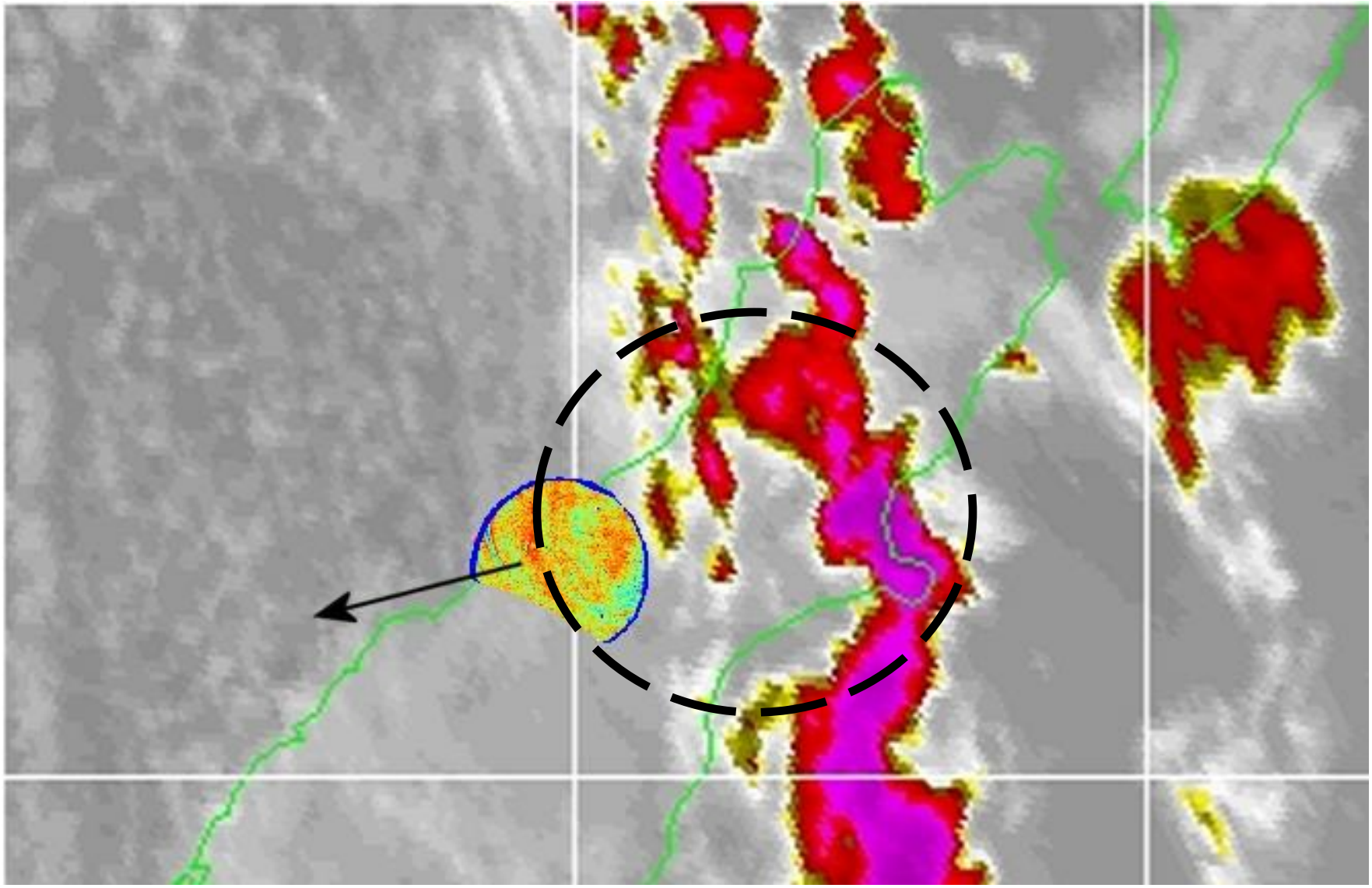


OH (3,1) rotational temperature

RF-13 Circular Waves –Convective Sources?

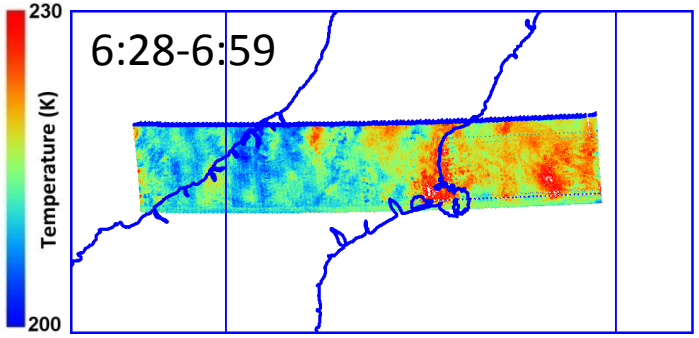


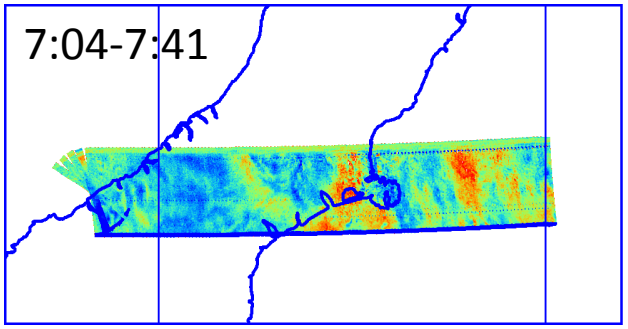
RF-13 Circular Waves –Convective Sources?

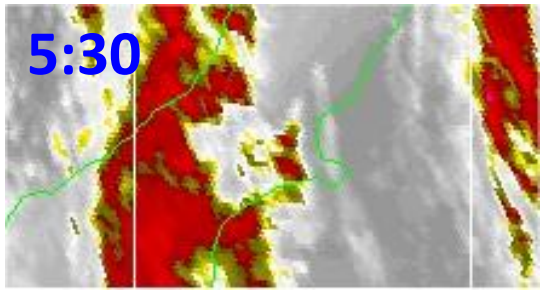


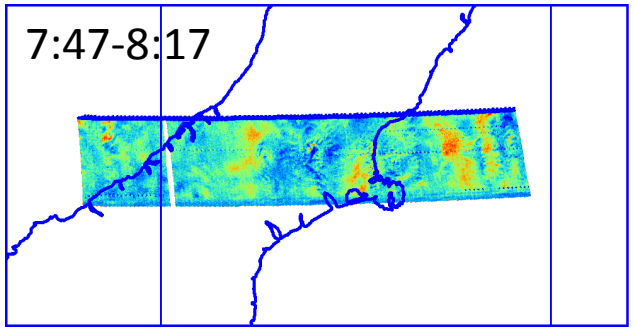
RF-14, Weak Forcing, No Obvious Mountain Wave Structures

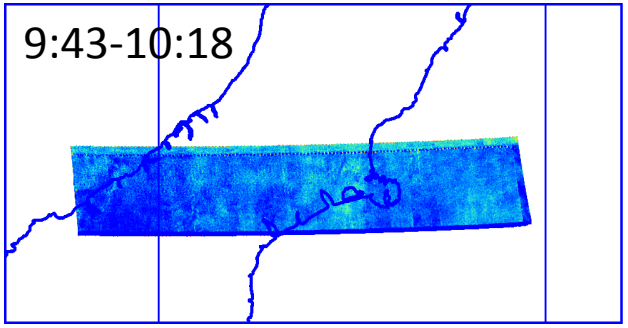
RF-14 Wave Activity Associated With Transit of Trough?

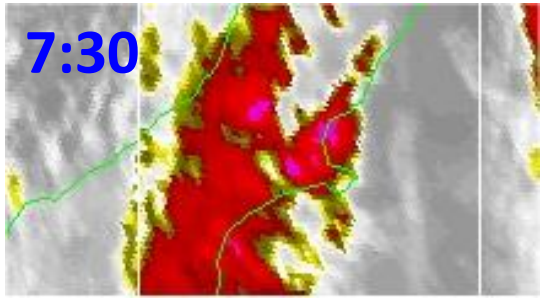


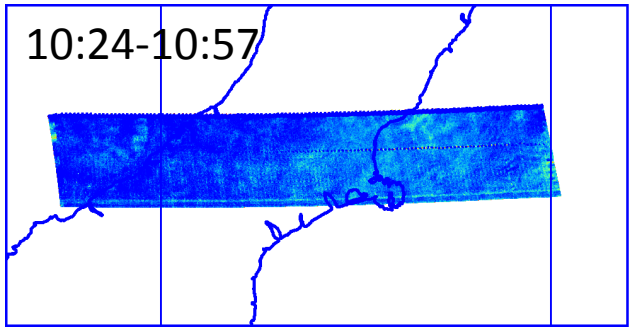


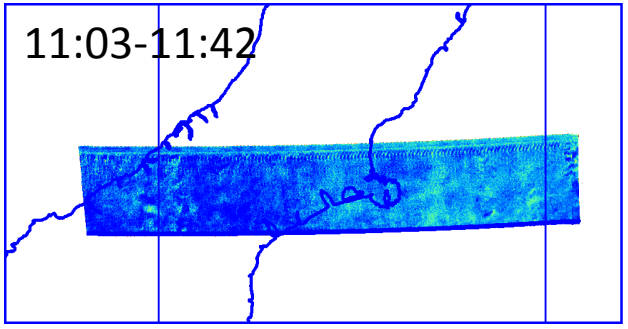


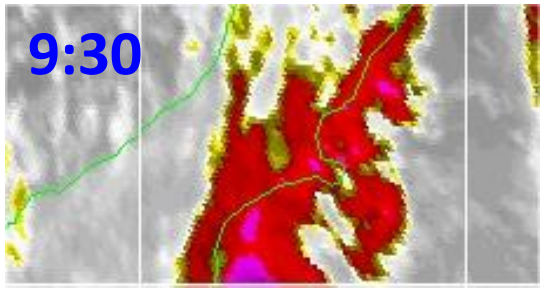












Summary (to date)

- T-Mapper instrument suite (3 IR cameras on aircraft, one at Lauder) continue to work well. Detailed measurements of GW with large spatial coverage ~1000 km).
- Airborne mesospheric GW measurements revealing significant correlations with the stratospheric model wave maps (and AIRS?).
- Clear evidence for MW penetration to MLT over Southern Alps, as well as GW from other wave sources.
- Coordinated measurements at Lauder indicate Mountain Wave activity on at least 7 nights so far (May 30th to date)..during variable forcing!
- Overall: Wave data are very interesting indeed. At least 2 nights were spectacular in their amplitudes, spatial extent and temporal evolution.
- Looking forward to tonight's flight over Southern Ocean!