

Sodium Lidar Data Overview

Current Available Data Sodium Lidar

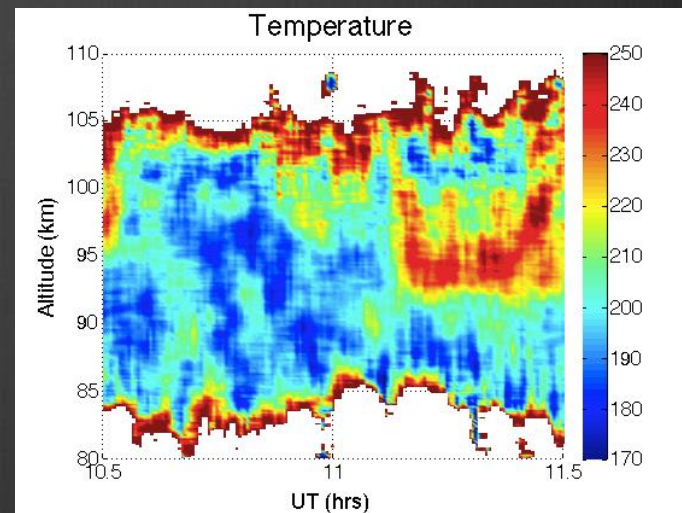
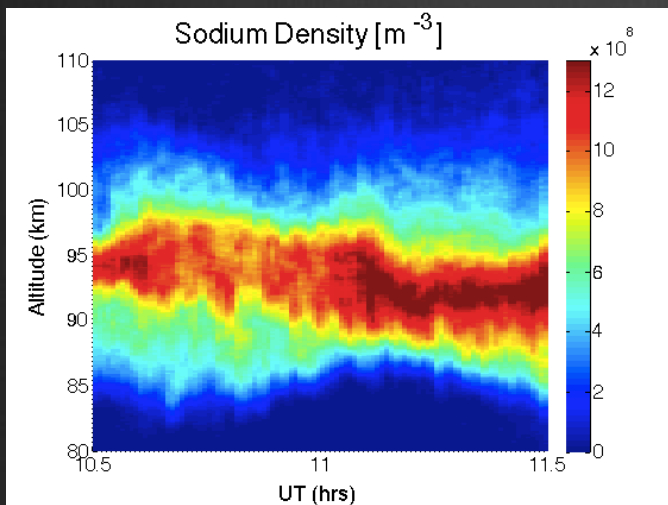
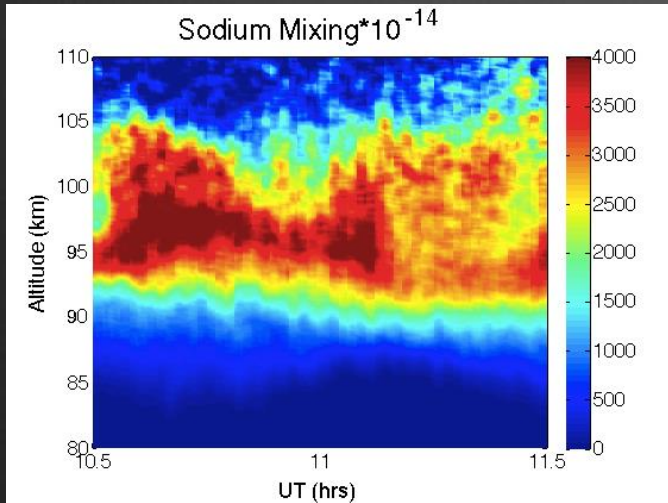
- ❖ Temperatures and Densities
 - ❖ RF 11,12,13,14,16, 17
- ❖ Densities Only
 - ❖ RF22, 23, 24
- ❖ Other Data potentially available

Measurement Capabilities

Sodium Lidar Provides the following capabilities:

- ❖ Sodium Densities
- ❖ Sodium Mixing ratio (calculated based on background density estimation)
- ❖ Temperatures (on flights where the sodium lidar had two frequencies running)

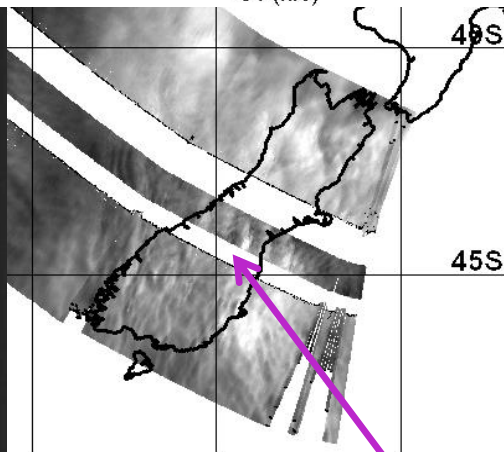
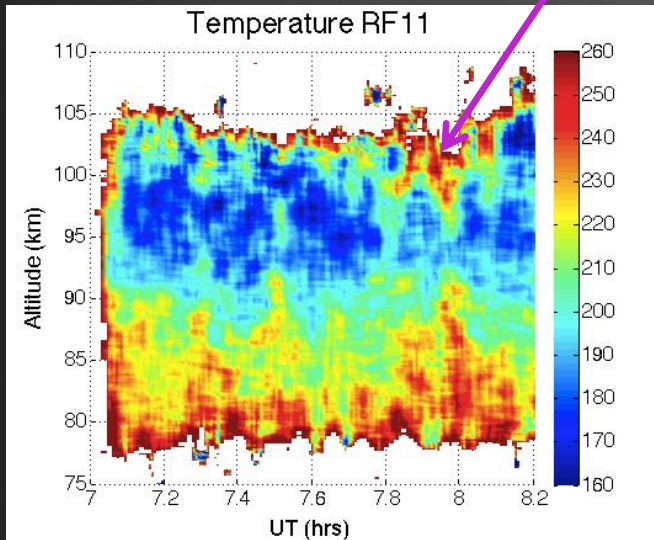
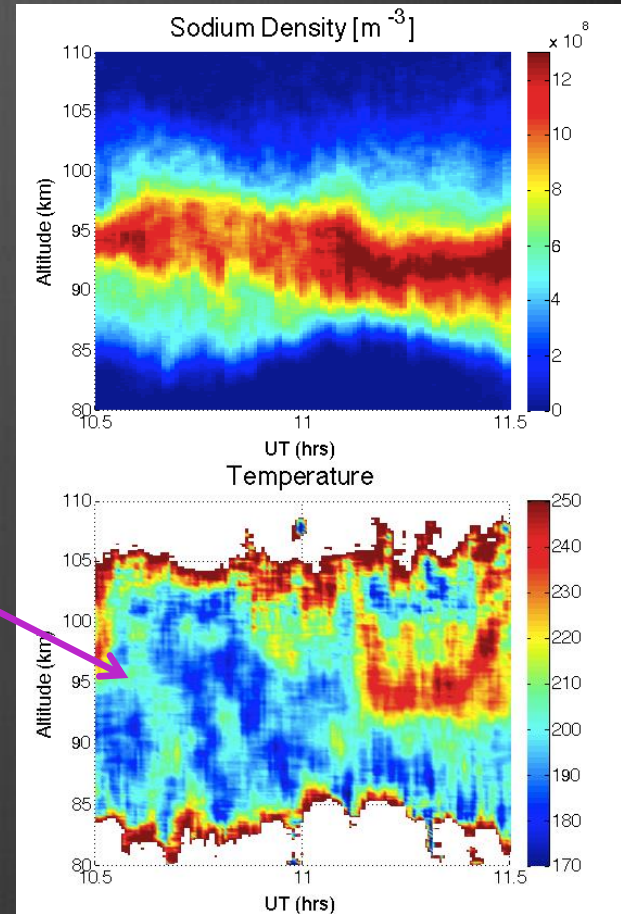
Measurements generally between 80-105km



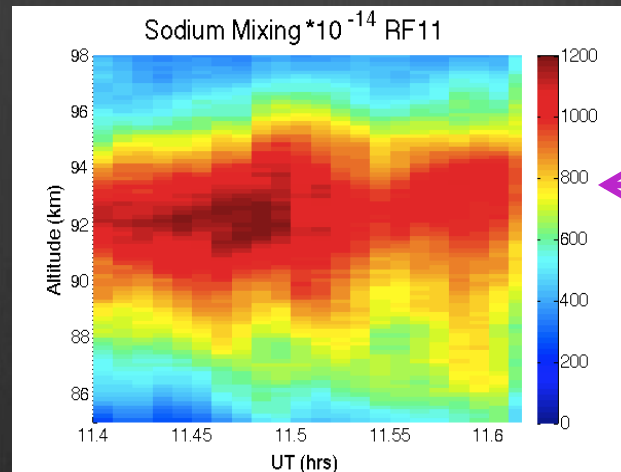
RF11

Significant temperature perturbations through sodium layer observed over NZ portion of flight.

Waves still visible at the end of the flight several hours later.



Beginning of flight, over South Island

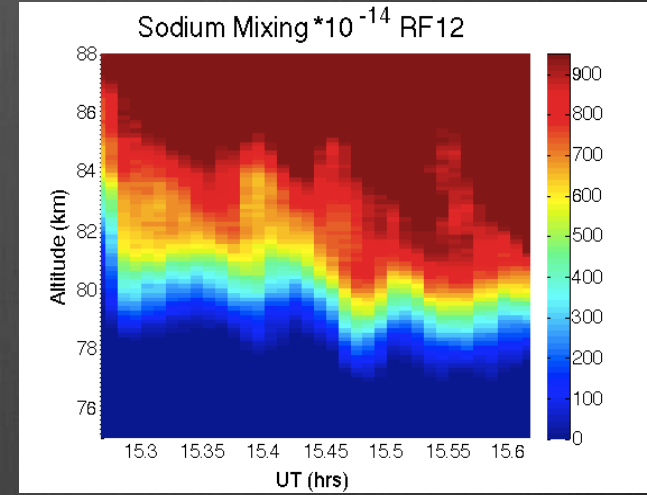
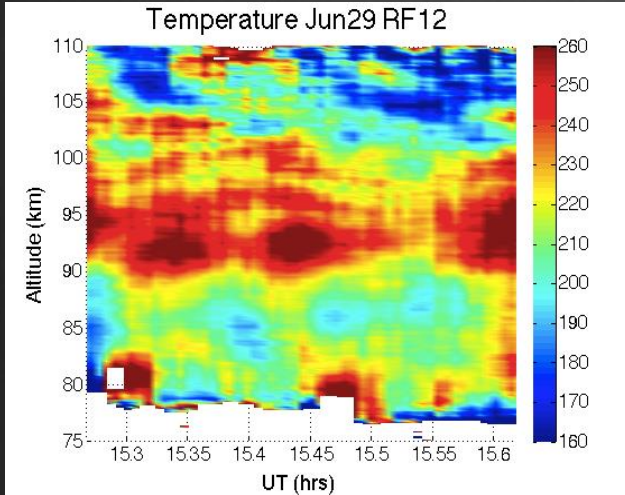


Some observations of overturning in the sodium density

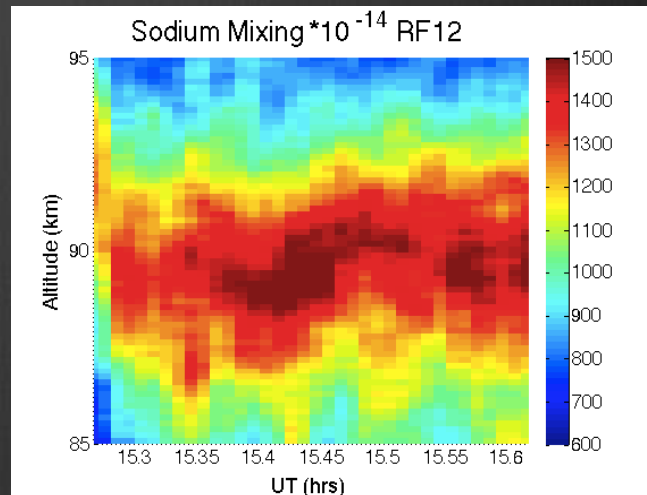
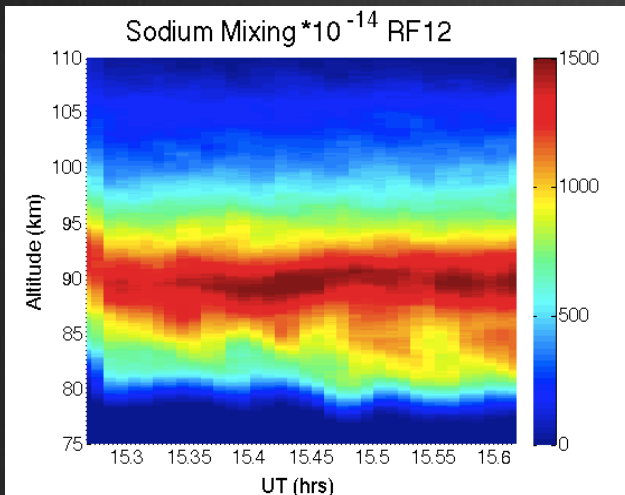
RF12

RF12 Over Mt. Cook

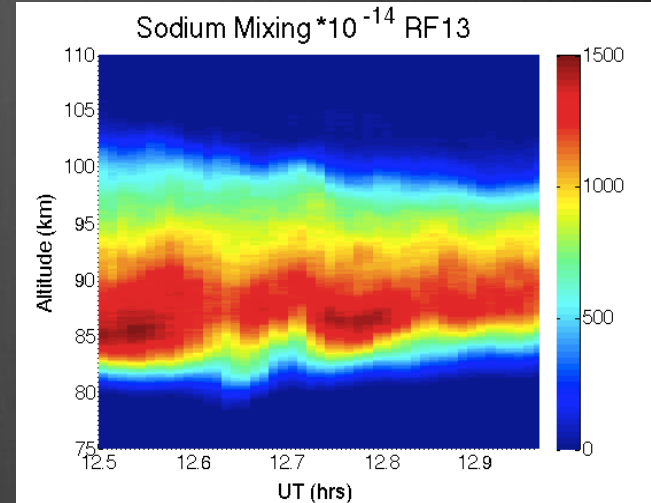
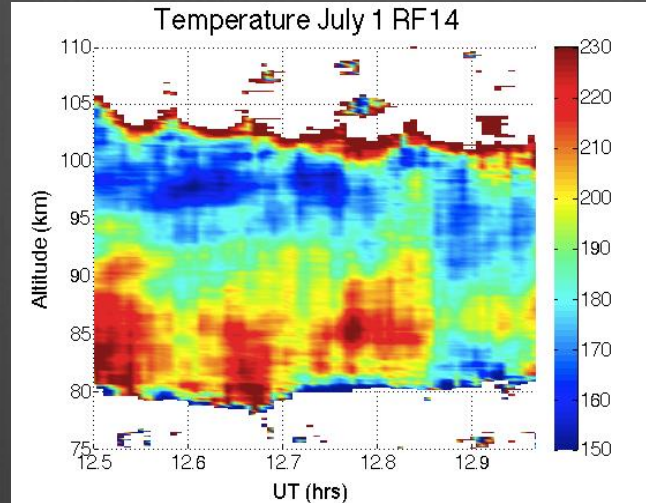
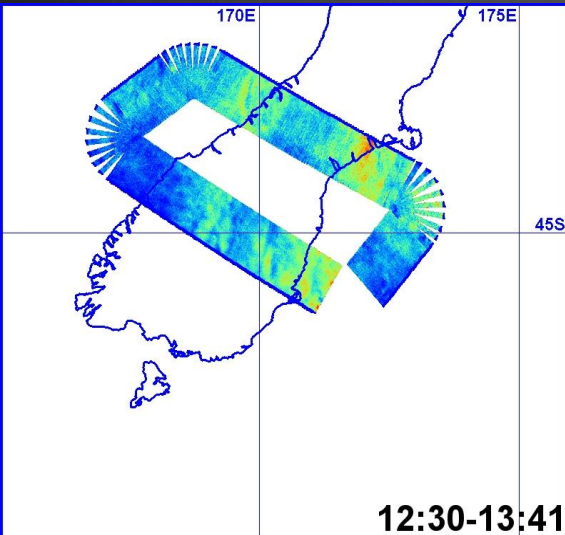
Multiscale GW activity
and events observed in
temperatures



Overtuning
and instability
observed
throughout
sodium density
layer.

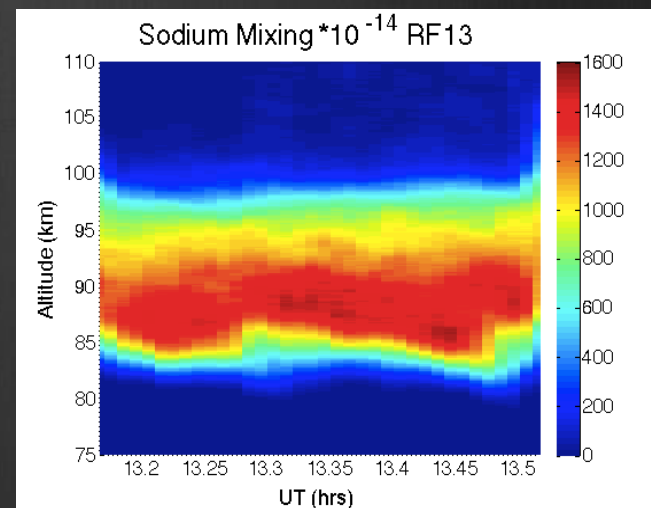
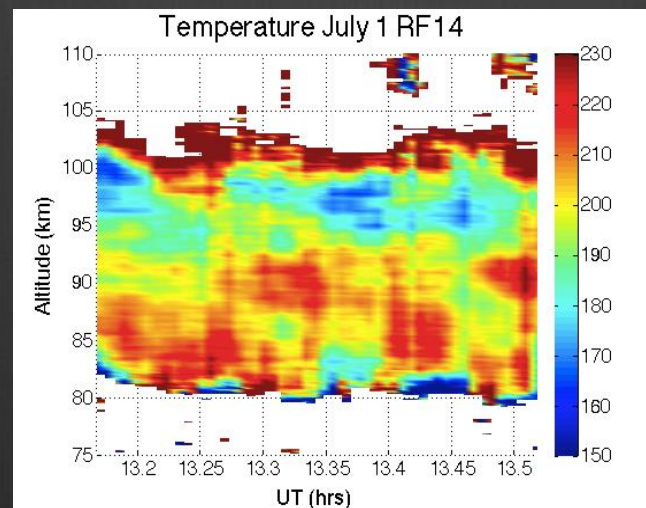


RF13



Above: East to West flight track

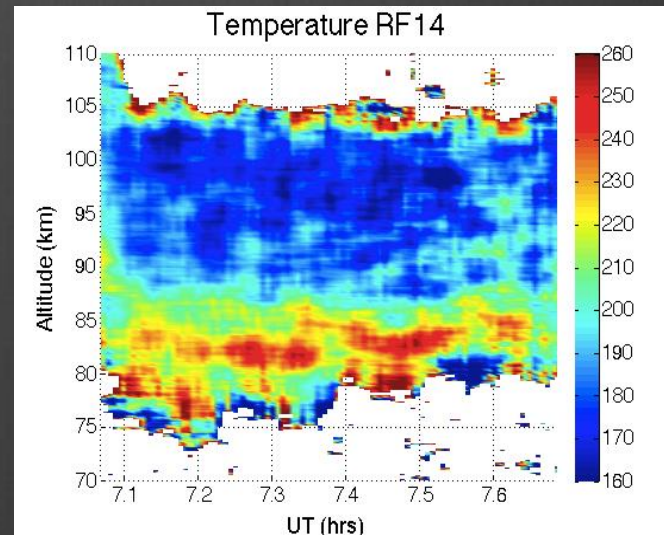
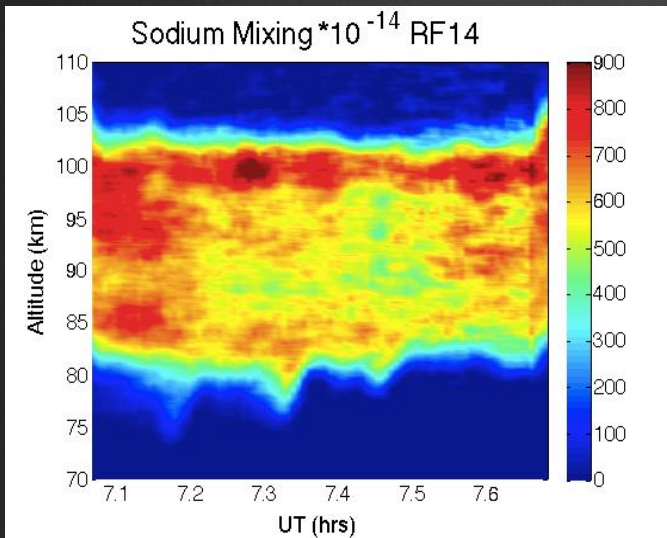
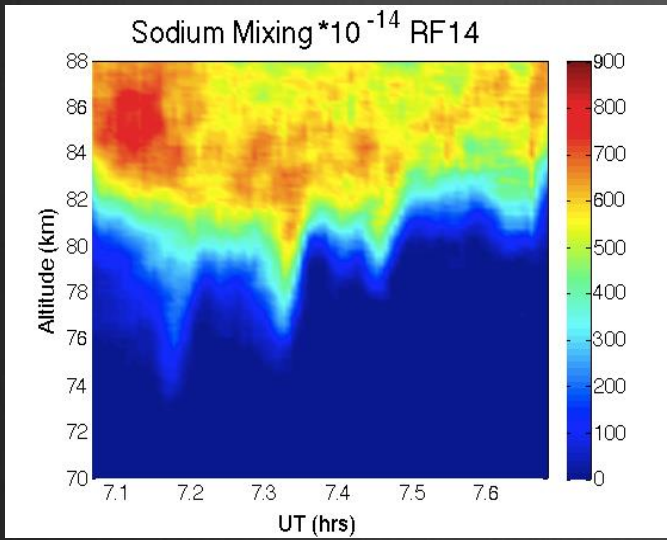
Below: West to East flight track



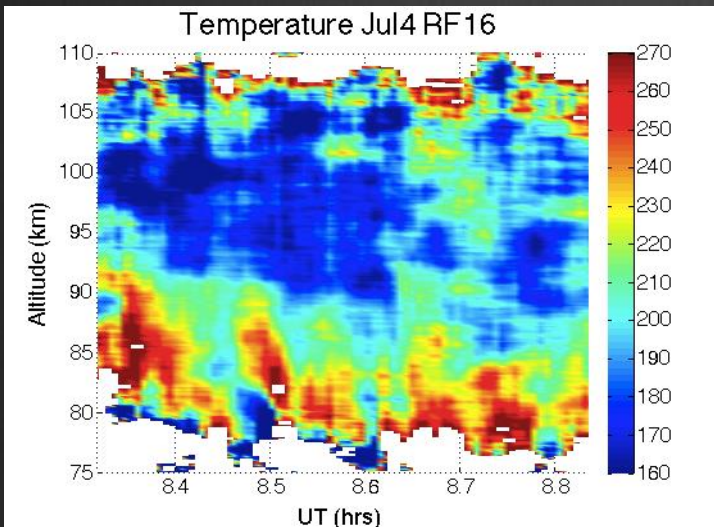
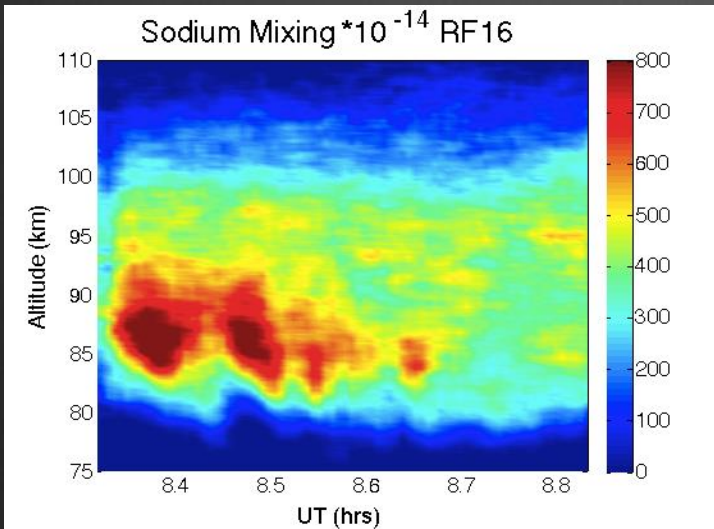
Larger horizontal
scale GWs observed
over south island of
NZ

RF14

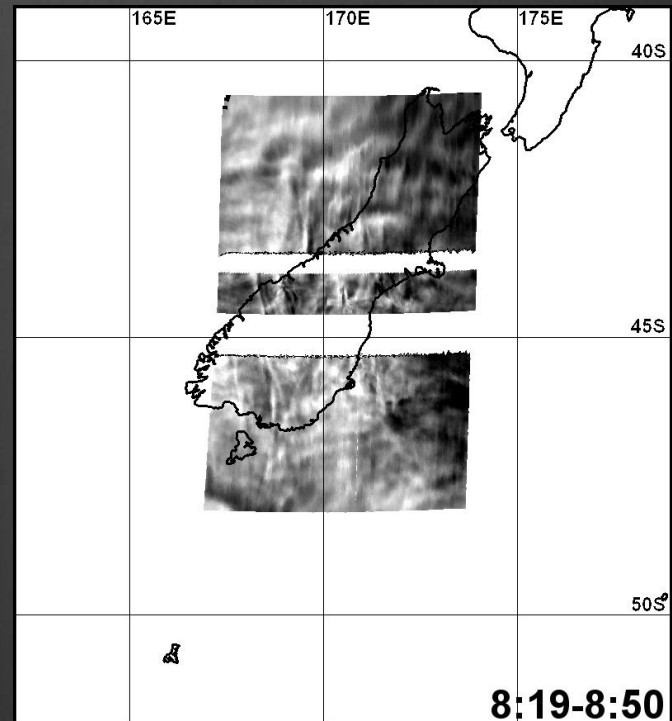
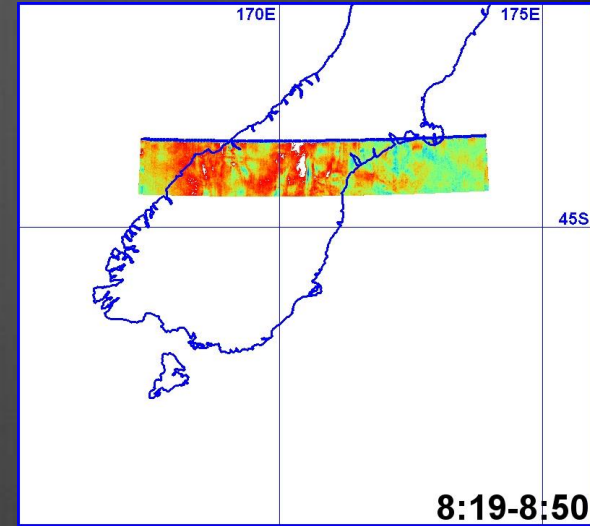
GWs observed over the south island of NZ during the beginning of the flight. Both temperatures and densities are available.



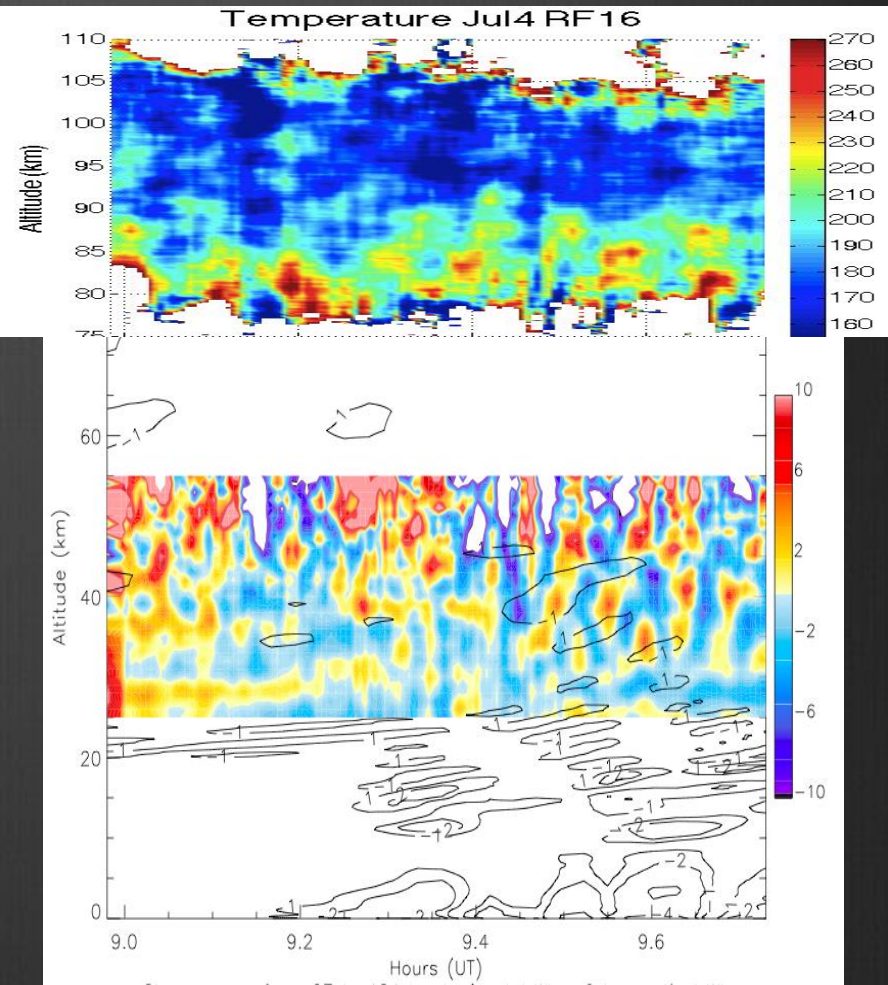
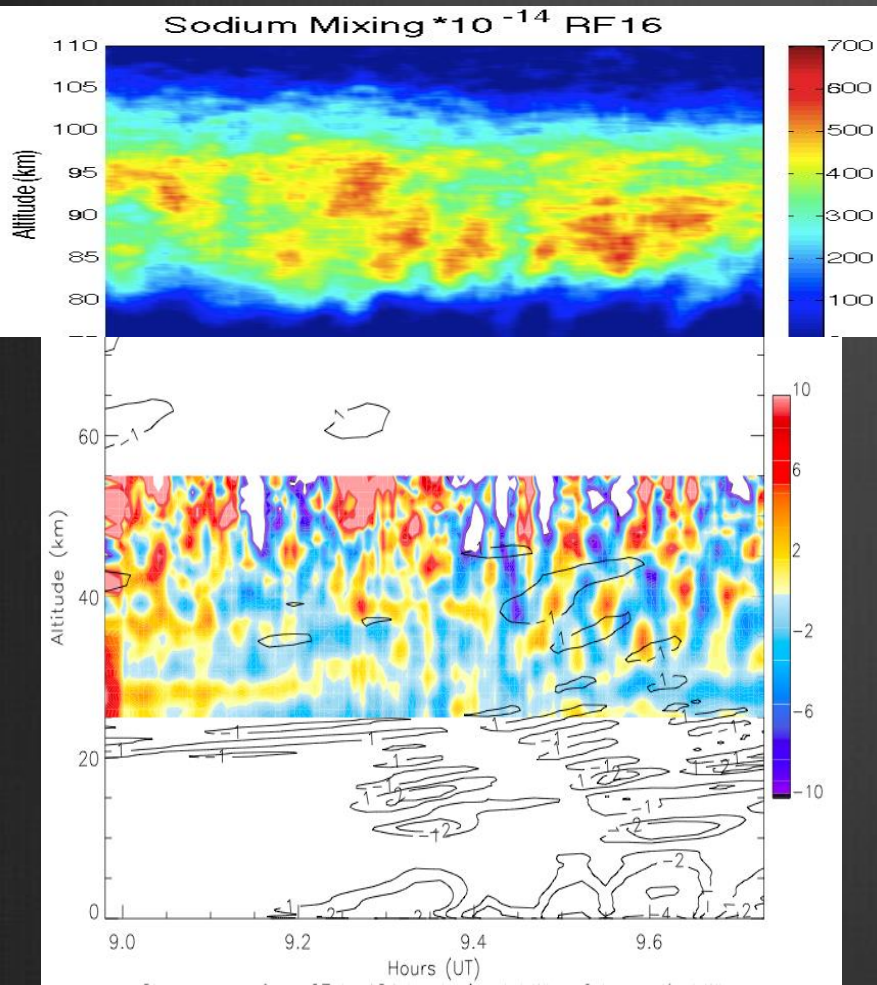
RF16



Very large amplitude
GW event observed
over south island.

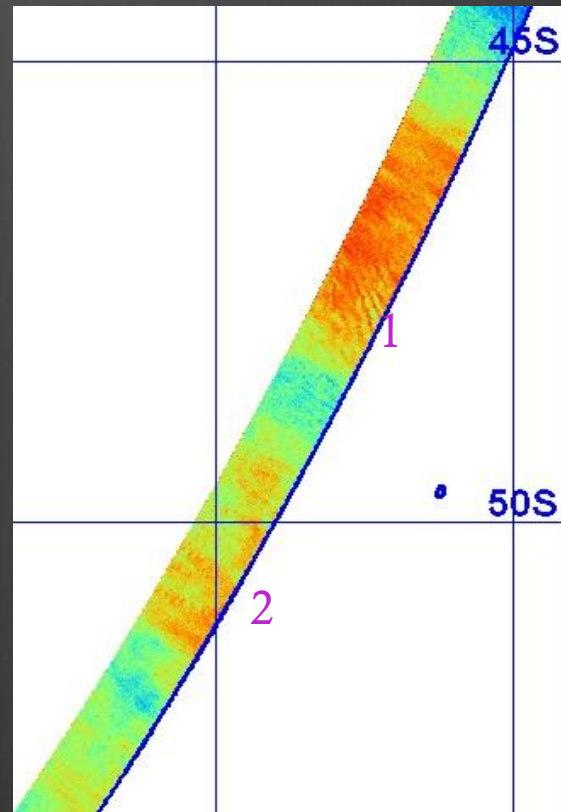
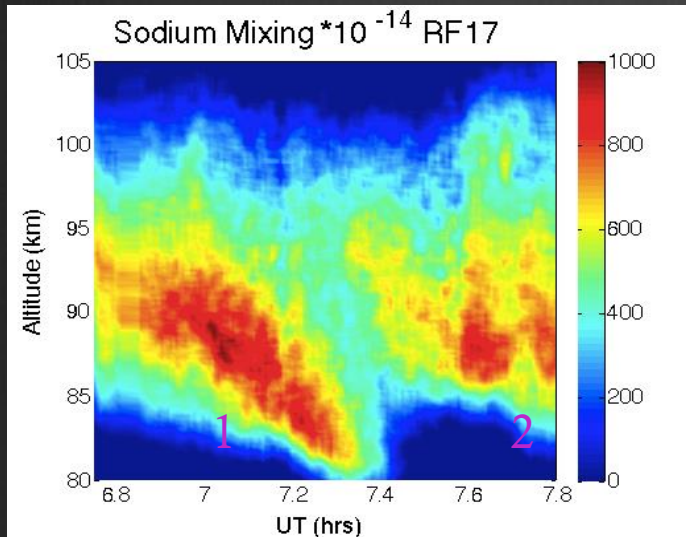
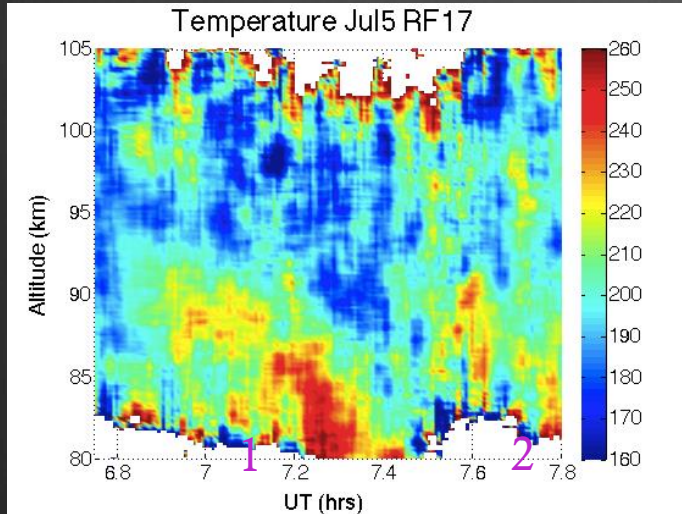


Combined Rayleigh and Sodium Lidar RF16

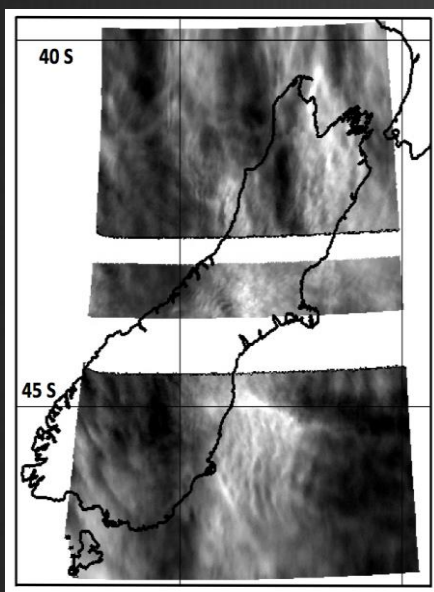
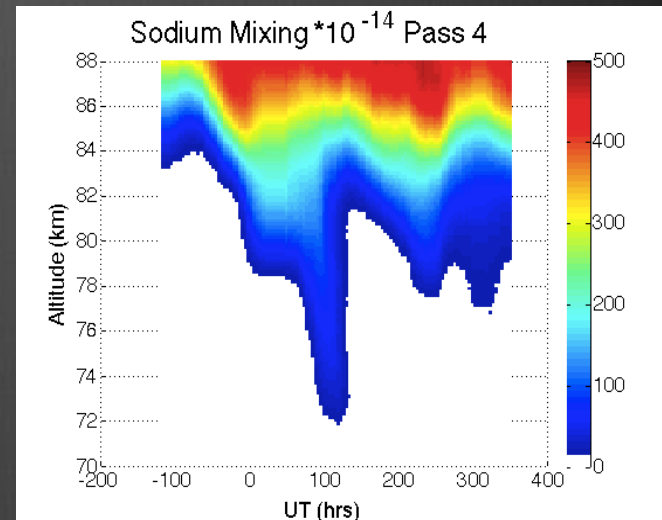
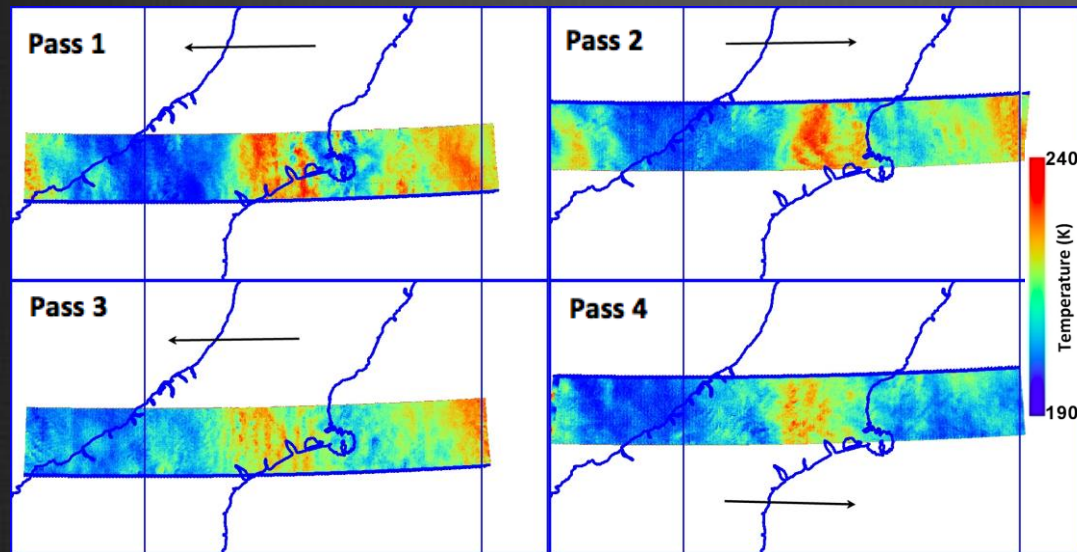


RF 17

Multi-scale GW activity observed throughout various regions of this flight.



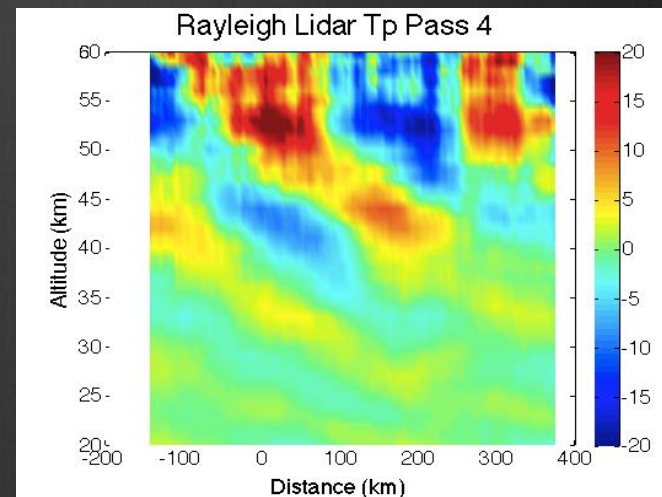
RF22



Multiple scales of GWs observed:

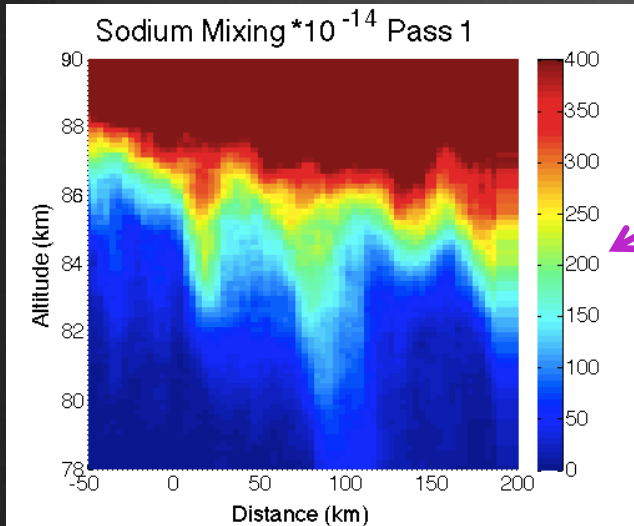
~240km most clearly visible, seen in sodium lidar, UV lidar, and AMTM

-Large amplitude smaller-scale ~30km GWs also observed



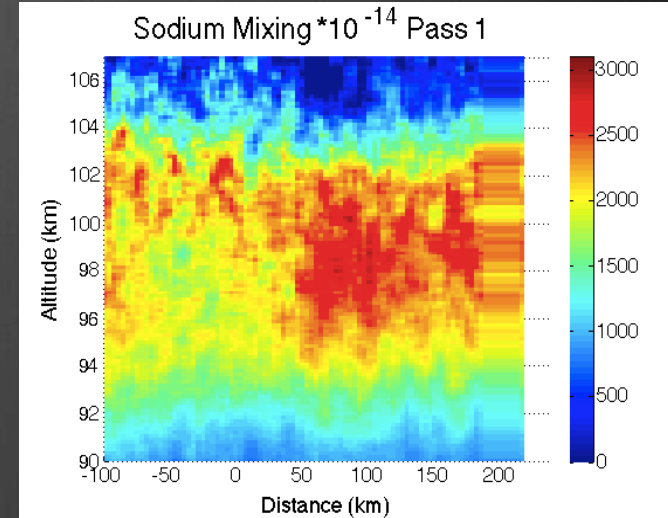
RF22

Pass 1 across the island



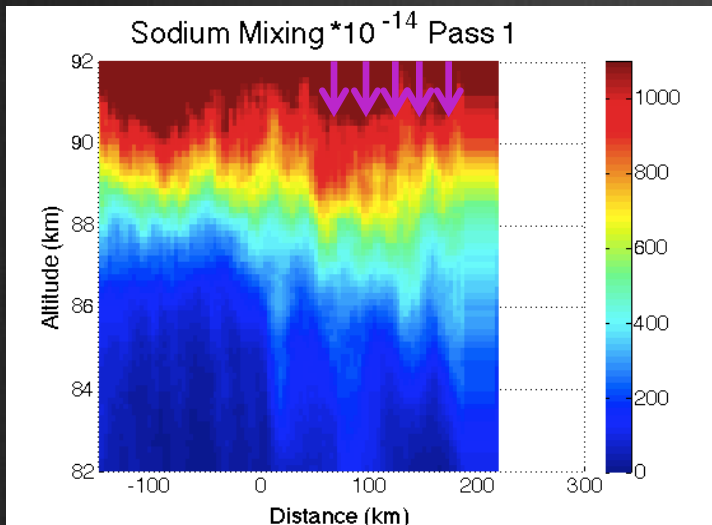
-Larger scale waves (~60km) visible at lower altitudes.

-No small scale waves visible below 86km



-Small-scale waves appear to have eastward phase progression

-small-scale waves may be propagating to high altitudes near 100km or higher

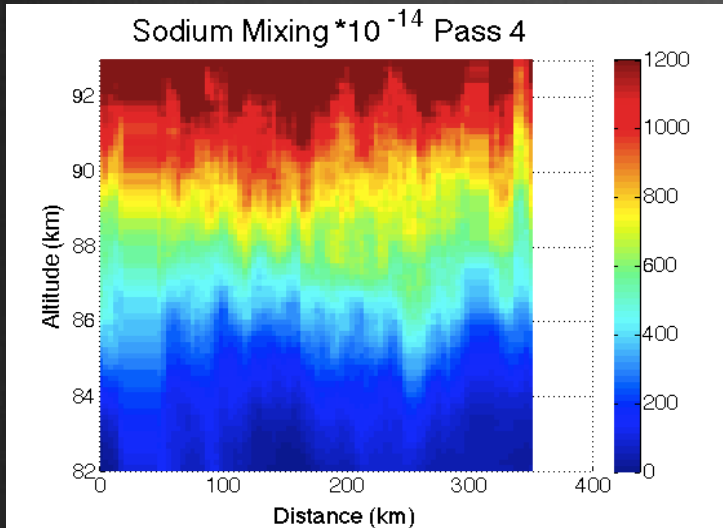


-Large scale waves may be approaching critical level near 90km

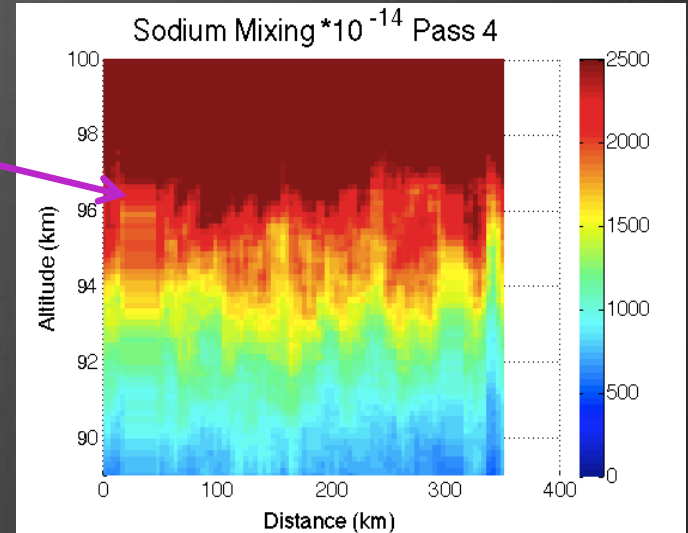
-Small-scale (~20-30km) waves visible starting above 86km

RF22

Pass 4 across the island



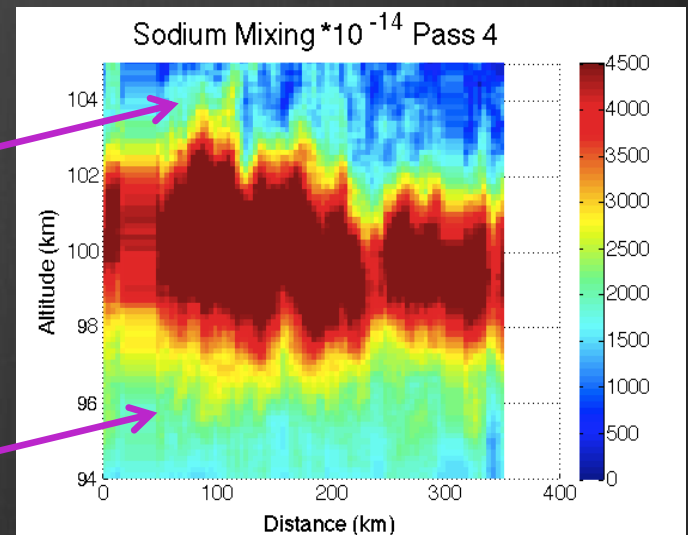
Eastward propagation observed at higher altitudes near 96km



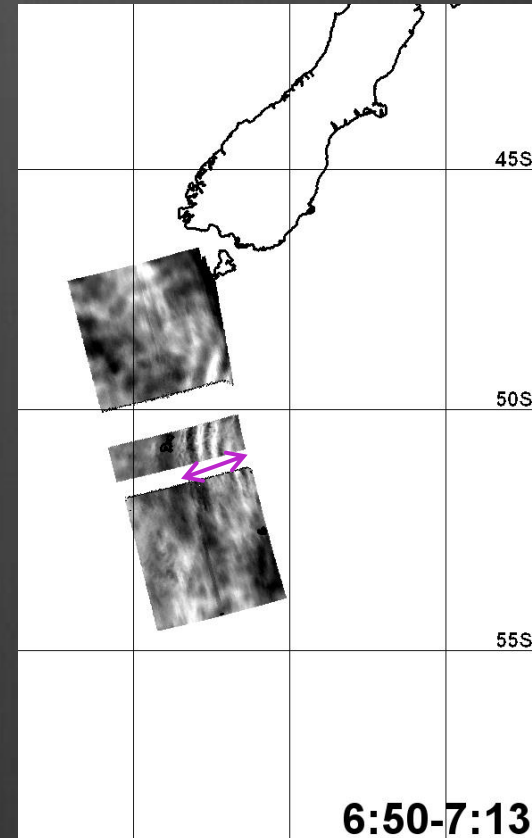
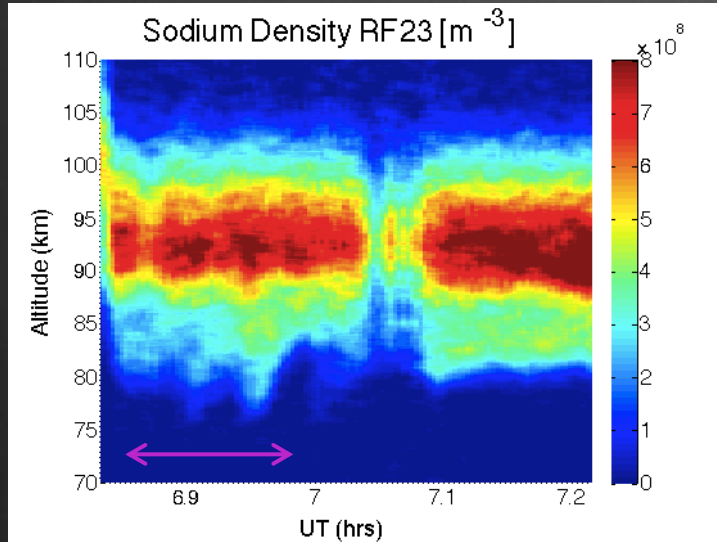
-Similarly observed small scale GWs at higher altitudes

-Slightly different location

Smaller scale waves visible as high as 104km



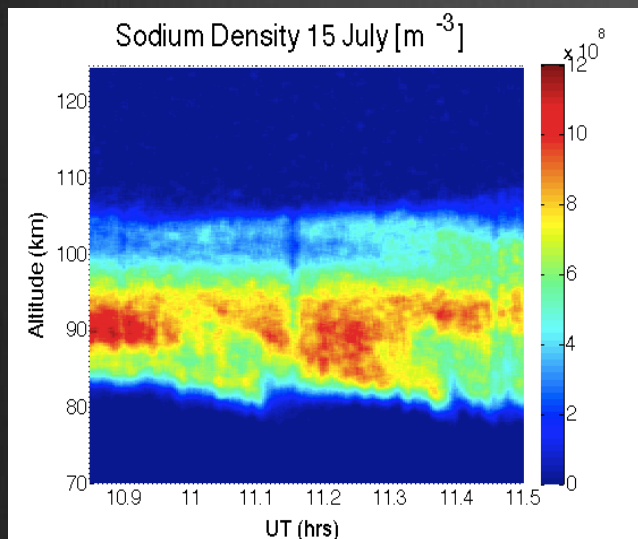
RF 23



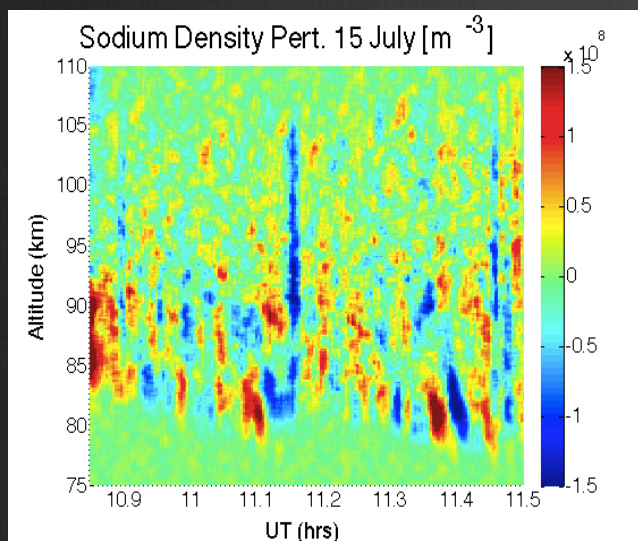
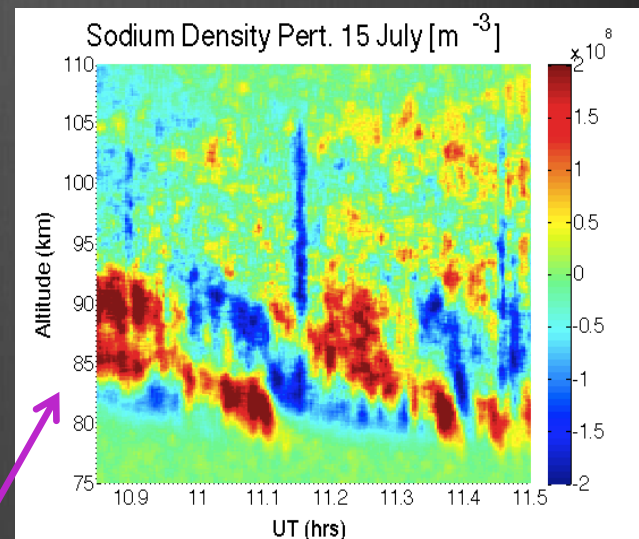
-Lidar off for most of flight due to flight altitude.

-One coincident measurement of large amplitude GW event before lidar was shut off

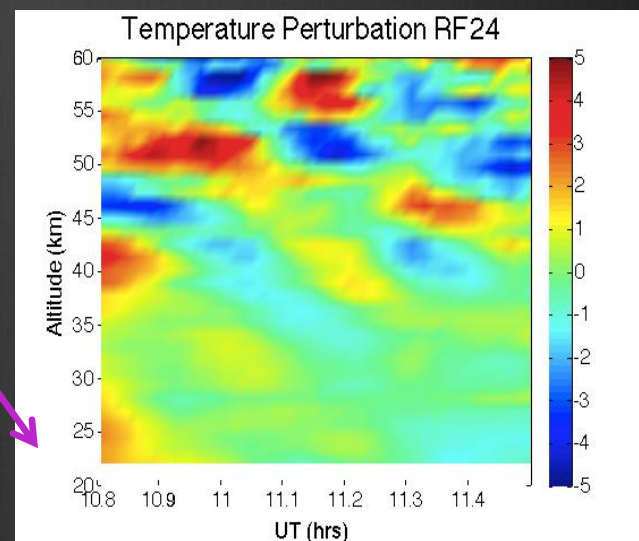
RF 24



Various scales of
density perturbations
observed
-5 minute
-15 minute



Larger
perturbations
appear to match
with Rayleigh
lidar temps lower
down



Questions and Discussion