Wave Interactions
Using Lidar and AMTM measurements
- Multiple waves observed in the sodium density
- Longer period wave (~15 minutes) has shorter vertical wavelength (10-15km)
- Shorter period wave (<5 minutes) has long vertical wavelength

** note: periods dependent on aircraft speed.
Relation to waves in MLT to Stratosphere?

Rayleigh lidar shows multiple scales of waves at lower altitudes.

Larger scale wave observed in UV lidar. Similar period to wave in sodium density.
AMTM Measurements

Multiple scales of temperature perturbations observed in AMTM similar to sodium density observations.
Filtered AMTM Data

Small scale waves observed in both AMTM and sodium data. Wavelengths on the order of 10’s of km.
Filtered AMTM data

- Larger scale waves visible in both data sets as well.
- Larger scale waves may be between 100-300km
Smaller scale waves appear to follow direction/orientation of larger scale waves in keograms.

Note from sodium density plots previously shown, the vertical wavelengths are different for the longer and shorter period waves.
Deepwave
13 July (RF 22)

Strong waves observed in sodium density layer.

Sodium density perturbations down to 70km!
AMTM comparison
East to West

Comparisons of AMTM and sodium densities show correlations between temperature and large density perturbation observed below 80km.

The phase is slightly offset showing evidence of upward propagating wave.
AMTM comparison
West to East

Flight legs in opposite direction show opposite phase lag/lead between sodium density at 80km and AMTM temperature (centered at ~86km) giving further evidence of propagating wave.
AMTM

Flight legs

Warm phase of event observed over NZ, West of Christchurch

On second and third leg of flight, small scale wave features observed in the warm phase.

Wave A and B appear to be different.

- Wave A moving slowly towards west.
- Wave B moving quickly towards the east.
Conclusions

• Multiple scales of waves present in sodium densities

• Similar waves observable in AMTM data

• Potential link between warm phase of wave and smaller scale wave propagation