Advanced Mesospheric Temperature Mapper (AMTM)

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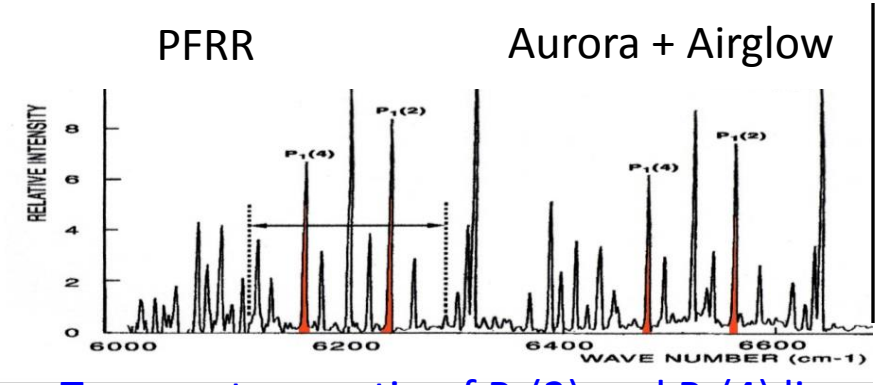
Advanced Mesospheric Temperature Mapper

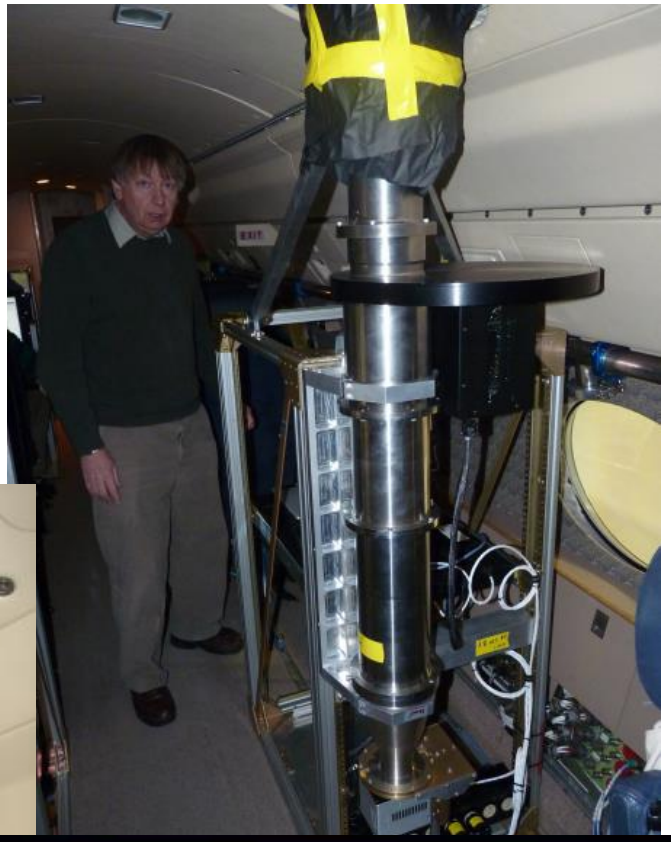
- High-resolution gravity wave intensity and temperature maps, and phase relationship.
- IR imager (~1.55μm) OH (3,1) band at ~87 km.
- Large format (120° FOV) fast (f/1) telecentric optics. Precision ~1 K in <30 sec.
- 2 systems operating: at ALOMAR (69 °N) and at South Pole (past 3 winters).
- **New GV AMTM** (80° x 60°) FOV. Operates at higher 4 sec cadence, 15 sec for temperature map, precision 1-2 K.

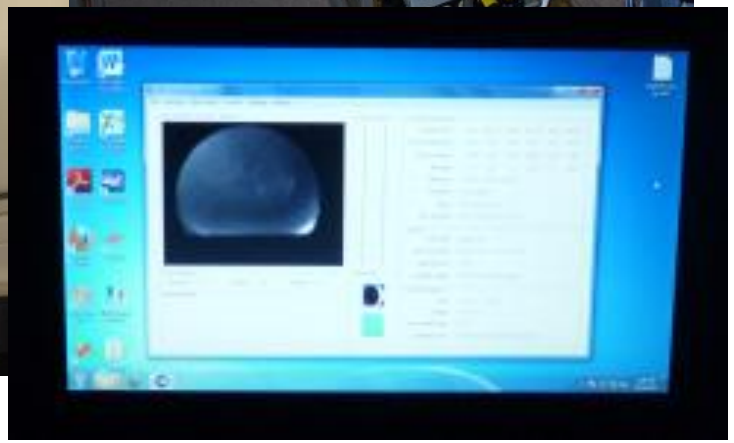
Data since 2011 (3 winters each site)



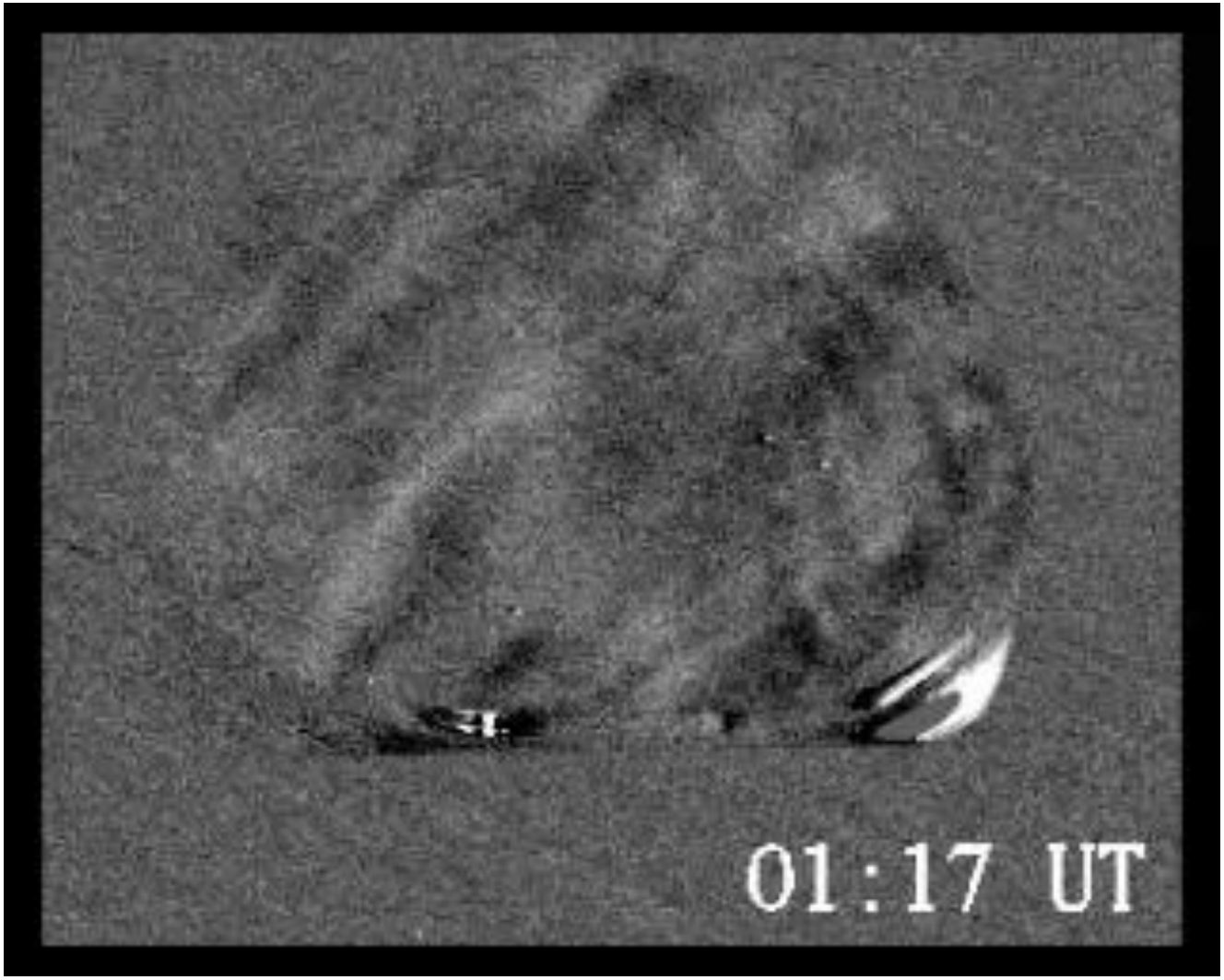
Temperature: ratio of $P_1(2)$ and $P_1(4)$ lines

Test Flights – Broomfield CO – Feb 2013





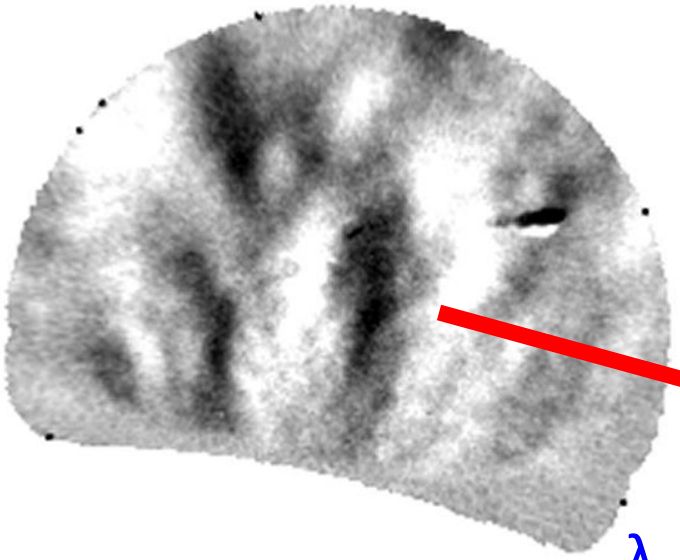
DEEPWAVE Test Flight Western USA (February 22-23, 2012)



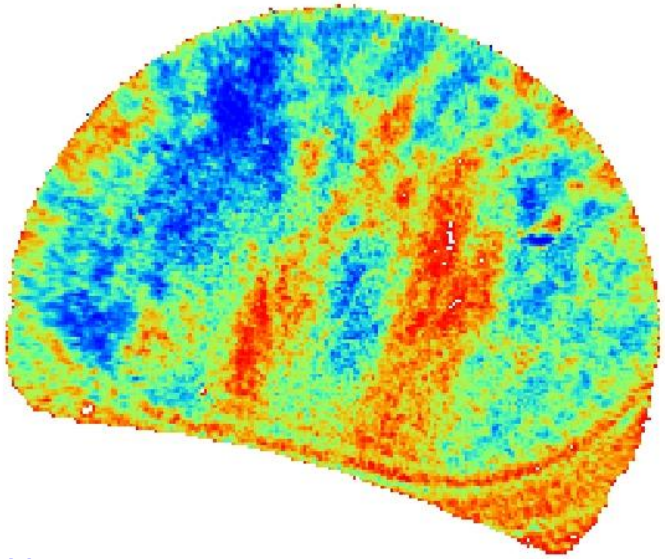
OH (3,1) Band Intensity Movie, Duration ~3.5 hours

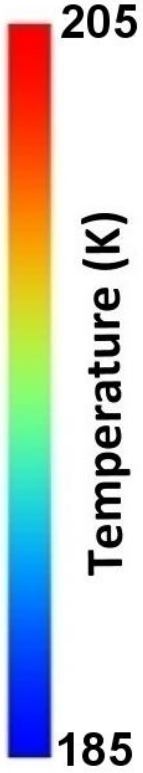
Example GW Data, Feb 22-23, 2012

OH P_{12} (3,1) line



OH (3,1) rotational temperature





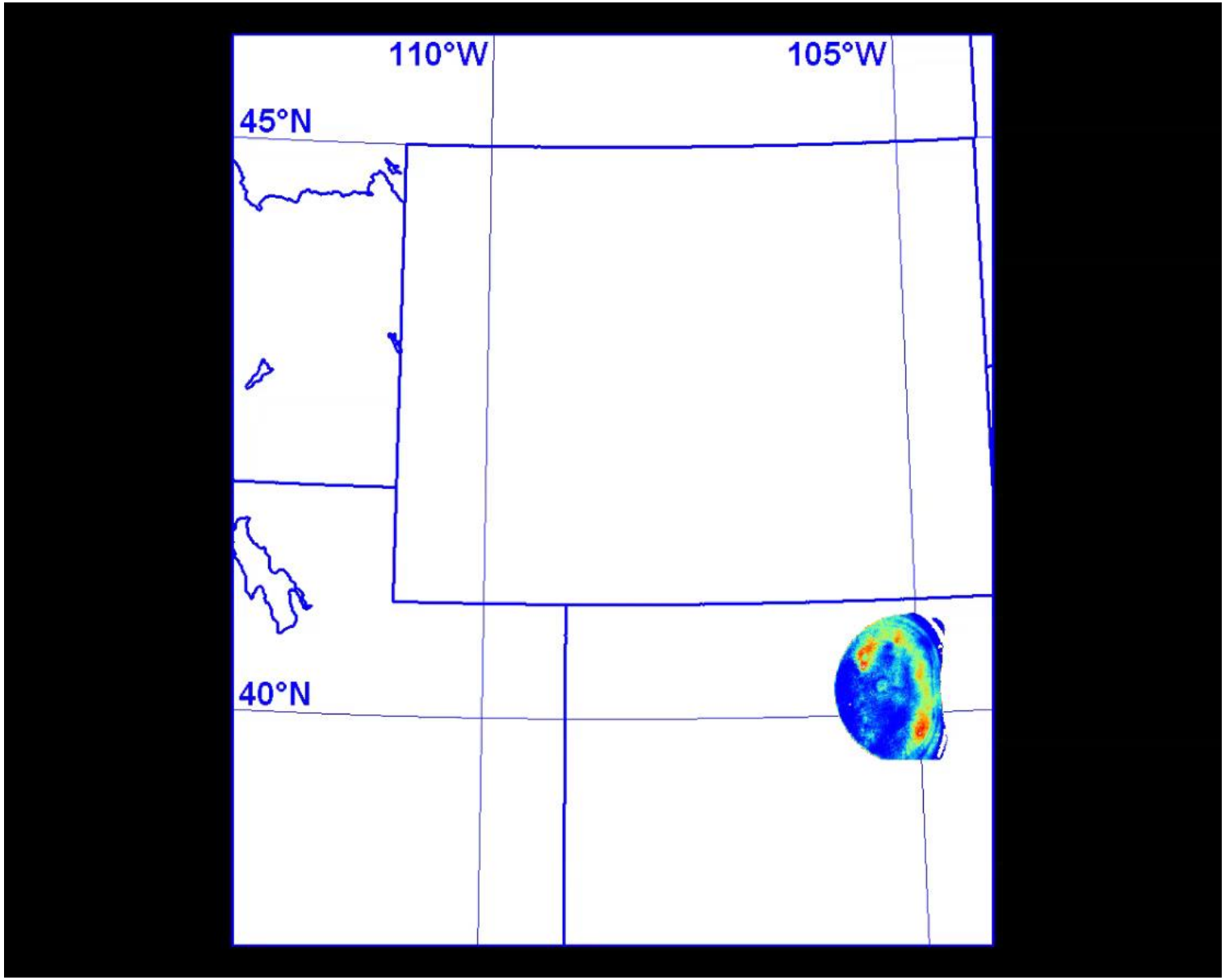
λ_z = 30 km

V ~ 44 m/s

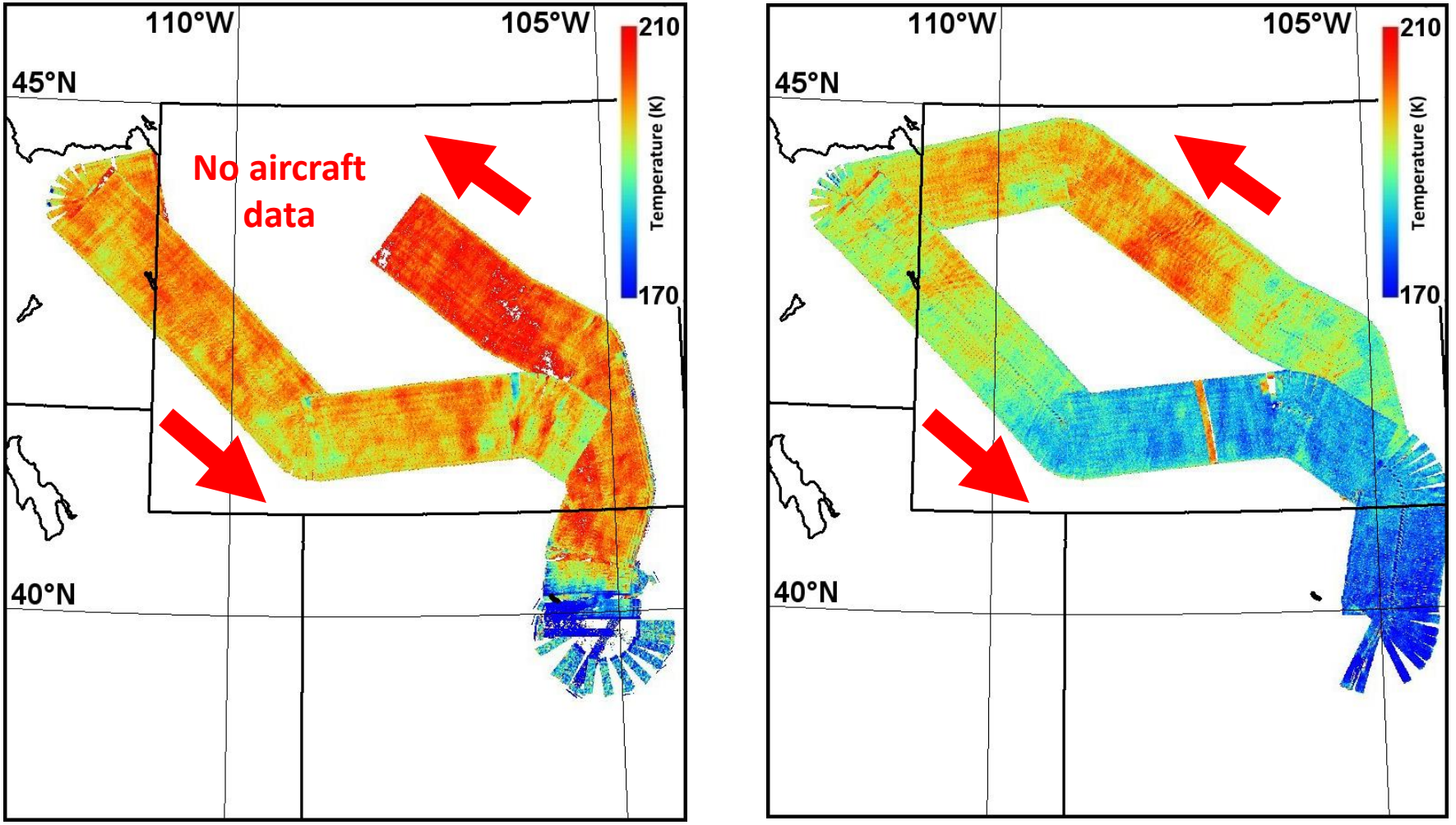
T= 11.4 min

Direction = 114°

OH Temperature Movie – Feb 22-23

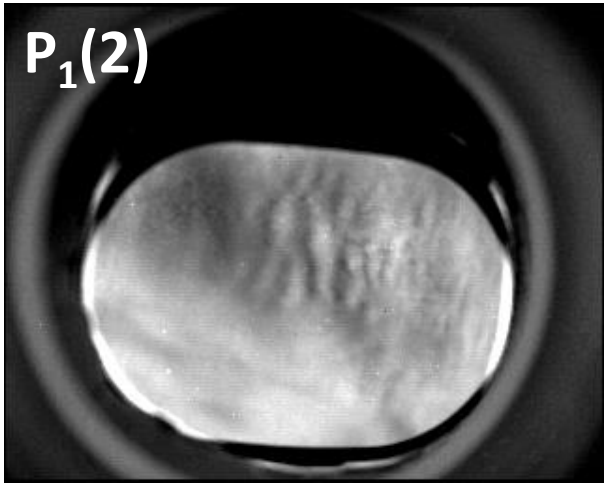


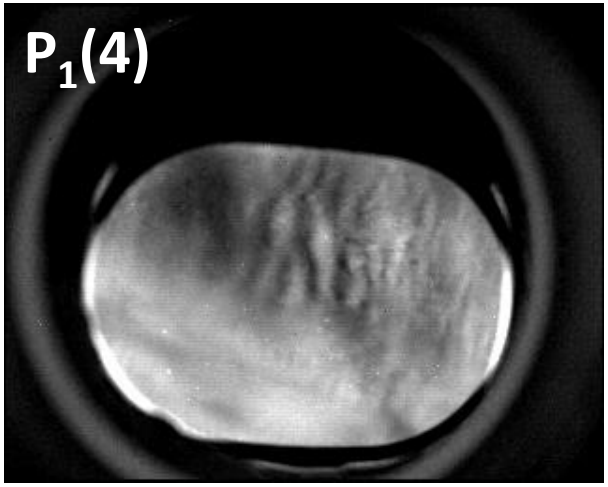
OH (3,1) Temperature Keogram – Feb22-23

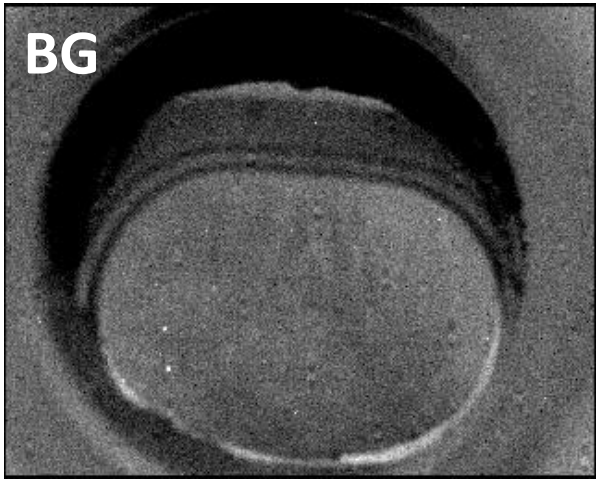


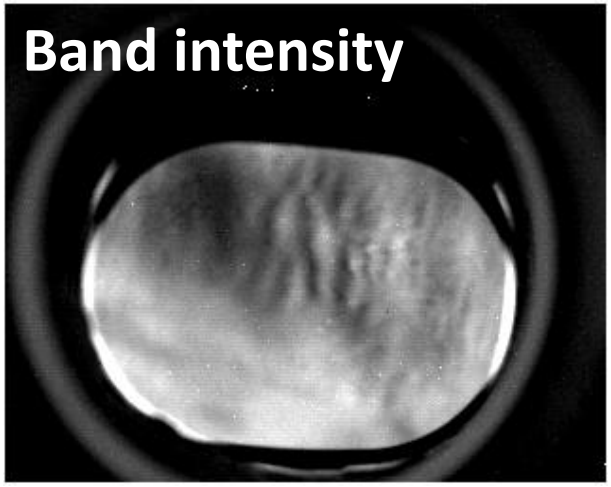
1st loop 3.5 hr duration 2nd loop

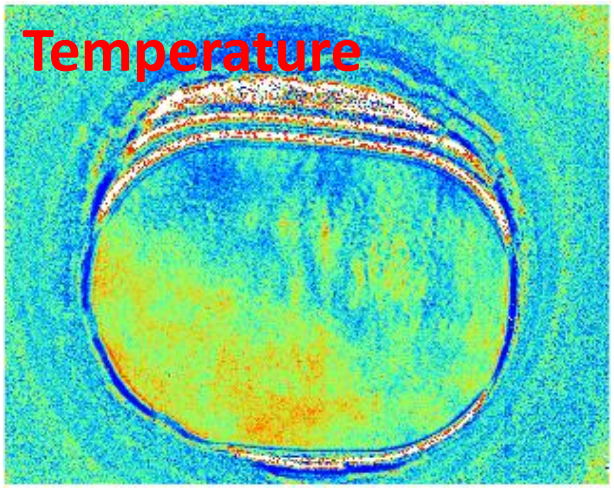
Post Test-Flight AMTM Measurements at USU with Correct GV Window







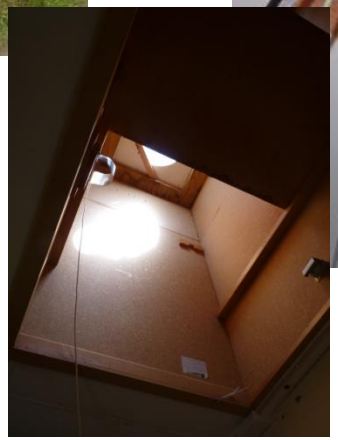




No more interference patterns!!!

Planned Ground-Based AMTM Measurements, Lauder Observatory NZ, (45.0°S)

In addition to the GV AMTM data we plan to use a second AMTM (currently at ALOMAR, Norway) to make ground-based measurements from Lauder alongside a DLR lidar, and in conjunction with existing radar and all-sky measurements.



Lauder observing hatch

Ground-Based Correlative Measurements at Lauder Observatory

Lauder is ~5hrs drive from Christchurch

Ground-Based Support
Lauder Observatory,NZ (45.0°S)

Contact person: Ben Liley (Ben.Liley@niwa.co.nz)

For more information:

http://www.niwa.co.nz/our-science/atmosphere/lauder

Summary

- AMTM measures intensity and rotational temperature of the OH emission at ~87km
- Temperature/intensity maps every ~15s over a ~120x80km region
- Successful test flight measurements, February-March 2013
- Imager operated well even during full moon conditions
- Analysis of intensity and temperature maps reveals high-quality wave data with high precision measurements (1-2K).
- Unexpected interference pattern shown to be due to wrong window (our IR window was accidentally switched with the lidar UV window during installation)

Current Activities:

- Running AMTM alongside the USU Na lidar in Logan, UT, since May 2013.
- Detailed temperature calibration
- Improvements in the temperature processing and analysis techniques.