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 (\(~1.55\mu m\)) 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.

ALOMAR (69.3° N, 16.0° E)  South Pole (90°S)

Data since 2011 (3 winters each site)

PFRR  Aurora + Airglow

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

$\lambda_z = 30$ km

$V \sim 44$ 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

No aircraft data
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.
Ground-Based Correlative Measurements at Lauder Observatory

Lauder is ~5hrs drive from Christchurch
Ground-Based Support
Lauder Observatory, NZ (45.0°S)

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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.