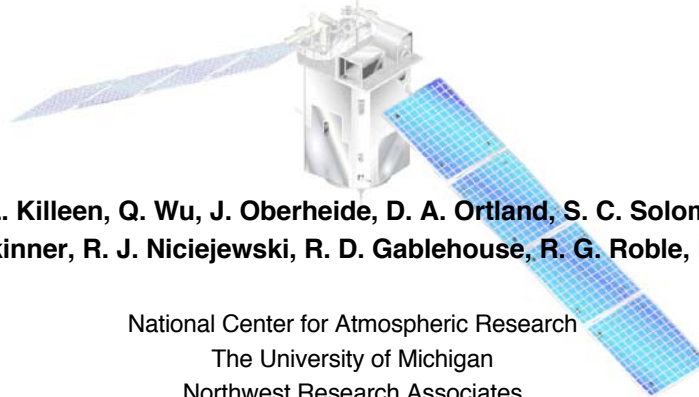




TIDI Observations of Mesosphere and Lower Thermosphere Tides in Neutral Winds



T. L. Killeen, Q. Wu, J. Oberheide, D. A. Ortland, S. C. Solomon,
W. R. Skinner, R. J. Niecejewski, R. D. Gablehouse, R. G. Roble, M. Hagan

National Center for Atmospheric Research
The University of Michigan
Northwest Research Associates



NCAR

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Summary of Presentation

- Overview and status of the TIMED Doppler Interferometer
- Measurements of migrating diurnal and semi-diurnal tides
- Amplitude and phase analysis of migrating tides, and comparison to GSWM
- Non-migrating tidal analysis and model comparisons
- Use of a data assimilation model in TIDI measurement analysis
- New data from the O₂ Atm (0,0) P-branch “broadband” filter

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TIDI Overview

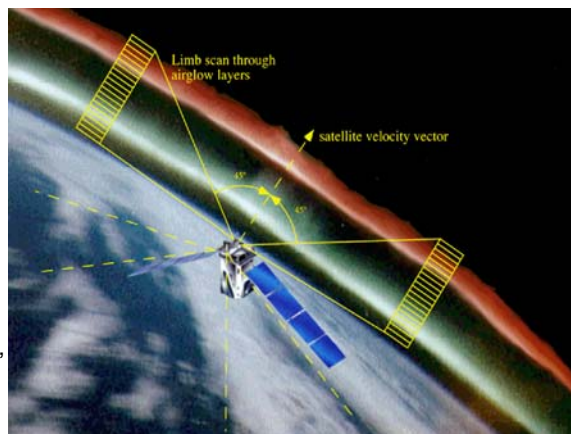
The TIMED Doppler Interferometer (TIDI) is a 4-telescope Fabry-Perot interferometer for measuring global winds and temperatures in the Earth's upper atmosphere

Primary measurement goal:
Global wind field, 60–180 km

Additional measurements:
Temperature, O₃ (day), O (night)

Primary emissions observed:
O₂ 1Σ (0-0) P9 line

Additional emissions observed:
O₂ 1Σ (0-0) P15, O(1S) "green line"



TIDI Viewing Geometry

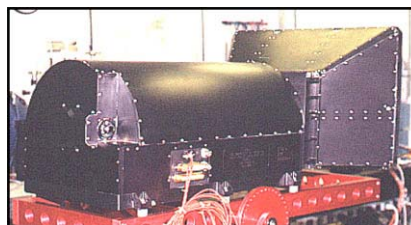
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Major Subsystems

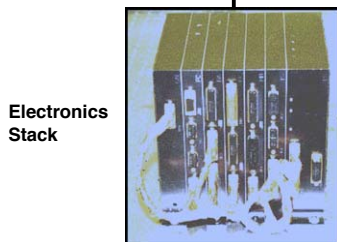


Telescope Assembly



Profiler

Fiber Optic & Electrical Harnesses



Electronics Stack

Power
1553

TIMED
Spacecraft
& MOC

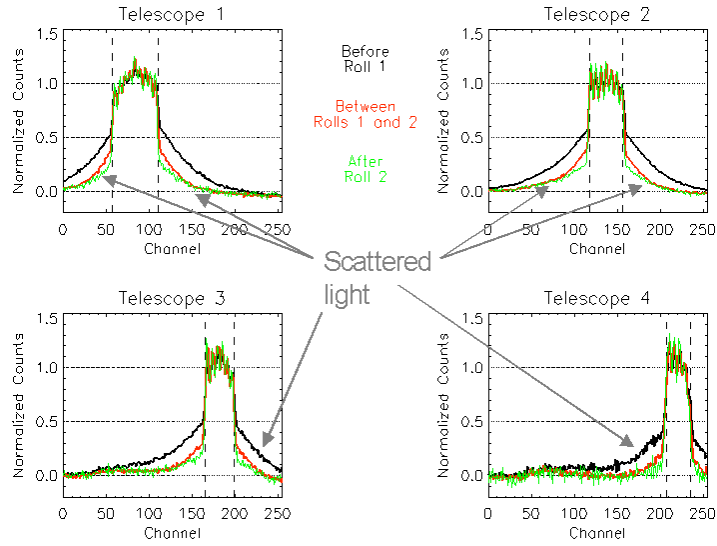
Internet

TIDI POC and
Data Processing
System

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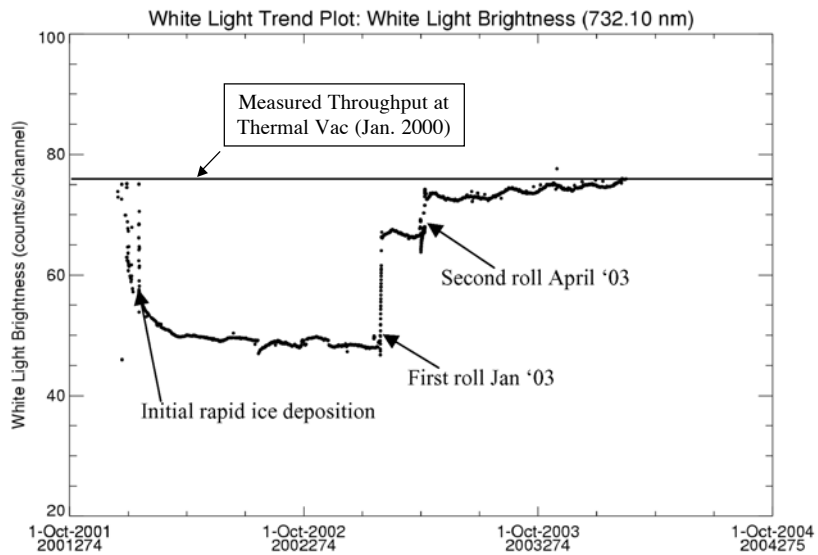
Reduction in Cross-Talk



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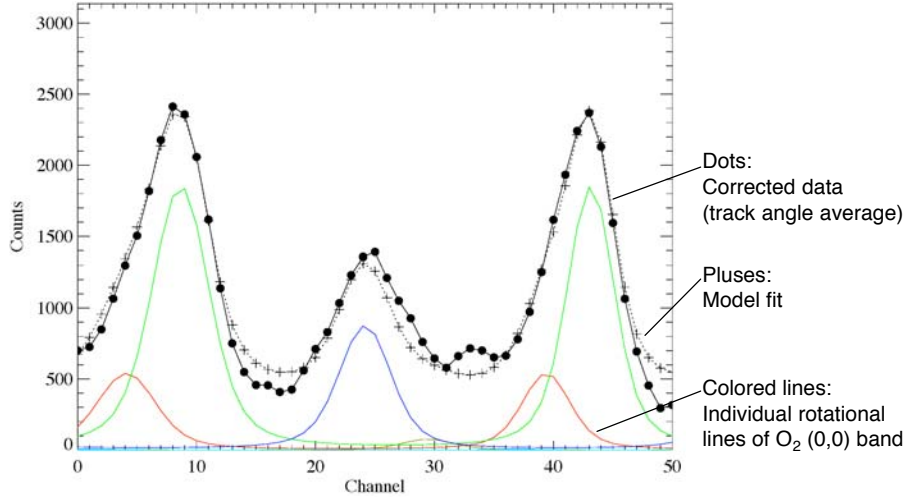
Improvement of White Light Throughput



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Data Reduction — Spectral Fit

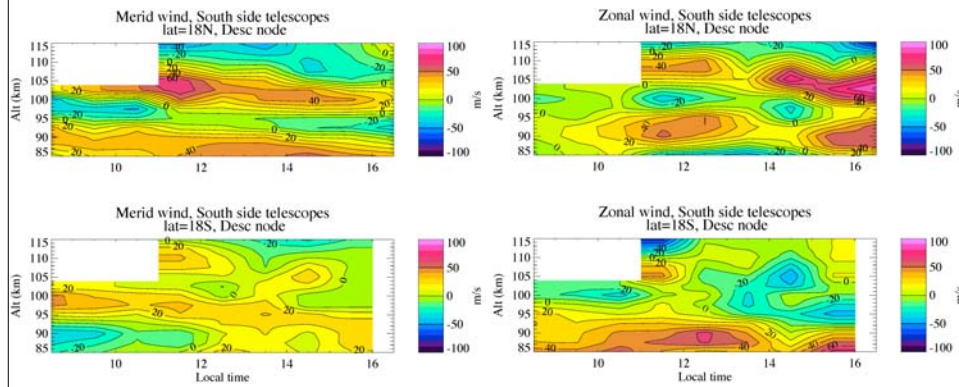


Forward model fit to spectrum

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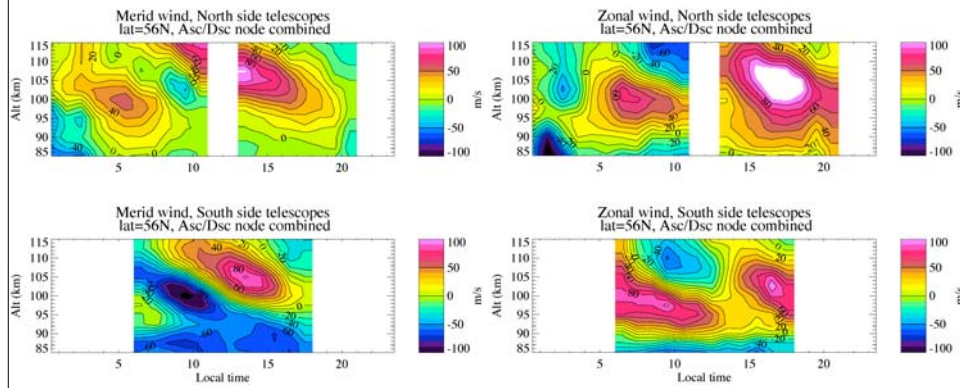
Measurement of the Migrating Diurnal Tide



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Measurement of the Migrating Semi-Diurnal Tide



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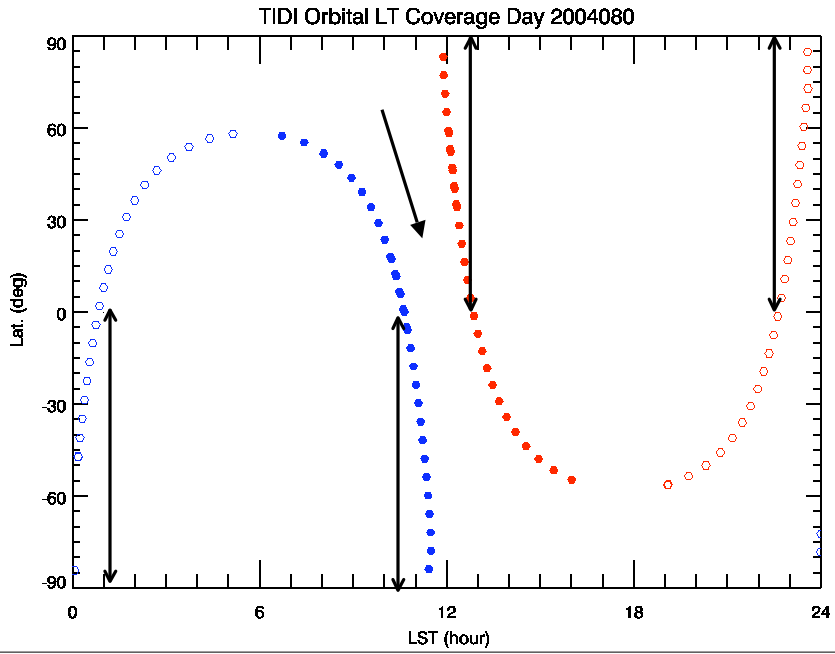
Tidal Amplitude and Phase Analysis

- Tidal analysis based on daily zonally averaged meridional winds
- Performed during each 60-day yaw period from 2003 to 2004
- Least square fit results for diurnal and semi-diurnal tides
- GSWM-00 model comparison

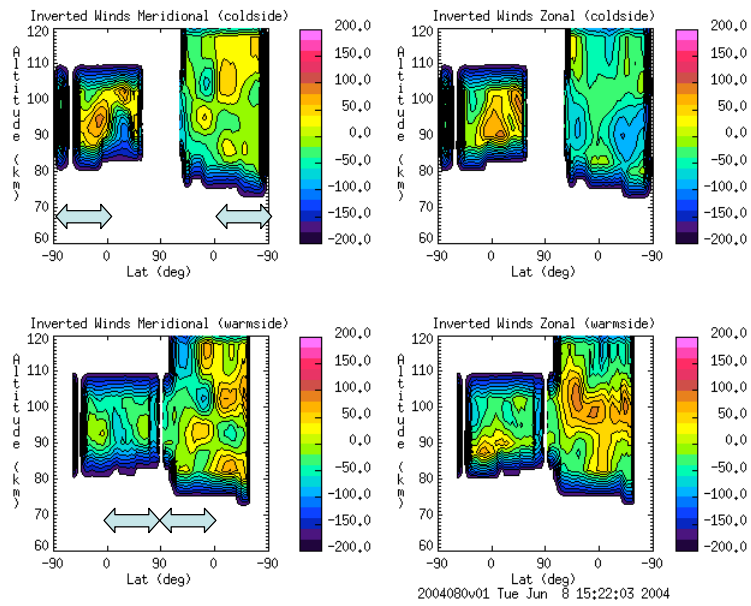
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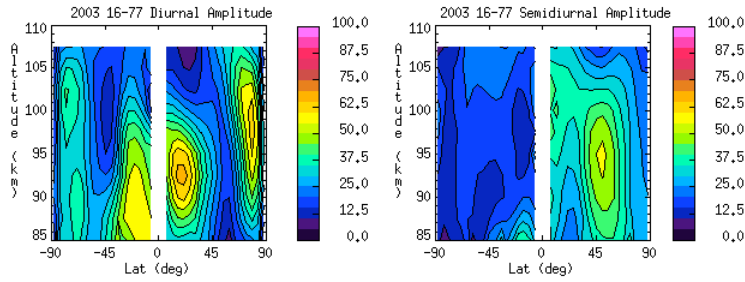
Example of TIDI Measurement Tracks



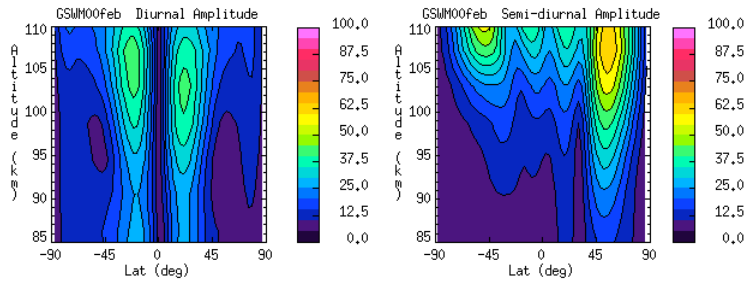
Example of Daily Zonally Averaged Neutral Winds



Meridional Wind Tidal Amplitudes, Days 16-77 of 2003



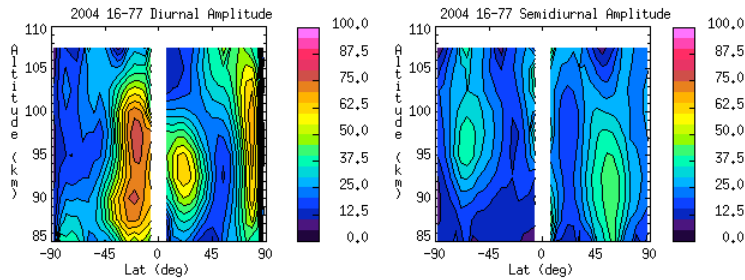
GSWM Amplitudes, February 2003



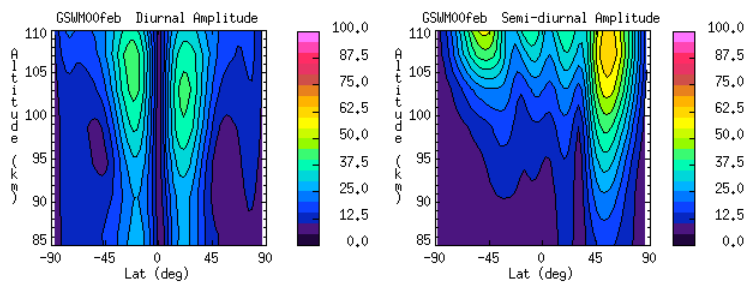
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Meridional Wind Tidal Amplitudes, Days 16-77 of 2004



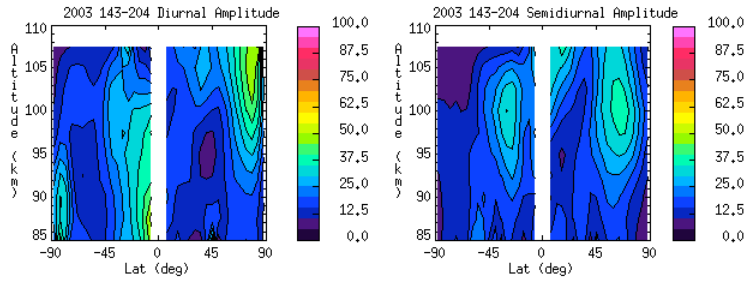
GSWM Amplitudes, February 2004



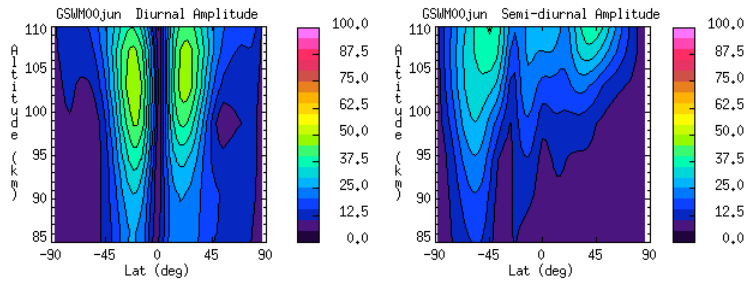
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Meridional Wind Tidal Amplitudes, Days 143-204 of 2003



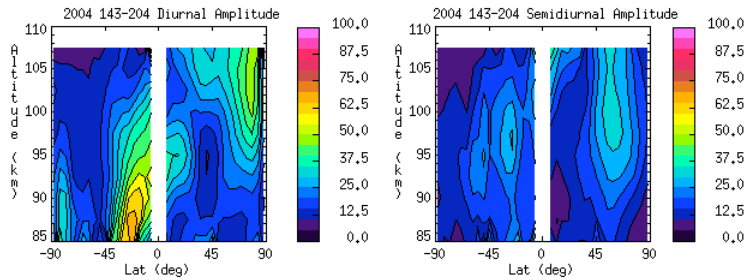
GSWM Amplitudes, June 2003



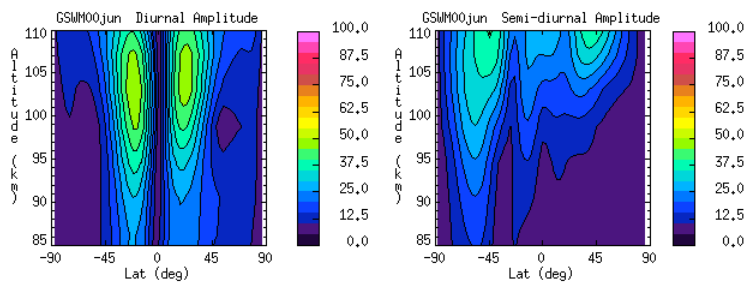
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Meridional Wind Tidal Amplitudes, Days 143-204 of 2004



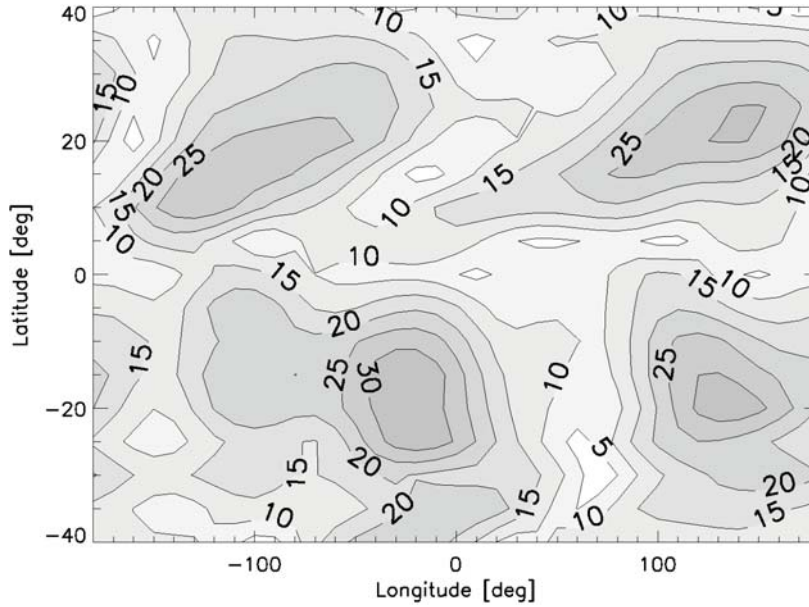
GSWM Amplitudes, June 2004



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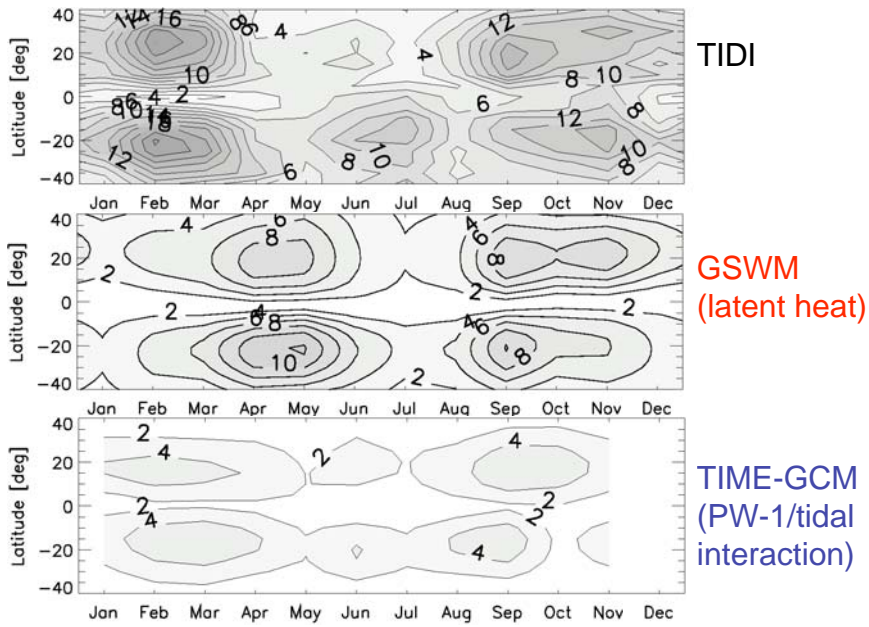
Diurnal Non-migrating Amplitude at 95 km, October 2003



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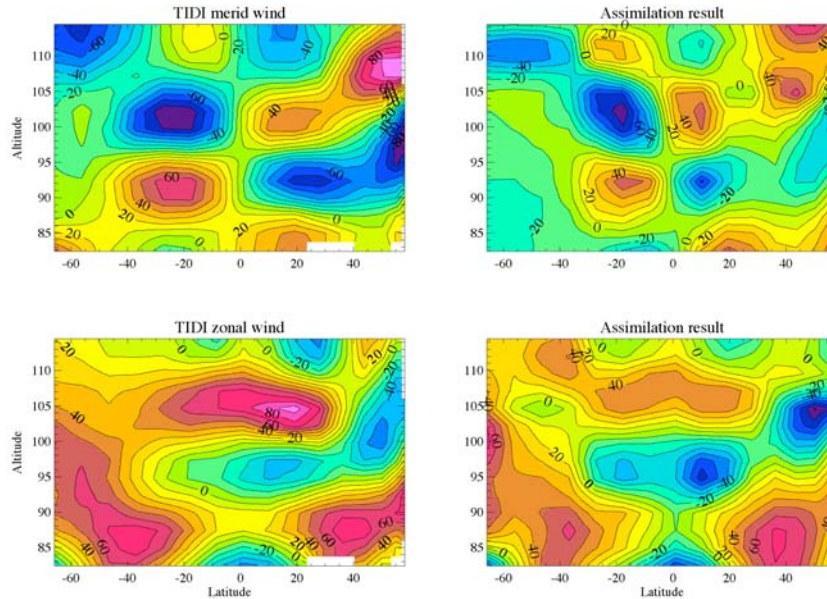
Non-Migrating W2 Tidal Analysis at 95 km



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TIDI Data Assimilation Model – Preliminary Results

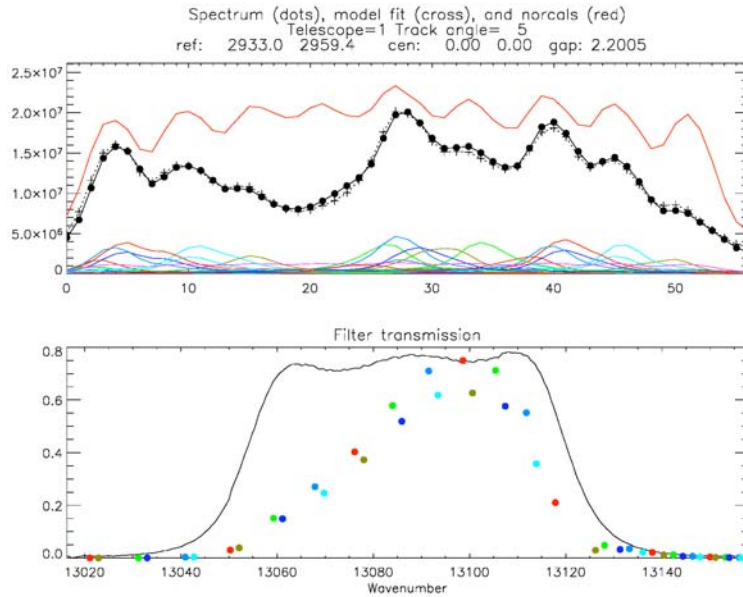


Data from March 1, 2004, meridional & zonal, descending node, warm side

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New Data from the O₂ Atm (0,0) P-branch Broad Filter

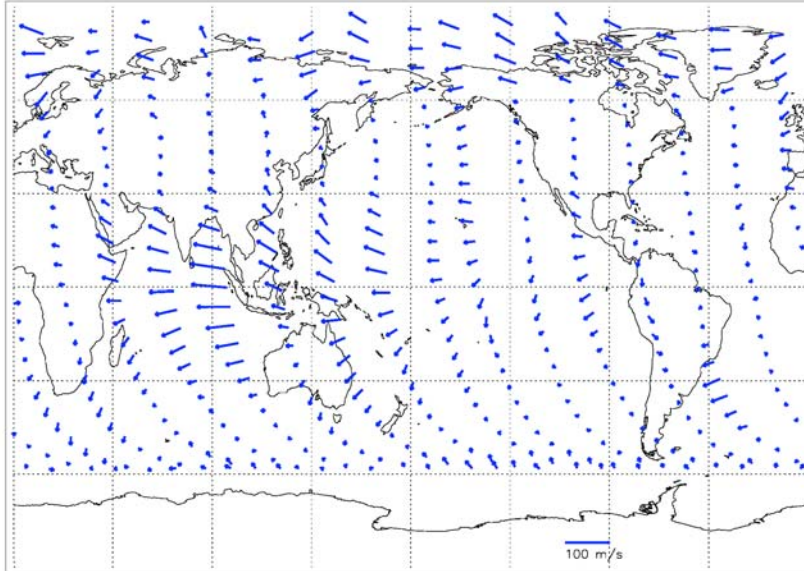


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New Data from the O₂ Atm (0,0) P-branch Broad Filter

TIDI Colside Winds ct 96. km DAY 2003320



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Conclusions

- TIDI data quality has been greatly improved by detector ice removal procedure and through remediation by processing algorithms.
- Migrating and non-migrating tidal features are recovered through analysis of multi-day data sets.
- New data assimilation model has potential for daily estimation of tidal parameters.
- O₂ (0-0) P-branch broadband filter results have great promise for high-precision wind field measurements.

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