



Neutral Wind Measurements from The TIMED Doppler Interferometer



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Overview

- TIDI Instrument and Basic Performance
- Zonally averaged wind profiles
- Multi-day composite wind fields
- Summary

The TIDI Instrument

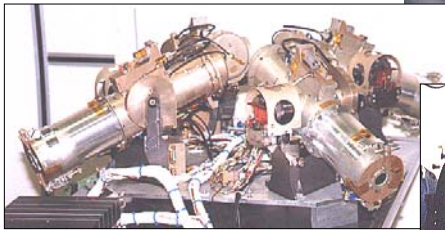
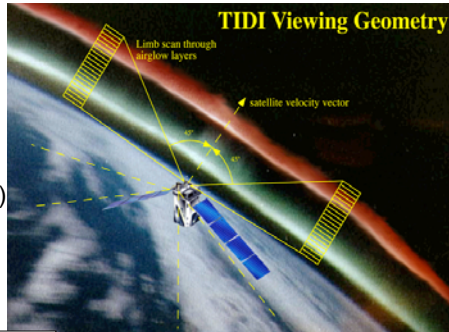
The TIMED Doppler Interferometer (TIDI) is a Fabry-Perot interferometer for measuring winds in the mesosphere and lower thermosphere.

Primary measurement: Global neutral wind field, 60–120 km

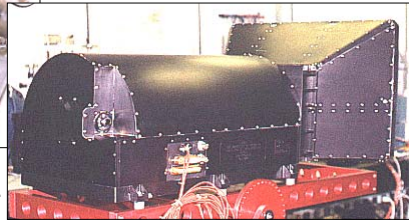
Other measurements: T, O₃ (day), O (night)

Primary emission observed: O₂ ¹Σ (0-0) P9

Additional emissions observed: O₂ ¹Σ (0-0) P15, O₂ ¹Σ (0-1) P7, O(¹S) “green line”

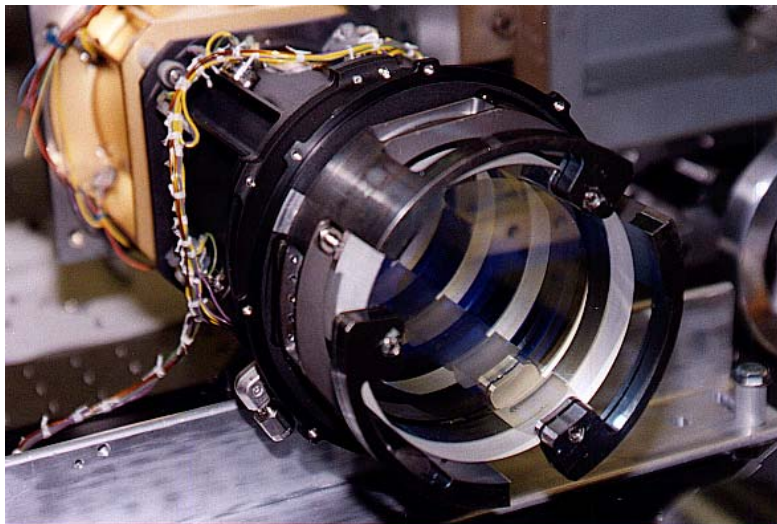


Telescope Assembly



Profiler

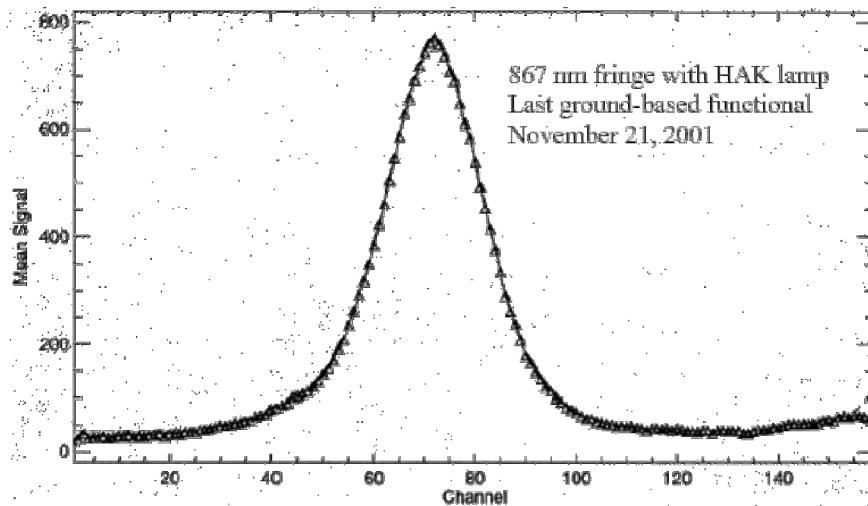
Etalon /Detector Assembly



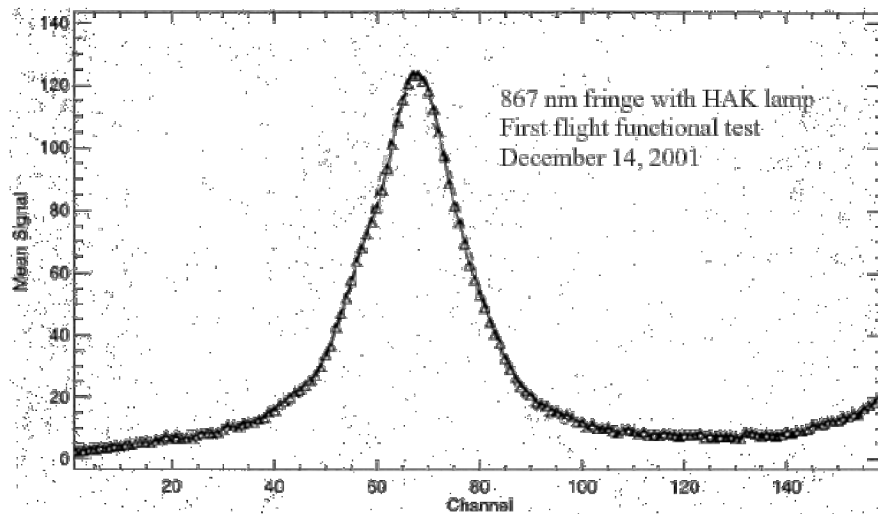
Instrument Health Summary

- Mechanisms functioning normally after 16 months in orbit
 - Filter wheel error rate small
 - One of the two spectral calibration sources (Helium, Argon. Krypton, HAK, lamp) appears to be deteriorating
- Optical system, telescopes, CCD Detector nominal
 - No significant changes since on-orbit activation
- Etalon spectral performance nominal
 - Thermal control of the profiler is excellent
 - Etalon drift will continue to be monitored
- Two significant instrument anomalies
 - Low (earthshine) light leak - resolved through software change.
 - Accumulation of ice on detector window, leading to scattering and crosstalk. Resolution well underway - using 1) multi-day spacecraft maneuvers to warm window to release ice buildup and 2) software de-convolution to remove crosstalk.

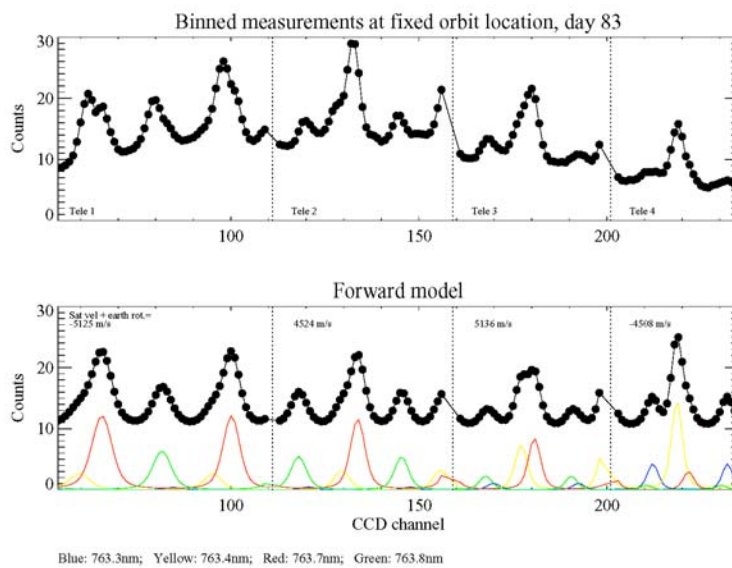
Last Pre-Launch Etalon Test



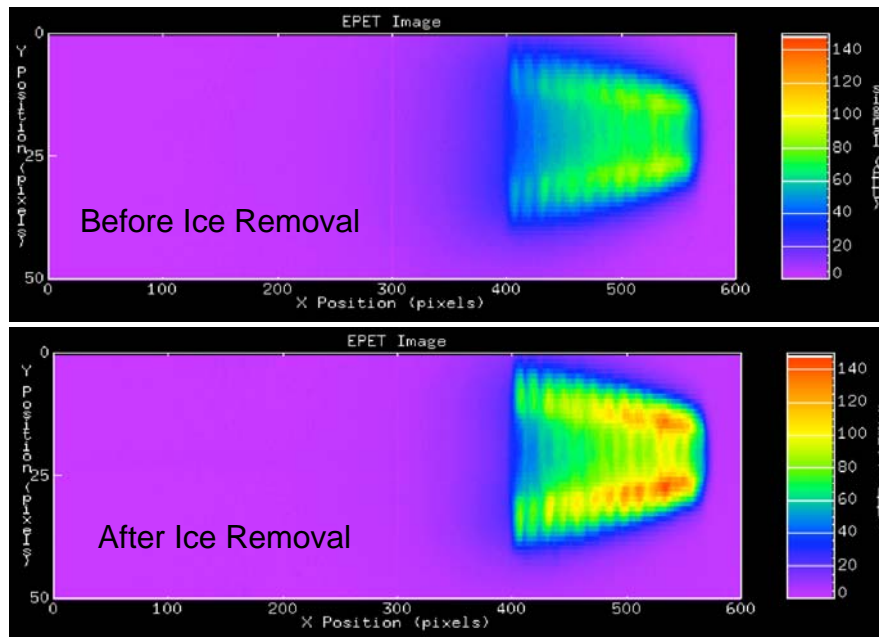
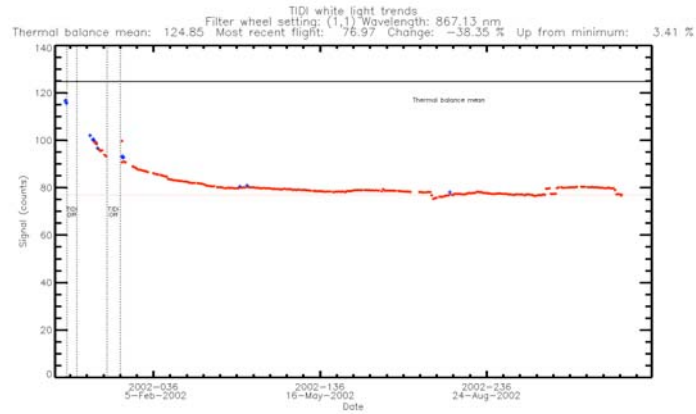
First Flight Etalon Test

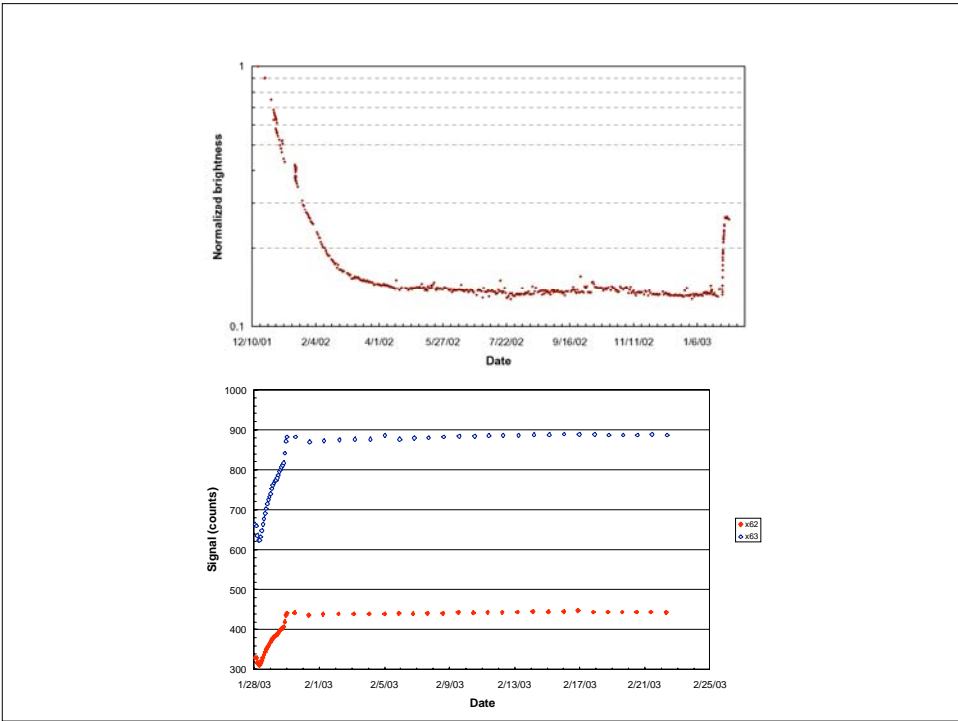


Daytime Forward Model Fitting

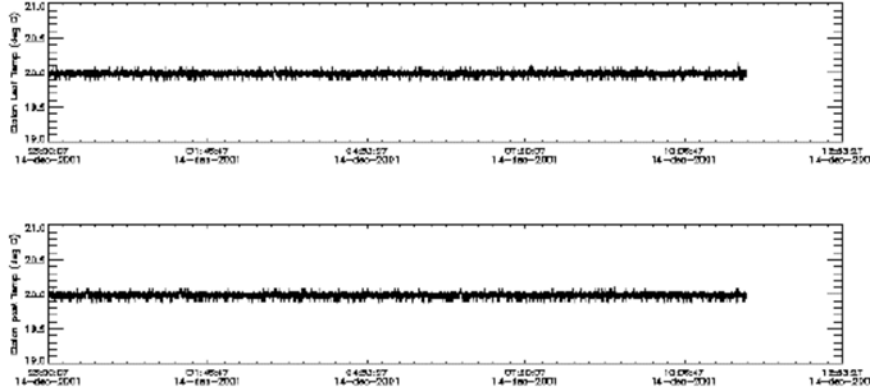


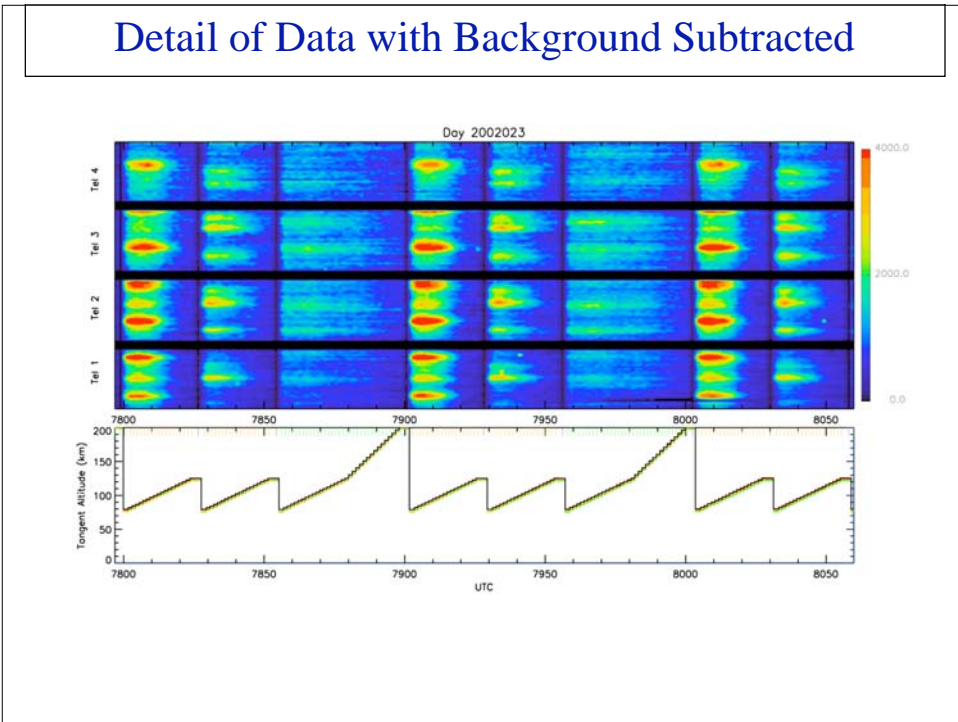
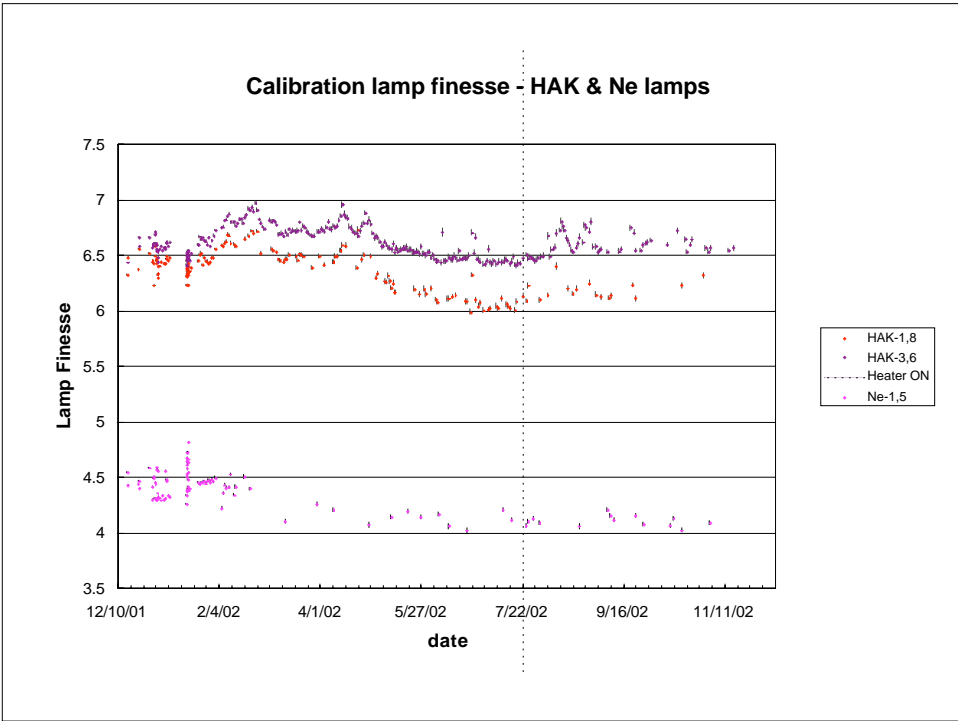
TIDI in-flight white light calibration sensitivity trend



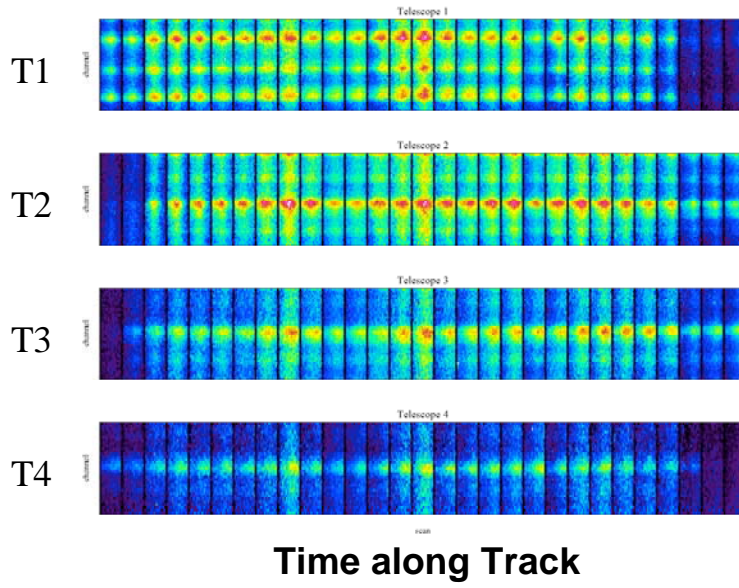


Etalon Temperature Stability

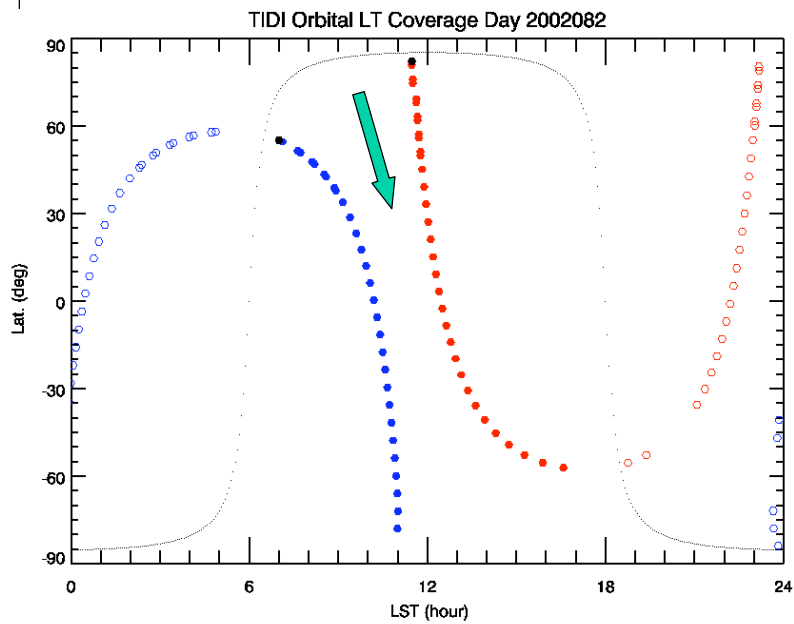




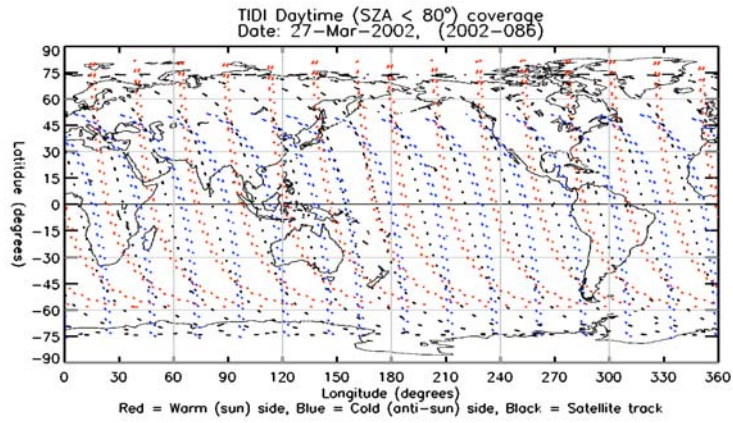
TIDI Daytime Spectra



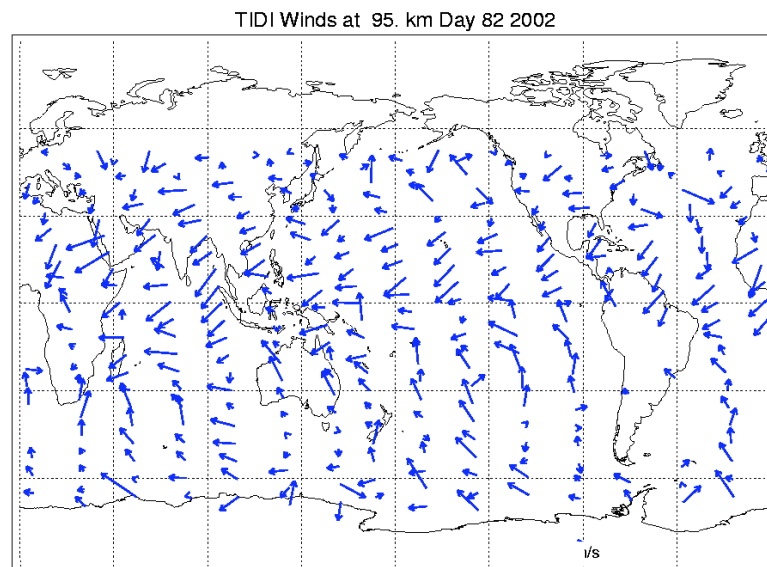
TIDI Local Time Coverage



TIDI coverage - 27 Mar 2002

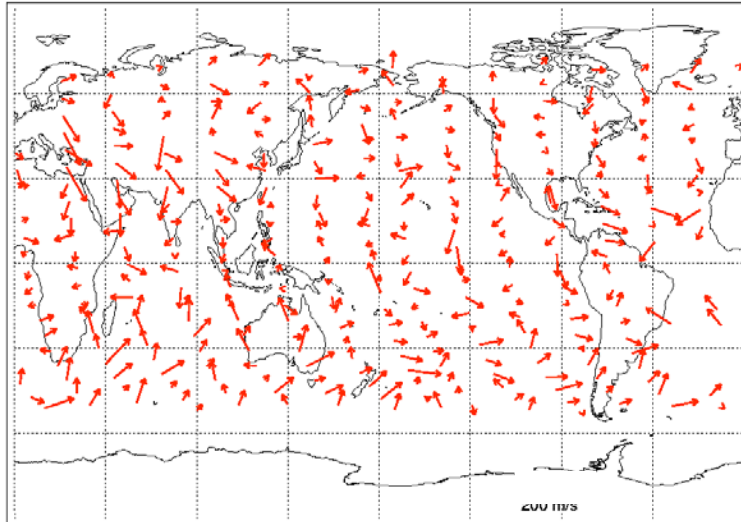


TIDI Coldside Wind Vectors

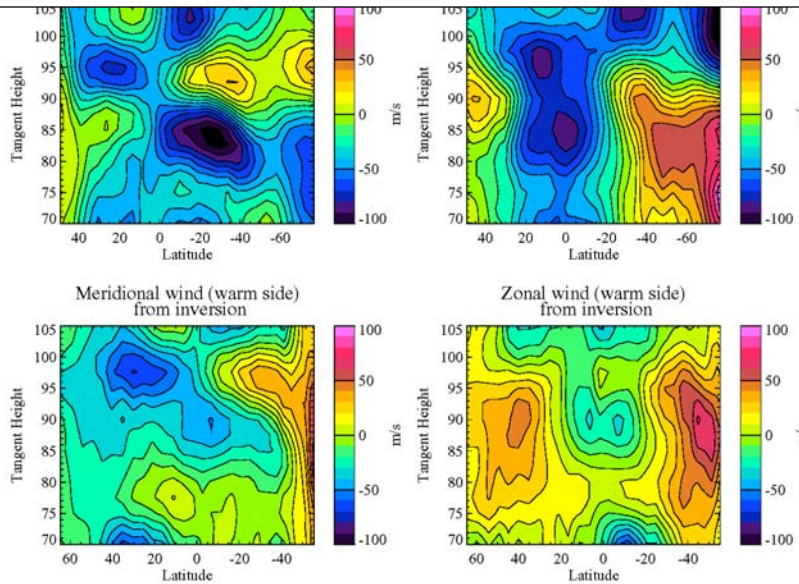


TIDI Warmside Wind Vectors

TIDI Winds at 95. km Day 82 2002

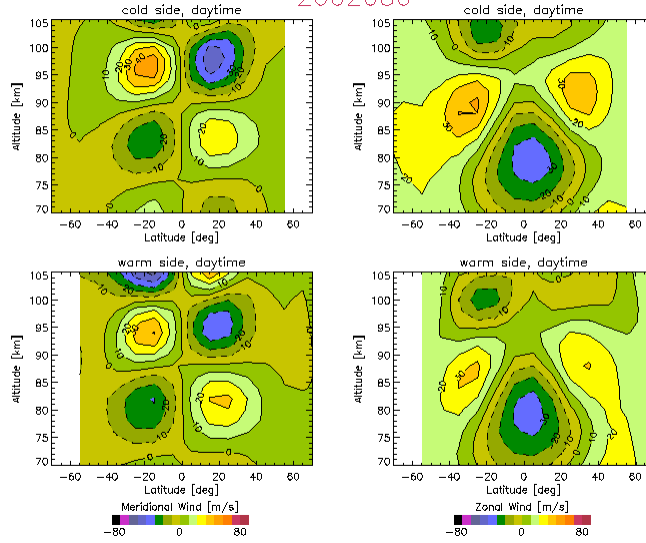


TIDI Winds Day 83, 2002



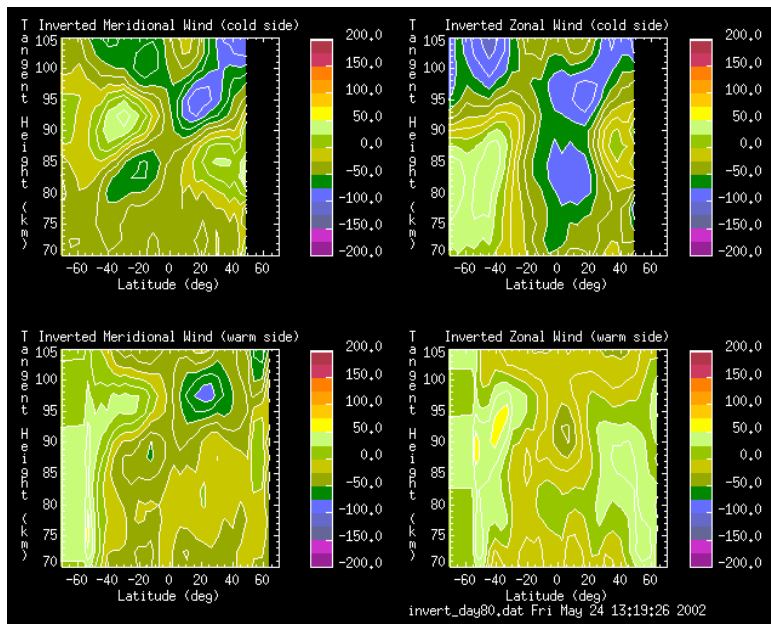
GSWM Winds Day 80 - 98

2002080

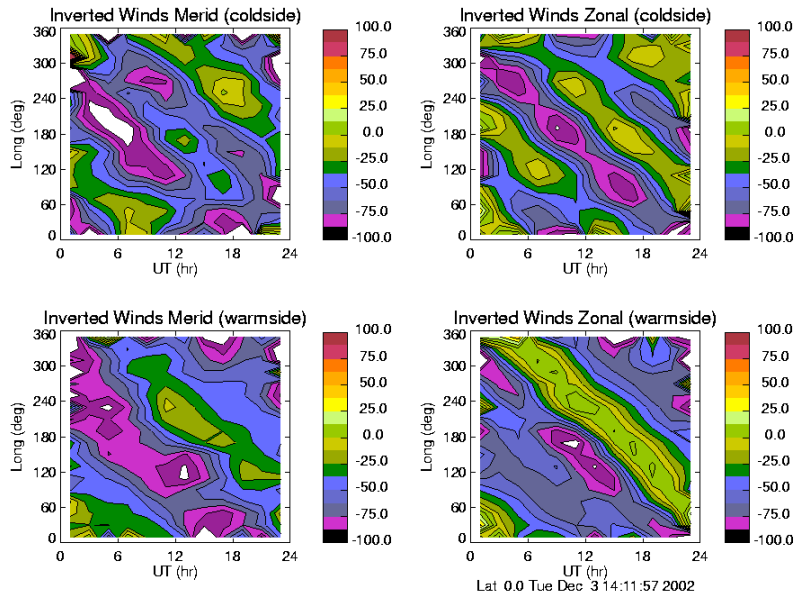


GSWM results courtesy Oberheide and Hagan

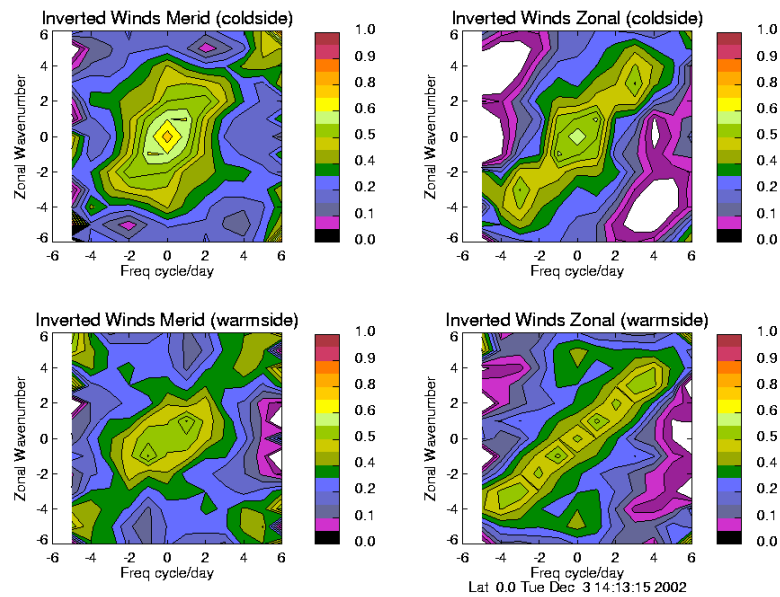
TIDI Winds Day 80 - 98



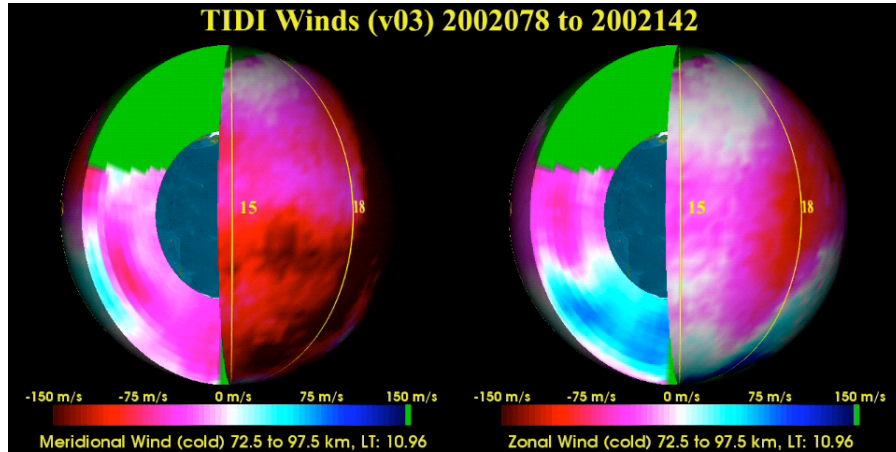
TIDI Low Latitude (0°) Long & UT Binned Winds at 85 km (Days 2002078 – 2002142)



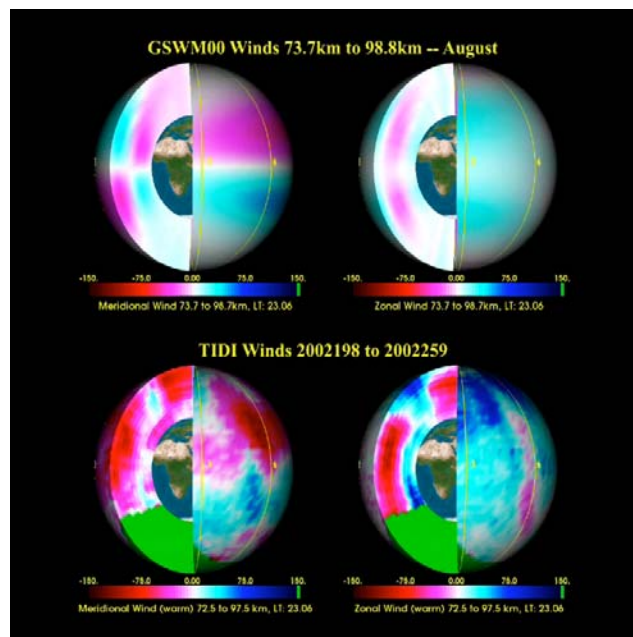
TIDI Winds Low Latitude Wind 2D FFT (log amplitude)

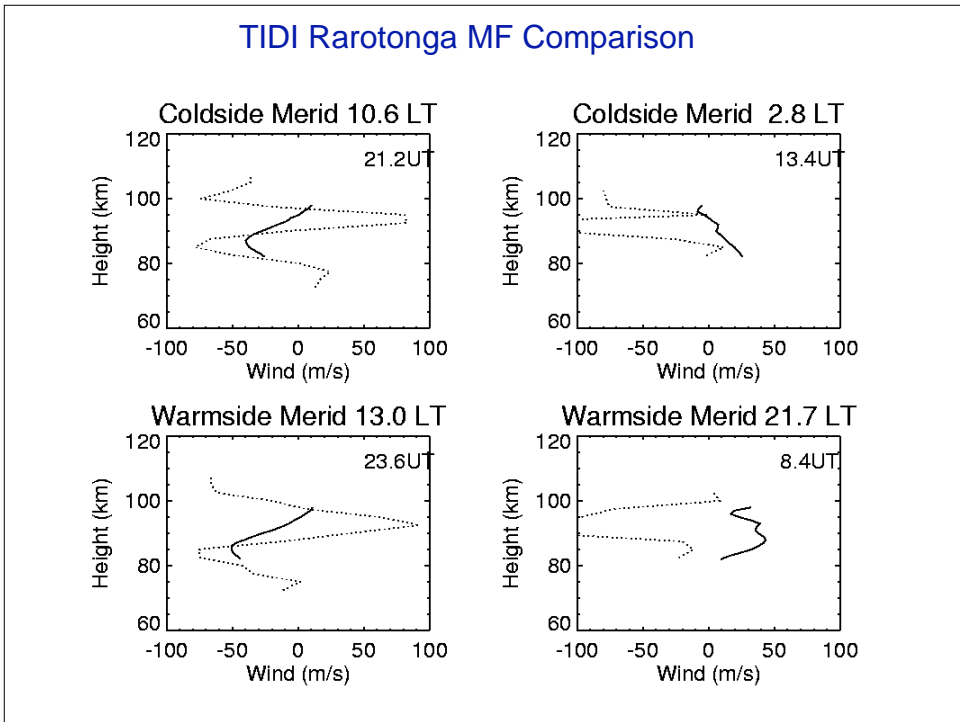
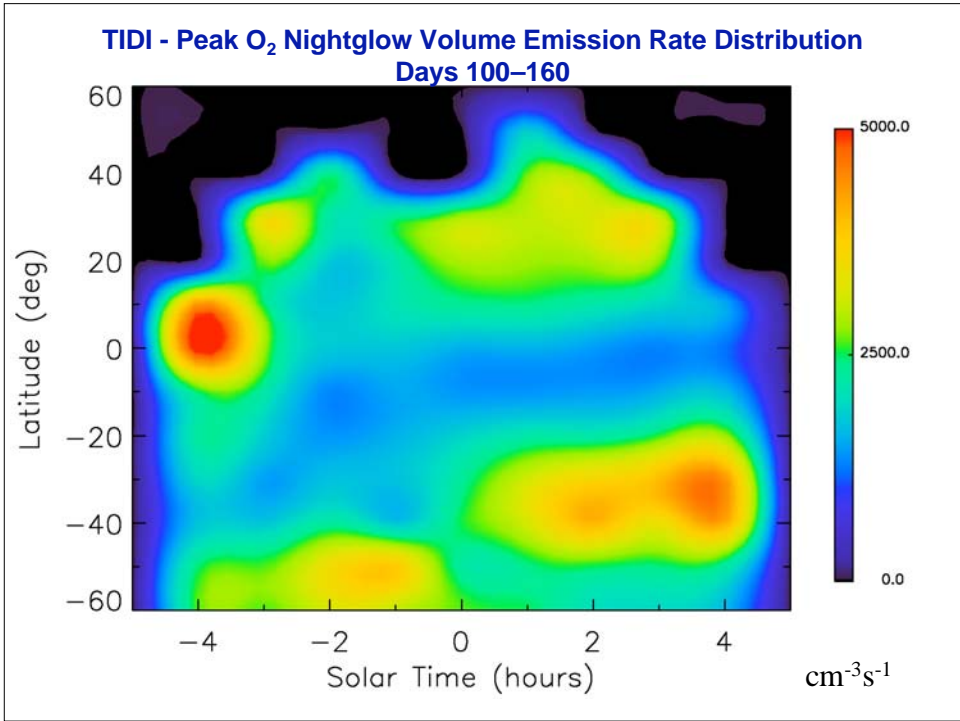


TIDI First Yaw Cycle, Cold Side

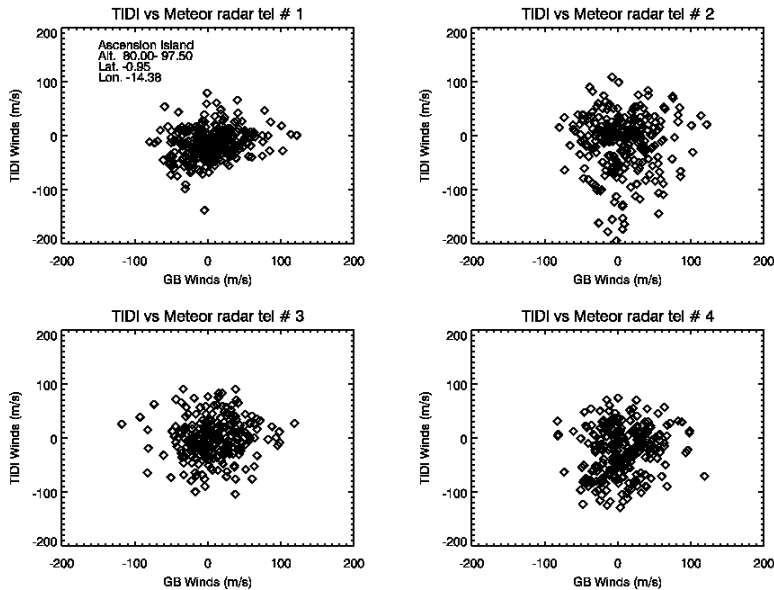


TIDI Winds, Third Yaw Cycle Model Comparison





TIDI and Ascension Island Meteor Radar Comparison (zero wind corrected)



TIDI data product status

Level 1: Line-of-sight (LOS) integrated data (“LOS” files)

- LOS-integrated emission spectra (each telescope)
- RAW_LOS (detector counts, no background correction) and version 1B (background-corrected radiances in geophysical units) are in routine production
- version 1C (improved background correction) released.

Level 2: Inverted LOS winds (“PROFILE” files)

- inversion step 1 altitude inversion: altitude profiles of LOS winds, VER, minor constituent densities (each telescope)
- We expect Level 2 files to be available by Spring 2003.
 - Preliminary versions of these files available at NCAR/HAO TIDI web site

Level 3: Vector winds (“VECTOR” files)

- inversion step 2 sequential estimation applied to inverted LOS winds: altitude profiles of zonal and meridional winds, VER, densities
- profiles gridded in altitude and along-track direction
 - Expected to be at full production status, Spring 2003.

Conclusions

- TIDI is operating stably and well at a 100% duty cycle
- More than 80 million spectra have been obtained
- Routine data products are now being inserted into the TIDI data base, reanalysis is needed to populate the data set with data products from updated algorithms
- Validation efforts will continue, working with experimentalists and modelers
- Preliminary wind products exhibit strong, but highly variable, tidal signatures