A COMPARISON OF TIDI SCIENCE OBSERVATIONS BETWEEN 2002 & 2003

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TIDI Data Products

- **Level 0**
  - Processed telemetry data
    Spectra are in ADU

- **Level 1**
  - Line of sight fits to all Level 0 spectra
    Best fit in the “least-squares sense”
    Geophysical output includes line of sight winds
    *SCIENTIFICALLY USEFUL WIND PRODUCT*

- **Level 2**
  - Inversion of Level 0 altitude scans into geophysical products
  - Altitude profiles of line of sight winds onto a “mean” grid

- **Level 3**
  - Conversion of Level 2 output onto a track angle/altitude grid
Data study

- **Time period**
  - Full mission

- **Tangent altitude**
  - Dayside 70 to 120 km
  - Night 80 to 110 km

- **Binning strategy**
  - 7.5 degree track angle bins (0 = eq; 90 = N; 180 = eq; 270 = S)
  - 7.5 degree latitude bins
  - 1 hour local time bins
  - 2.5 km altitude bins

- **Engineering constraint**
  - Mission data divided into individual yaw periods
Yaw periods

- TIMED undergoes yaw maneuvers
  - TIDI telescopes undergo 180 degree change in pointing azimuth
  - “Zero-wind” offset which includes Earth rotation is dependent upon flight direction and is different for each telescope (8 unknowns)

- Three complete yaw cycles are compared in this study
  - mid-March to mid-May, flying forward
  - mid-May to mid-July, flying backward
  - mid-July to mid-September, flying forward

- Yaw periods are roughly
  - March equinox
  - June solstice
  - Mix?
TIDI LOS airglow brightness
TIDI line of sight winds
TIDI LOS winds: annual series
Meridional winds - annual
Zonal winds - annual
Alt/lst comparison: brightness
Alt/LST: meridional winds
HRDI observations

Figure 4.11. Observed monthly mean zonal and meridional wind contours on altitude-local time grids at a fixed latitude of 25°S for the spring equinox of 1992. The downward phase progression suggests a phase speed of about 24 hours and a vertical wavelength of 25 km.

Alt/lat: zonal winds
TIME-GCM zonal wind runs

Equinox

December solstice
Lat/LST: zonal winds

TIDI - Spring SWG 2004 03.16.04  15 Niciejewski
Equinox winds

HRDI

Model:
Forbes and Gillette, 1982
Summary

• Time trends indicate
  – Strong tidal signatures are present in the wind data sets
  – Expected dynamics features are clear in the wind data sets
  – Dynamics features repeat from 2002 to 2003
  – Airglow brightness increase in 2003 coincident with removal of “frosting” from optical path

• FUTURE WORK
  – Complete 2002 data ingestion
  – Optimize line-of-sight “zero” wind offset
    Recalculate meridional and zonal horizontal wind components
    Determine tidal amplitudes/phases for entire mission
    Determine mean prevailing winds
  – Compare with ground-based MLT wind measurements