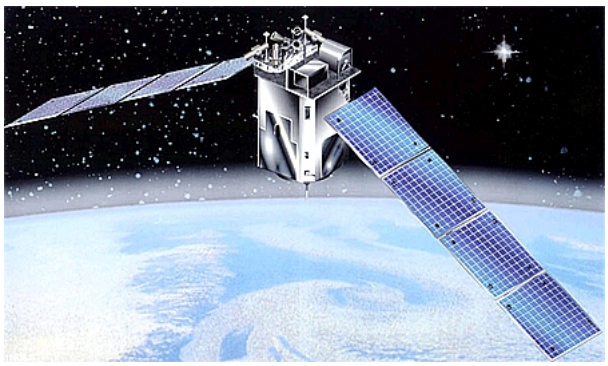
TIDI

TIMED Doppler Interferometer



Experiment Overview

The TIMED Doppler Interferometer (TIDI) will investigate the dynamics and energetics of the Earth's mesosphere and lower-thermosphere-ionosphere (MLTI) from an altitude of 60 to 300 km. TIDI measurements will allow us to obtain a global description of the vector wind and temperature fields, as well as important information on gravity waves, species densities, airglow and auroral emission rates, noctilucent clouds, and ion drifts. TIDI will provide basic information about global winds and temperatures. TIDI will also contribute to the study of MLTI energetics.

Science Objectives

The TIDI interferometer (or Profiler) primarily measures horizontal vector winds and neutral temperatures from 60 to 300 km, with a vertical resolution 2.5 km at the lower altitudes and with an accuracy that approaches ~3 m/sec and ~3 K, respectively, under optimum viewing conditions. The TIDI design allows for 100% duty cycle instrument operation during daytime, nighttime, and in auroral conditions. TIDI views emissions from OI 557.7 nm, OI 630.0 nm, OII 732.0 nm, O_2(0-0), O_2(0-1), Na D, OI 844.6 nm, and OH to determine Doppler wind and temperature throughout the TIMED altitude range. TIDI also makes spectral ratio observations to determine O_2 densities and rotational temperatures.

Key Spacecraft Characteristics

Orbital Altitude: 625 km Circular
Orbital Inclination: 74.1°
Total Spacecraft Weight: 660 kg
Spacecraft Size: Mid-Lite class
Launch Vehicle: Delta II 7920

Description and Specifications

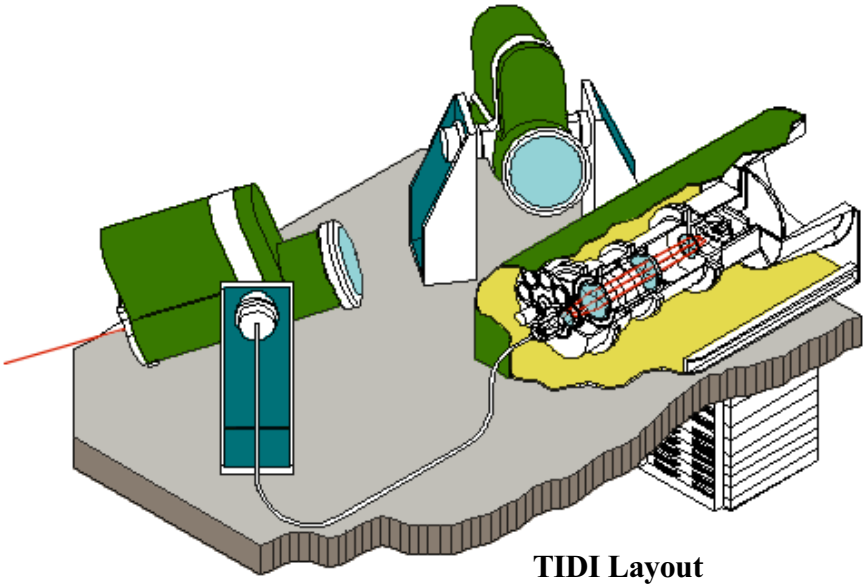
TIDI comprises three major subsystems: four identical telescopes, a Fabry-Perot interferometer with a CCD detector, and an electronics box. Light from the selected regions of the atmosphere is collected by the telescopes and fiber-optically coupled to the detection optics. The four fields of view are scrambled along with a calibration field input and converted to an array of five concentric circular wedges. This input then passes through a selected filter, then through a Fabry-Perot etalon, and is finally imaged onto a CCD via a circle to line imaging optic (CLIO) device.

TIDI System

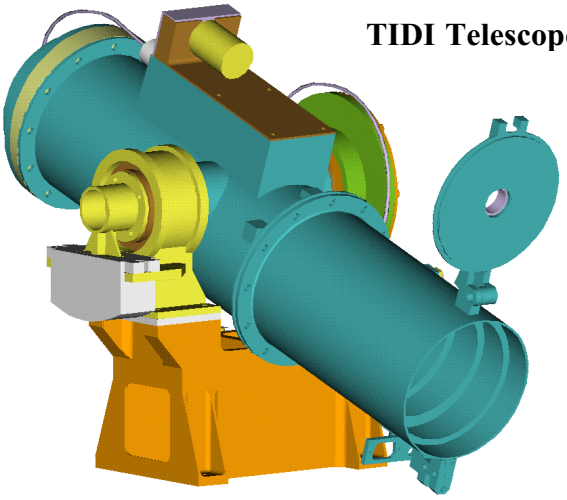
Mass:	41.8 kg
Electrical Power:	19.32 watts (orbit ave.)
Heater Power:	11.0 watts
Data Rate:	2494 bits/sec
Observations:	winds, temperatures, and density
Wind accuracy:	3 m/s (line of sight)
Altitude Resolution:	2.5 km
Spectral Range:	550 - 900 nm
Lifetime:	>2 years

Electronics System

Hybrid Power supply
80C51 (UTMC) Flight computer
Data acquisition
CCD controller
Filter wheel/ shutters/ PWM heaters
Telescope servo amp



TIDI Layout
(showing two of four telescopes)

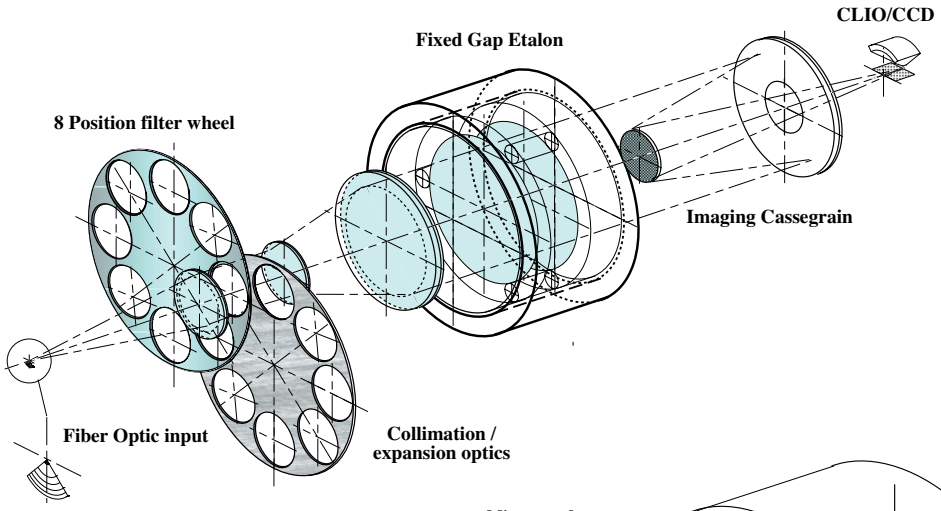


TIDI Telescope

Telescope Specifications

Off axis Gregorian
Low scatter optics and baffles
Zenith gimbal

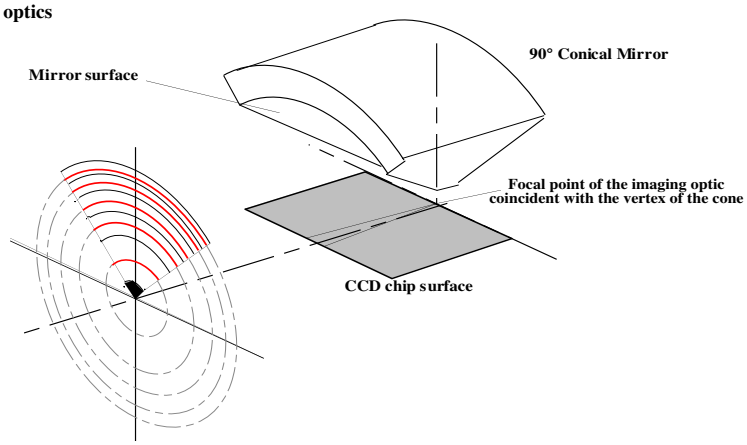
Clear Aperture	7.5 cm
Area	44.2 cm^2
Angular FOV	2.5° horiz x 0.05° vert
F/number	2.2



Profiler Specifications

Fixed gap single etalon Fabry-Perot interferometer
2 x 8 position filter wheel
Circle to line image converter (CLIO)
Passively Cooled CCD detector
5 x 32 Channels

Clear Aperture	7.5 cm
Plate Diameter	10.5 cm
Gap	2.2 cm
Finesse	8.1-8.9



Interferometer Optics

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