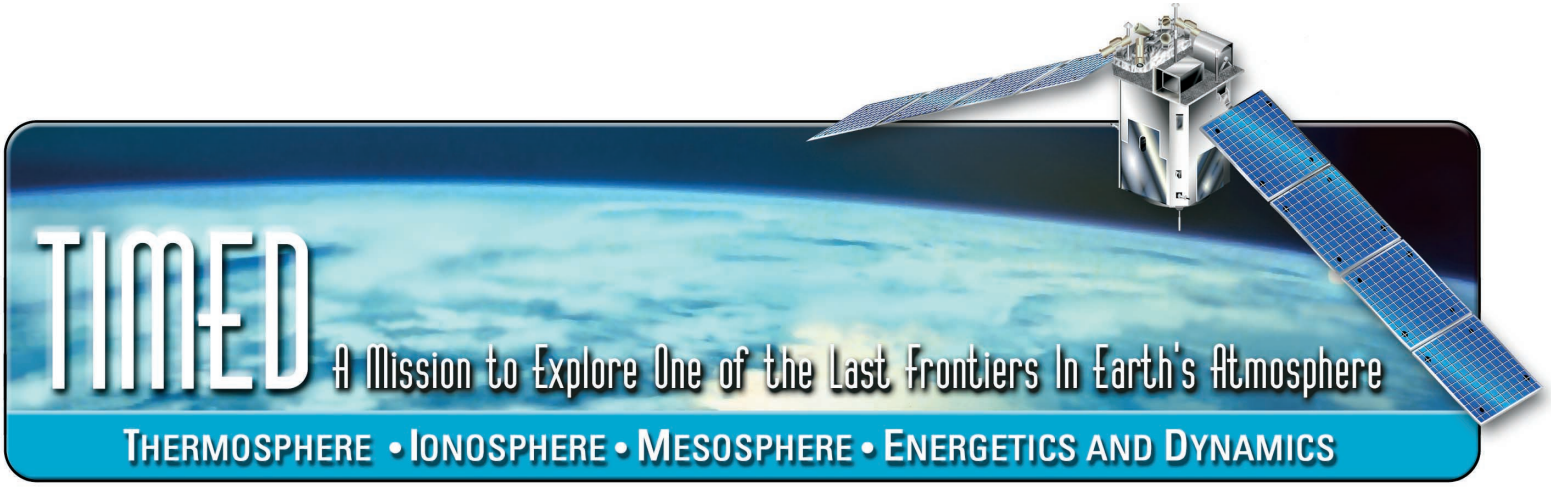


Why TIMED?

For centuries, scientists have realized that Earth's natural environment is greatly impacted by the abundance of solar energy striking the Earth from a constantly changing sun. Over the last few years, they have begun to realize that human activities are also playing a role in changing our environment.

By studying portions of Earth's atmosphere, scientists believe global change is occurring, primarily due to variations in the sun's cycle and from human-induced changes to the atmosphere by the release of gases such as methane and carbon dioxide.

Despite signs of global change, scientists haven't had a benchmark against which future changes in Earth's upper atmosphere can be globally compared, analyzed or predicted because there are still portions of this solar-terrestrial chain, including regions within Earth's atmosphere, that are poorly understood.

The TIMED (Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics) mission will study the influences of the sun and humans on the least explored and understood region of Earth's atmosphere—the Mesosphere and Lower Thermosphere/Ionosphere (MLTI). The MLTI region is a gateway between Earth's environment and space, where the sun's energy is first deposited into Earth's environment. TIMED will focus on a portion of this region located approximately 40–110 miles (60–180 kilometers) above the surface.

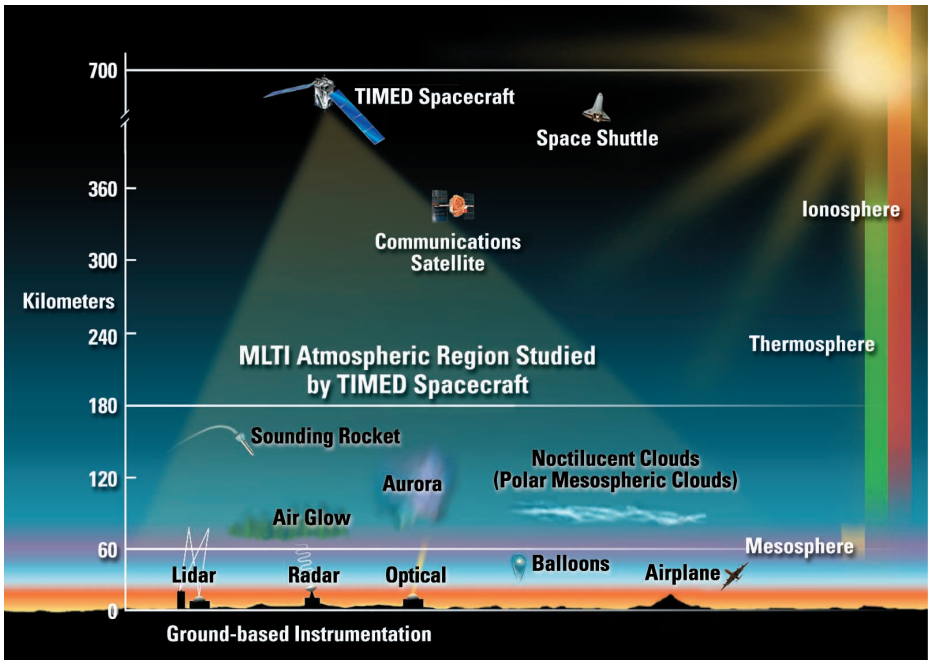
In a society increasingly dependent on satellite technology and communications, it is vital to understand the variability within this critical region of Earth's atmosphere so that scientists can predict its effects on communications, satellite tracking, spacecraft lifetimes, degradation of spacecraft materials and the reentry of piloted vehicles. TIMED's study of space weather will help scientists gain a better understanding of the dynamics of this gateway region.

The TIMED spacecraft is the initial mission in NASA's Solar Terrestrial Probes (STP) Program, part of NASA's initiative to lower mission costs and provide more frequent access to space to systematically study the sun-Earth system. The mission is sponsored by NASA's Office of Space Science, Washington, D.C., and is managed by NASA's Goddard Space Flight Center, Greenbelt, Md. The Johns Hopkins University Applied Physics Laboratory (APL), in Laurel, Md., designed, built and is operating the spacecraft for NASA. APL is also leading the project's science effort during the mission.

Mission Objectives

A comprehensive global study of the MLTI region has never before been accomplished. Ground-based instruments can only observe a small portion of the upper atmosphere located over an observation site. This region is too high for balloons to reach. Sounding rockets (rockets that fly into the upper atmosphere for just a few minutes before falling back down) can only provide a brief snapshot of the MLTI region's activity near the rocket.

Other spacecraft have studied portions of the MLTI region, but TIMED will be the first mission to obtain a global picture of it, which scientists need to better understand our upper atmosphere. The TIMED mission will establish a baseline against which future studies of changes within this region can be compared and analyzed.

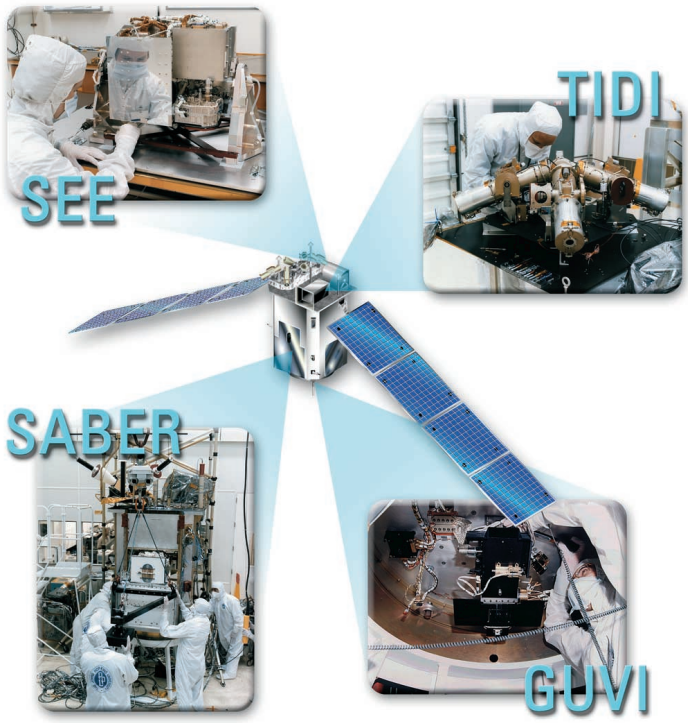


The TIMED spacecraft will observe this relatively unexplored frontier from its 388-mile (625-kilometer) circular orbit around the Earth. Employing advances in remote-sensing technology, the spacecraft's instrument suite will work with a worldwide network of ground-based observation sites to obtain an unprecedented set of comprehensive global measurements of the region's temperature, pressure, wind and chemical composition, along with its energy inputs and outputs.

www.timed.jhuapl.edu

Instruments

GUVI (Global Ultraviolet Imager)—A spatial scanning, far-ultraviolet spectrograph that will globally measure the composition and temperature profiles of the MLTI region, as well as its auroral energy inputs.



SABER (Sounding of the Atmosphere using Broadband Emission Radiometry)—A multi-channel infrared radiometer designed to measure heat emitted by the atmosphere over a broad altitude and spectral range. SABER will also measure global temperature profiles and sources of atmospheric cooling, such as the "air glow," which occurs when energy is radiated back into space.

SEE (Solar Extreme Ultraviolet Experiment)—A spectrometer and suite of photometers designed to measure solar ultraviolet radiation—the primary energy deposited into the MLTI atmospheric region— which includes solar soft X-rays and extreme-ultraviolet and far-ultraviolet radiation.

TIDI (TIMED Doppler Interferometer)—An instrument that will globally measure the wind and temperature profiles of the MLTI region.

Science Objective

The science objective of the TIMED mission is to understand the MLTI region's basic pressure, temperature and wind that result from the transfer of energy into and out of this region.

Mission Operations & Data Management

TIMED combines an innovative operations concept and interdisciplinary approach that lowers mission costs while enhancing science return.

The four instrument principal investigators (PIs) will have direct control of their instruments and experiments, individually processing data and generating products for distribution from Payload Operations Centers located at each of the PI institutions across the country. Data will be collected and distributed from the Mission Data Center located at APL in Laurel, Md. Data products can be accessed via TIMED's Web site (www.timed.jhuapl.edu).

TIMED's innovative operations concept and efficient data management system allows the Mission Operations Center and Payload Operations Centers to oprate with one shift per day and to provide rapid turnaround of data products.

Key Characteristics

Mission

Launch Opportunity	December 2001
Launch Site	Vandenberg Air Force Base, Calif.
Launch Vehicle	Delta II 7920-10 (launched with Jason-1 spacecraft)
Primary Mission	Two years
Orbit	388-mile (625-kilometer) circular
Inclination	74.1 degrees from the equator

Spacecraft

Mass	1,294 pounds (587 kilograms)
Dimensions	8.93 feet (2.72 meters) high 5.29 feet (1.61 meters) wide (launch configuration) 38.47 feet (11.73 meters) wide (solar arrays deployed) 3.93 feet (1.20 meters) deep
Power Consumption	406 watts per orbit
Data Downlink	4 megabits per second
Memory	5 gigabits
Attitude	
Control	Within 0.5 degrees
Knowledge	Within 0.03 degrees

Mission Management

NASA Headquarters (HQ) & Goddard Space Flight Center (GSFC)

STP Program Executive	Victoria Elsbernd (HQ)
STP Program Manager	Gilberto Colón (GSFC)
Program Scientist	Mary Mellott (HQ)
Project Manager	Bruce Campbell (GSFC)

The Johns Hopkins University Applied Physics Laboratory

Project Manager	David Grant
Project Scientist	Jeng-Hwa (Sam) Yee

Instrument Principal Investigators

GUVI	Andrew Christensen, The Aerospace Corporation
SABER	James Russell III, Hampton University
SEE	Thomas Woods, University of Colorado
TIDI	Timothy Killeen, National Center for Atmospheric Research

For more information, visit the mission Web site at **www.timed.jhuapl.edu.**

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