nism in driving global atmospheric circulation. The global images show the difference in tropical lightning distribution between the northern hemisphere winter and summer.

A markedly greater amount of lightning activity is observed over land areas as opposed to oceans. This is due to the greater surface heating and atmospheric instability occurring over the land areas, resulting in stronger storm updrafts and more frequent lightning.

Why Study Lightning from Space?

Lightning activity is closely coupled to storm dynamics and microphysics, and can be related to the global rates, amounts, and distribution of convective precipitation and the release and transport of latent heat. Tropical convection is important because of its role in large scale atmospheric circulations, including El Niño and La Niña. In addition, the high temperatures reached within lightning channels provide a mechanism for chemical reactions that form tropospheric ozone and nitrous oxide compounds.

A space-based lightning sensor provides many benefits from its ability to detect and locate all lightning, in-cloud and cloud-to-ground, over a large area of the earth, day and night. A lightning sensor in low earth orbit can measure lightning activity globally, allowing seasonal and inter-annual distributions to be examined. A sensor in geostationary orbit also permits continuous measurements of the thunderstorm life-cycle.

LIS data are analyzed by a team at NASA’s Global Hydrology and Climate Center in Huntsville, Ala., and co-investigators at other institutions. Data are available on line.

Obtaining LIS Data

LIS data, as well as many other Earth Science data sets, are available from the Global Hydrology Resource Center (GHRC), the Information Technology component of the Global Hydrology and Climate Center. For more information contact the GHRC User Services Office at:

Phone: (256) 922-5932
E-mail: ghrc@eos.nasa.gov
URL: http://ghrc.msfc.nasa.gov/

Further Information

For more information on the Worldwide Web:

Lightning Team
http://thunder.msfc.nasa.gov/
Global Hydrology & Climate Center
http://www.ghcc.msfc.nasa.gov/
TRMM Home Page
http://trmm.gsfc.nasa.gov/
The Instrument
NASA’s Lightning Imaging Sensor (LIS) is a small, highly sophisticated instrument that detects and locates lightning over the tropics within a band from 35° N to 35° S latitude. From its vantage point aboard the Tropical Rainfall Measuring Mission (TRMM) observatory 350 km above the Earth, the sensor provides information on the dynamics and physics of clouds that could lead to future advanced lightning sensors capable of significantly improving short-term weather “nowcasting.” The LIS promises to expand scientists’ capability for examining the distribution and variability of lightning and thunderstorm activity throughout much of the world.

LIS was developed by a team of atmospheric scientists and engineers at the Global Hydrology and Climate Center (GHCC) and NASA’s Marshall Space Flight Center in Huntsville Ala.

Future Sensors
The LIS is three times more sensitive than its NASA predecessor, the Optical Transient Detector, still in orbit. LIS and OTD are helping pave the way for future geostationary lightning mapping instruments that could deliver information to any forecaster’s workstation within 30 seconds of the lightning occurrence. From their stationary position in orbit, these future lightning sensors will provide continuous coverage of the continental United States, nearby oceans, and Central and South America.

Lightning Facts
- The global flash rate is approximately 40 flashes per second.
- 85% of global lightning occurs over the land masses.
- 70% of all lightning on Earth occurs in the tropical latitude band 35°N to 35°S.
- Extreme flash rates in excess of 1 flash per second are common in severe storms. The majority of the lightning produced by severe storms is within the cloud itself — and never reaches the ground.

TRMM
The Tropical Rainfall Measuring Mission, a joint mission with Japan’s National Space Development Agency (NASDA), is NASA’s first mission dedicated to observing and understanding tropical rainfall, and how this rainfall and related heating of the atmosphere affect the global climate. The primary instruments for measuring precipitation and cloud characteristics are the Precipitation Radar (PR), the TRMM Microwave Imager (TMI), and the Visible and Infrared Scanner (VIRS).

Early Observations from LIS
Lightning measurements from LIS and other TRMM instruments can be used together to determine the relationship between lightning, storm structure and precipitation. Global distributions of lightning locate regions of vigorous convection where strong latent heating occurs. The location and distribution of latent heating is an important mecha-