Science News

NASA/Marshall Lightning Imaging Sensor On Japan's Tropical Rainfall Measuring Mission Satellite To Illuminate Link To Weather And Climate

ScienceDaily (Dec. 2, 1997) —

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Folklore has it that rain follows lightning. Scientists think there might be more than a little truth to that saying. Soon, a new spaceborne instrument - the Lightning Imaging Sensor (LIS) - will help us understand more about the role of lightning in weather and climate.

LIS, developed by NASA's Marshall Space Flight Center, is one of five instruments aboard the Tropical Rainfall Measuring Mission (TRMM, pronounced "trim," depicted at right) launched today by Japan's National Space Development Agency. Other sensors aboard the craft include the first radar designed to map rain from space, and sensors to look at clouds and moisture in visible and infrared light and microwaves (short-wavelength radio).

When operations start in a few days, TRMM's instruments will gives us new insight into how clouds work, including the role played by lightning.

LIS images and data will be used in at least five areas:

Global lightning and rain,

Tropical convection and sea surface temperatures,

Rainfall estimates from geostationary orbit,

Global electric circuit and lightning, and

Atmospheric chemistry.

Lightning research is one of the first sciences developed in America. Ben Franklin became famous for his experiment in which he flew a kite in a thunderstorm to test his theory that lightning was the same as the exciting, new phenomenon called electricity. (Franklin was lucky; another scientist was electrocuted a few months later repeating the experiment, so don't try it. Lightning kills.)

NASA/Marshall has a long background in observing lightning from space since the second Space Shuttle mission (STS-2) in 1981. Marshall scientists modified a 16mm movie camera so the crew could record lightning from above the clouds rather than from below. A version also flew aboard a high-altitude U-2 research plane.

In the Mesoscale Lightning Experiment, the shuttle's payload bay cameras recorded hundreds of nighttime lightning flashes (left). Many were spectacular events that lit up entire storm systems. Others sometimes seem to talk to each other as flashes in one region were echoed by flashes in another.

Most recently, the Optical Transient Detector (OTD) has been operating aboard the Microlab 1 satellite, launched in 1995. OTD and LIS are almost identical (some minor improvements were made for LIS). OTD, though, operates at a higher altitude and has a wider field of view.

These experiments proved not only that lightning could be observed from above the clouds (like the map of a storm over Oklahoma, right), but that most of the electrical activity in clouds is not seen nor is it detected by electrical sensors on the ground. (Many people will be familiar with these from TV stations that map lightning strikes during severe weather. Because these use the Earth as part of the detection network, they only show cloud-to-ground strikes.)

Even El Nino is a factor in global lightning studies. In Central Florida, the most widespread severe weather outbreak in its history occurred the during the first week of February, 1983. Increased cyclogenesis in the Gulf, and jet stream winds 30-40 knots above normal, produced conditions favorable for an outbreak of 21 tornadoes (4 killed, 200 homeless). Goodman and Christian an Steve Goodman, also of NASA/Marshall, examined the warm, cold, and neutral El Nino/Southern Oscillation periods from 1986-1989 in the southeast United

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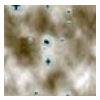

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