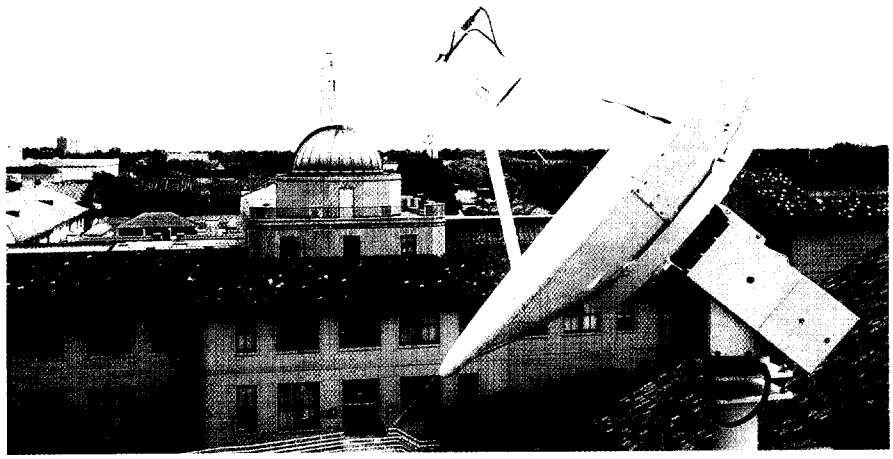
THE EARTH SCAN LABORATORY OF THE COASTAL STUDIES INSTITUTE

CENTER FOR COASTAL, ENERGY, AND ENVIRONMENTAL RESOURCES

LOUISIANA STATE UNIVERSITY

BATON ROUGE, LOUISIANA 70803



MISSION

The mission of the Earth Scan Laboratory (ESL) is to support RESEARCH, EDUCATION, AND PUBLIC SERVICE/EMERGENCY RESPONSE with near-real time or archival remotely sensed satellite and aircraft data, its processing, analysis, interpretation, and dissemination.

For more information, contact the Earth Scan Laboratory, 412 Howe-Russell Geoscience Complex, LSU, Baton Rouge, Louisiana 70803; (504) 388-2957.

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Earth Scan Laboratory
Coastal Studies Institute

The Earth Scan Laboratory, conceived and managed by faculty of the Coastal Studies Institute, is a National Oceanic and Atmospheric Administration (NOAA) satellite earth station. The ESL is a telemetry site for the capture of earth environmental data from satellites in space. Built with funds from the Louisiana Education Quality Support Fund, this state-of-the-art facility began operating on June 28, 1988. It is the nation's first satellite earth station established wholly by state funding.

The laboratory is equipped with a Telonics™ 1.2 m tracking antenna and receiver with a TeraScan™ (SeaSpace Corp.) satellite data acquisition and analysis system. The hardware and software system includes a compact digital tape archiving system and advanced, interactive image-processing software. A SUN™ workstation controls the data acquisition and archiving while the data analysis is conducted on Tektronics™ X-windows terminals linked by network to a Silicon Graphics Crimson™ computer.

Data is received in the high-resolution picture transmission mode (HRPT) from the NOAA polar-orbiting environmental satellites in polar orbits some 860 km above the Earth. The HRPT records include data from the Advanced Very High Resolution Radiometer (AVHRR), the TIROS operational vertical sounder (TOVS), and the System ARGOS data collection and location subsystem. The AVHRR is a radiometrically precise, 1.1 km spatial resolution, five-channel scanning imager providing a 2,800 km by up to 5,400 km view of the Earth with each pass captured by the ESL. The TOVS is a multispectral atmospheric sounder that provides a three-dimensional, time series of the temperature, humidity, and pressure structure of the atmosphere for weather forecasting. The ARGOS data allow tracking of free drifting buoys or balloons for velocities of motion and telemetry of insitu measurements.

Data from these various sensors are used by investigators at LSU to observe and quantitatively analyze the spatially large and time-varying features of the atmosphere, oceans, and land masses. Particularly important is the "live" or near-real time access to environmental information that is valuable to decision makers in times of emergency. Some recent investigations have examined storm systems, forest fires, ocean currents, floods, fog formation, and vegetation conditions.

From its central location, the ESL can capture data from the entire Gulf of Mexico, most of the western Atlantic, the extreme eastern Pacific, the northern Caribbean, and the land mass from Hudson Bay to northernmost South America. Nine to 12 passes of the data accumulated daily in the ESL archive create a permanent, growing record of environmental data for education, research, economic, and forensic applications. LSU is considered a premier NOAA satellite data source by the EROS Data Center, the National Aeronautics and Space Administration (NASA), the U.S. Geological Survey, the U.S. Navy, and other agencies.

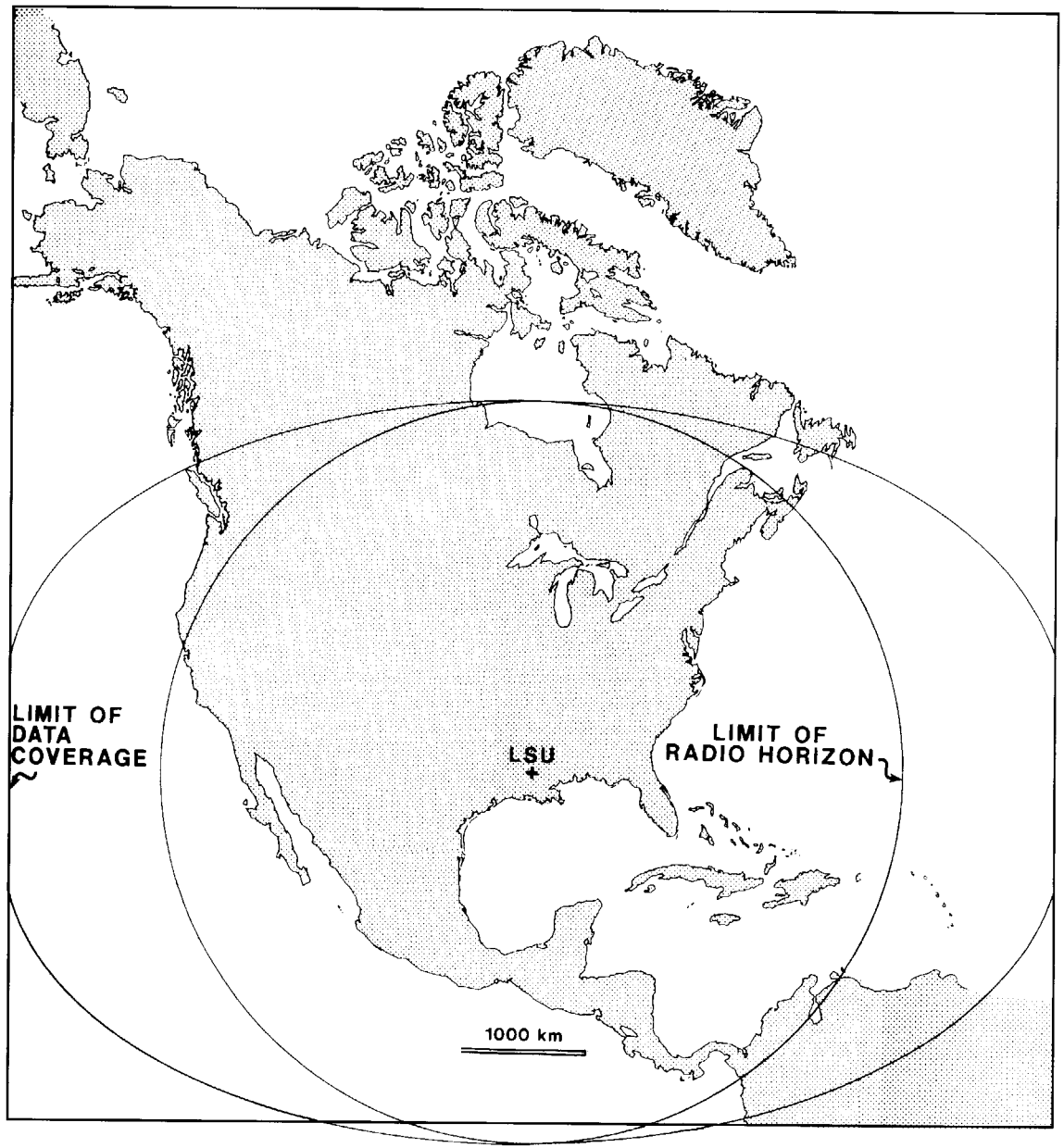
The Earth Scan Laboratory is part of a growing network of more than 50TeraScan™ environmental satellite earth stations that encircle the globe.

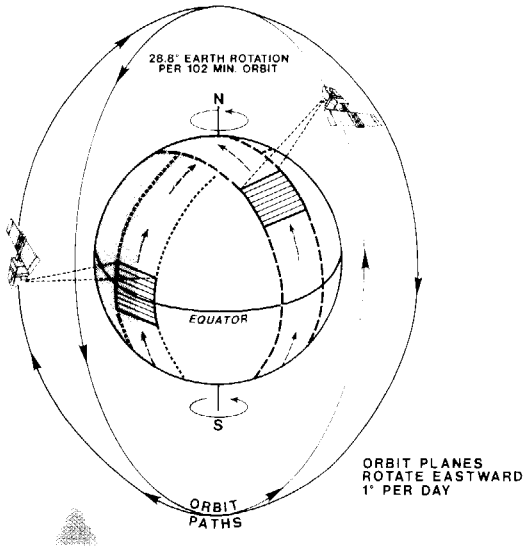
What is the Earth Scan Laboratory?

- A University-owned NOAA satellite earth station that includes a tracking antenna-receiver and a computer system to capture, process, and archive direct readout NOAA satellite data.
- A receiver of direct broadcast environmental satellite data from three sensors — an earth-imaging radiometer, an atmospheric-profiling radiometer, and a system that collects and re-transmits data from ground-based sensors.
- An immediate source of quantitative information on the large-scale terrain, ocean, and atmospheric conditions of Louisiana and surrounding lands and seas.
- The first installation of a low-cost, high-capacity, transportable NOAA satellite earth station.
- The nation's first state-funded NOAA satellite earth station.

Why is the ESL important?

- LSU is now one of only six universities in the United States capable of tracking NOAA satellites, capturing their broadcast high-resolution data "live," and displaying the environmental information in near-real time.
- It is a stimulus to research and education and it:
  - — initiates LSU operational participation in the U.S. space program.
  - — increases the competitiveness of environmental research programs at LSU.
  - — attracts and instructs superior students in the acquisition, processing, and use of satellite data in a quasi-operational mode.
  - — provides synoptic, real-time data to researchers in such varied fields as meteorology, oceanography, ecology, geology, geography, agriculture, fisheries, forestry, and veterinary sciences.
- Real-time satellite data are a valuable asset for management decision making that involves environmental conditions, such as:
  - — tracking and forecasting movement of severe storms over land and sea.
  - — providing atmospheric profile information in areas of frontogenesis and cyclogenesis over the Gulf of Mexico, needed for severe storm detection and forecasting. Presently this is not directly available to even the National Weather Service (NWS) Regional Forecast Center in Slidell, Louisiana.
  - — monitoring and forecasting of river and coastal fog for offshore petroleum, fisheries, and other maritime industries.
  - — detecting forest and brush fires and their progress in remote regions.
  - — detecting river flooding in local detail for state disaster-related decision makers.
  - — monitoring conditions of coastal and estuarine waters, their surface temperature, turbidity levels, and coastal inundation for fisheries management.
  - — detecting and tracking ocean currents, eddies, and water mass boundaries in the Gulf of Mexico for blue water fisheries, offshore platform installation, and weather forecasting.
  - — detecting vegetation stress (water or parasitic) in crops and forests for crop yield forecasting and management.





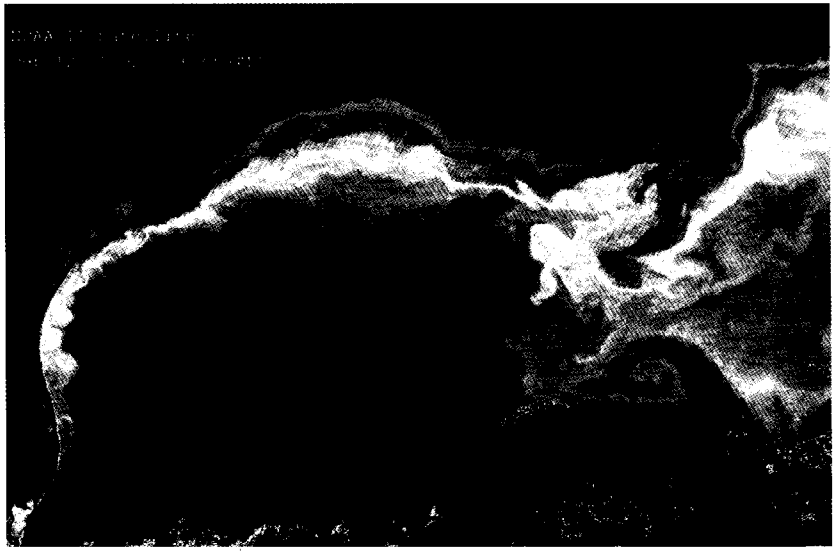
NOAA SATELLITES IN POLAR ORBITS

Two NOAA satellites orbit the Earth pole to pole in 102 minutes. The plane of each orbit remains fixed with respect to the Sun, as the Earth rotates beneath them. Repeat coverage occurs approximately the same sun time a minimum of four times each day everywhere on Earth.

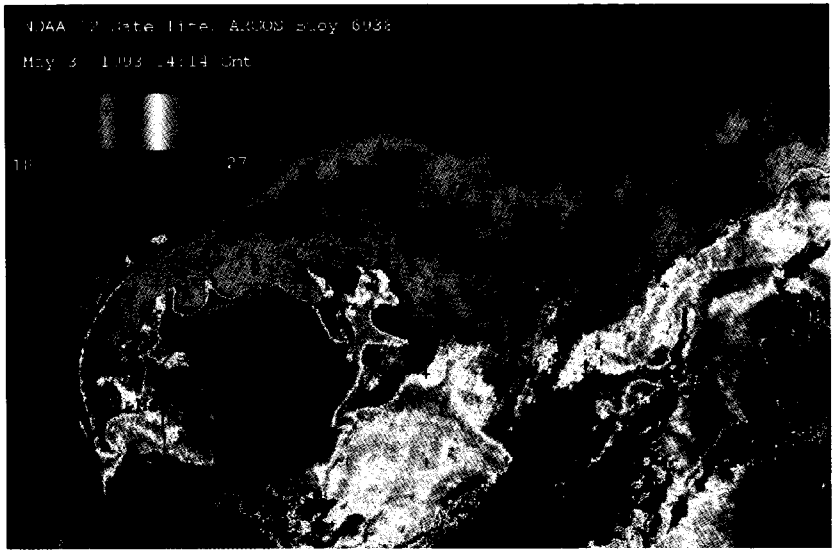
RADIO HORIZON AND DATA COVERAGE OF ESL TELEMETRY SITE

Line-of-sight radio transmissions are received at LSU when satellites rise above the horizon. They pass into the zone of data capture while scanning 2800km wide swath on Earth. Along track data coverage area is a maximum of 5400km. Data coverage extends beyond the radio horizon since sensors scan 1400km either side of satellite subtrack.

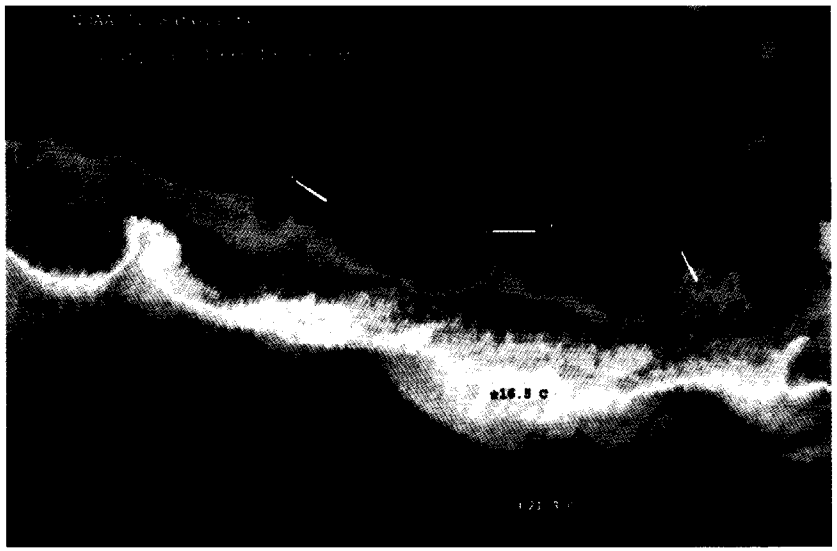
NOAA Satellite Data Products by the Earth Scan Laboratory



Surface temperature image of the northwestern Gulf of Mexico. Color codes are land, black; chilled shelf waters, blue; Mississippi River discharge, green; two huge oceanic anticyclones (clockwise spinning eddies of warm water), red.



Surface temperature image of the northwestern Gulf of Mexico. Color codes are land, black; cool shelf waters, blue; warm water eddies, red. Note the drifting buoy track in clockwise spinning eddy from May 2-31. It corroborates motion inferred from the surface temperature pattern.



Surface temperature image of the Louisiana coast showing surface water temperature values in estuaries, lakes, and the inner continental shelf.

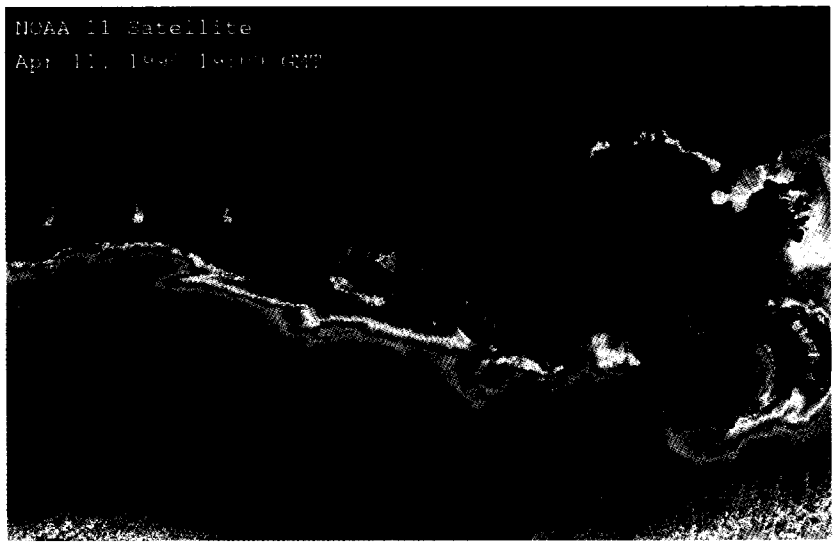


Image of ocean reflectance showing pattern of suspended sediment along the Louisiana coastline. Color codes are land, black; turbid waters, green/red; clear waters, blue.

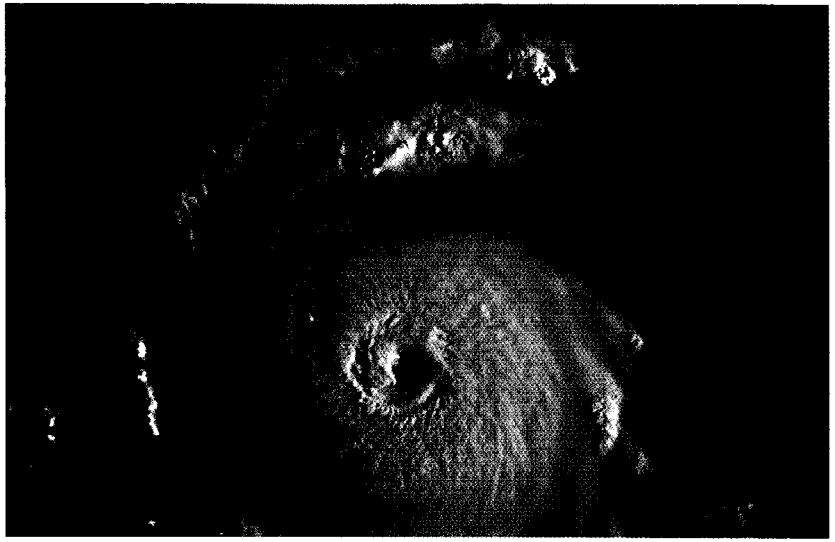


Image of Hurricane Andrew on its track bringing its destructive effects from South Florida to South Louisiana.

System ARGOS buoy tracks showing movement path of free-drifting Buoy 6935. Shows ocean current flow from the Louisiana coast along the continental shelf edge into the Florida Strait.

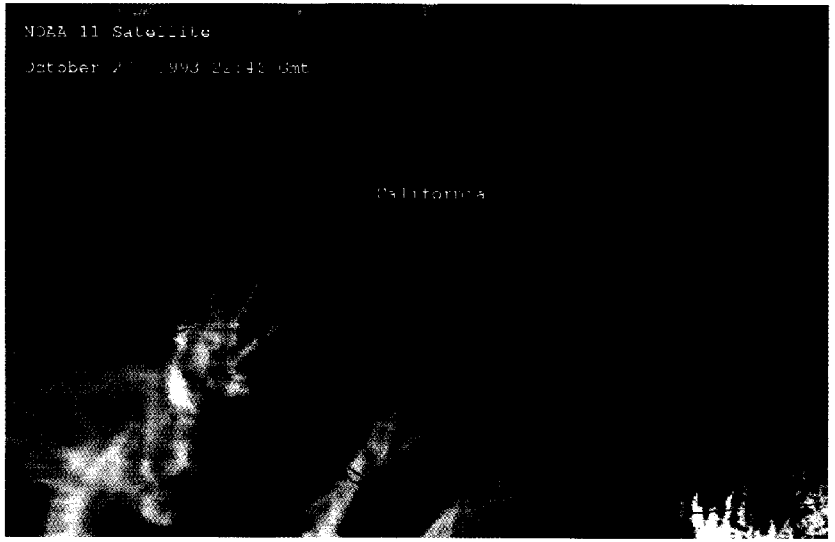


Image of the fires in southern California in October 1993. Color codes are coastlines and state boundaries, green; fires, red; smoke plumes blowing offshore, white.

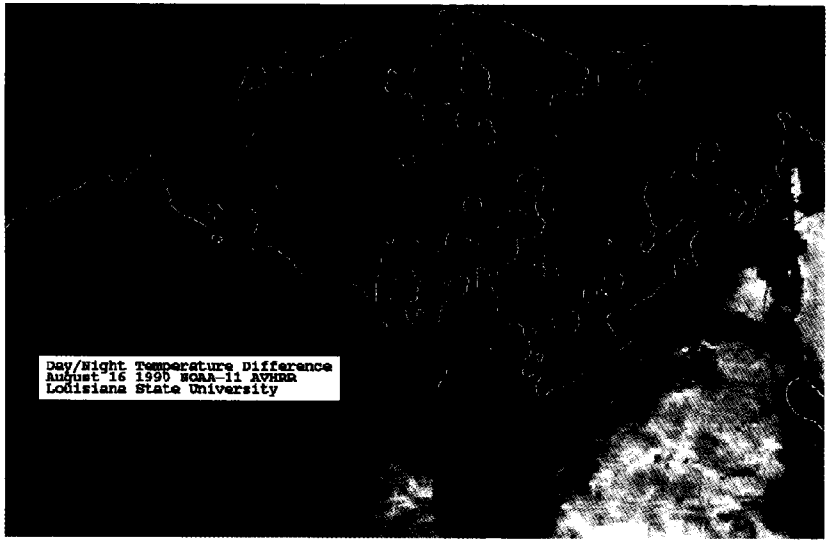
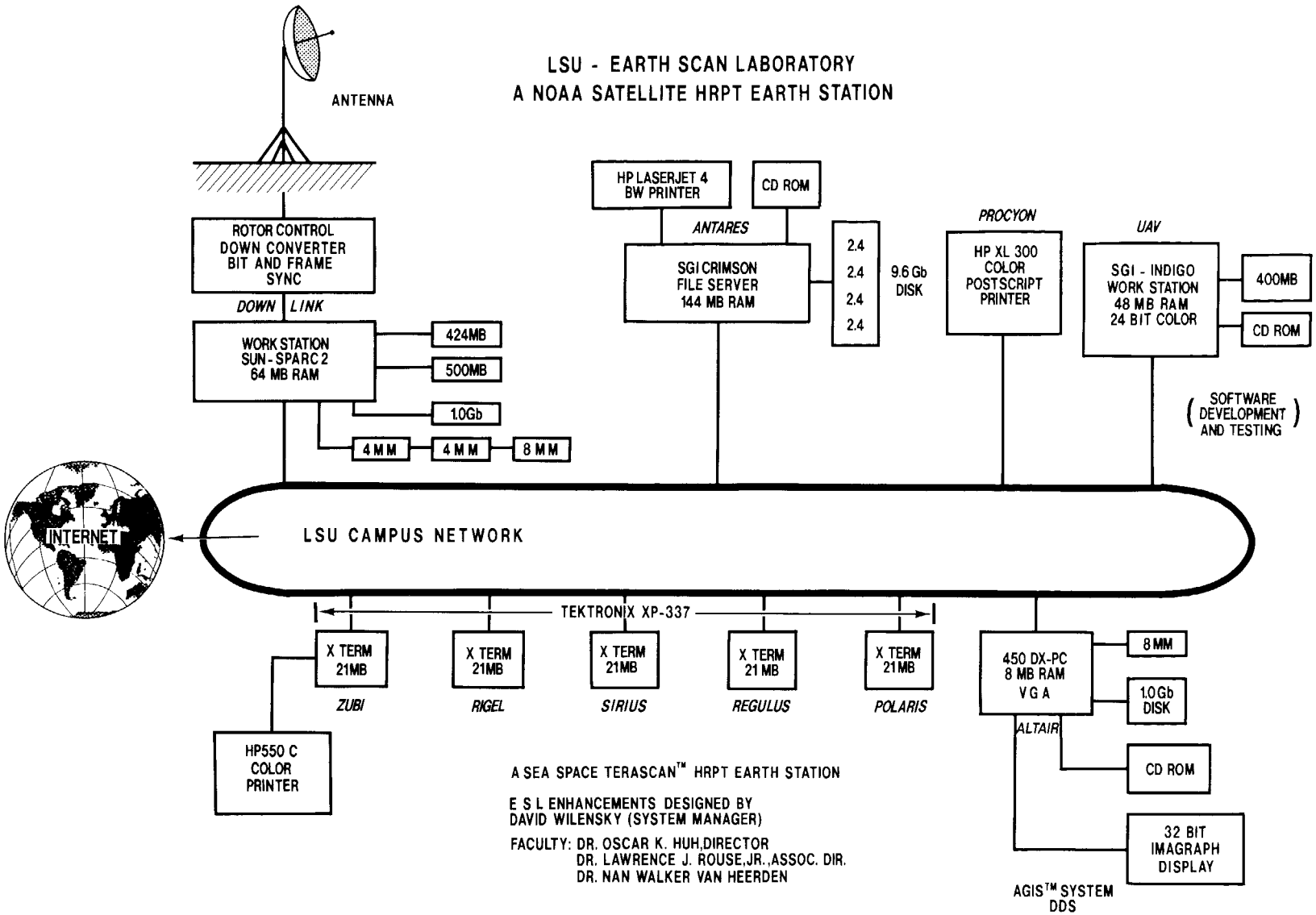


Image of the magnitude of the day/night changes in ground surface temperature of the Nile River Delta in Egypt. Larger values (yellow, red, green) mean dry soil; smaller values (bluish) mean moist, wet, snail-borne, disease-prone areas.


LSU - EARTH SCAN LABORATORY
A NOAA SATELLITE HRPT EARTH STATION
ANTENNA
ROTOR CONTROL
DOWN CONVERTER
BIT AND FRAME
SYNC
DOWN LINK
WORK STATION
SUN - SPARC 2
64 MB RAM
424MB
500MB
1.0Gb
4 M M
4 M M
8 M M
HP LASERJET 4
BW PRINTER
CD ROM
ANTARES
SGI CRIMSON
FILE SERVER
144 MB RAM
2.4
2.4
2.4
2.4
9.6 Gb
DISK
PROCYON
HP XL 300
COLOR
POSTSCRIPT
PRINTER
UAV
SGI - INDIGO
WORK STATION
48 MB RAM
24 BIT COLOR
400MB
CD ROM
(SOFTWARE
DEVELOPMENT
AND TESTING)
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LSU CAMPUS NETWORK
TEKTRONIX XP-337
X TERM
21MB
ZUBI
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RIGEL
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FACULTY: DR. OSCAR K. HUH,DIRECTOR
DR. LAWRENCE J. ROUSE,JR.,ASSOC. DIR.
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