Real-Time Satellite Remote Sensing

from the Direct Broadcast Receiving Station at the University of Texas Center for Space Research

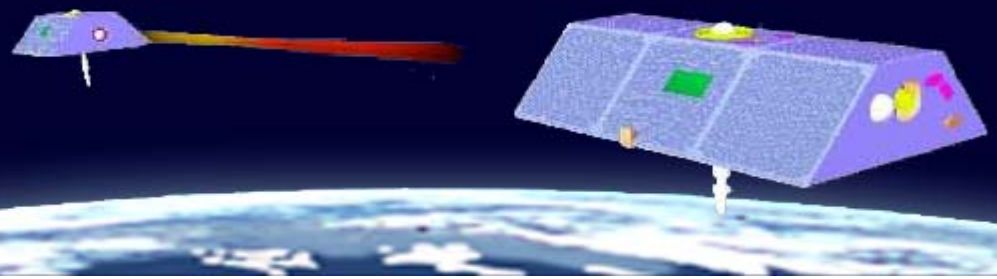
THE UNVERSITY OF TEXAS AT AUSTIN

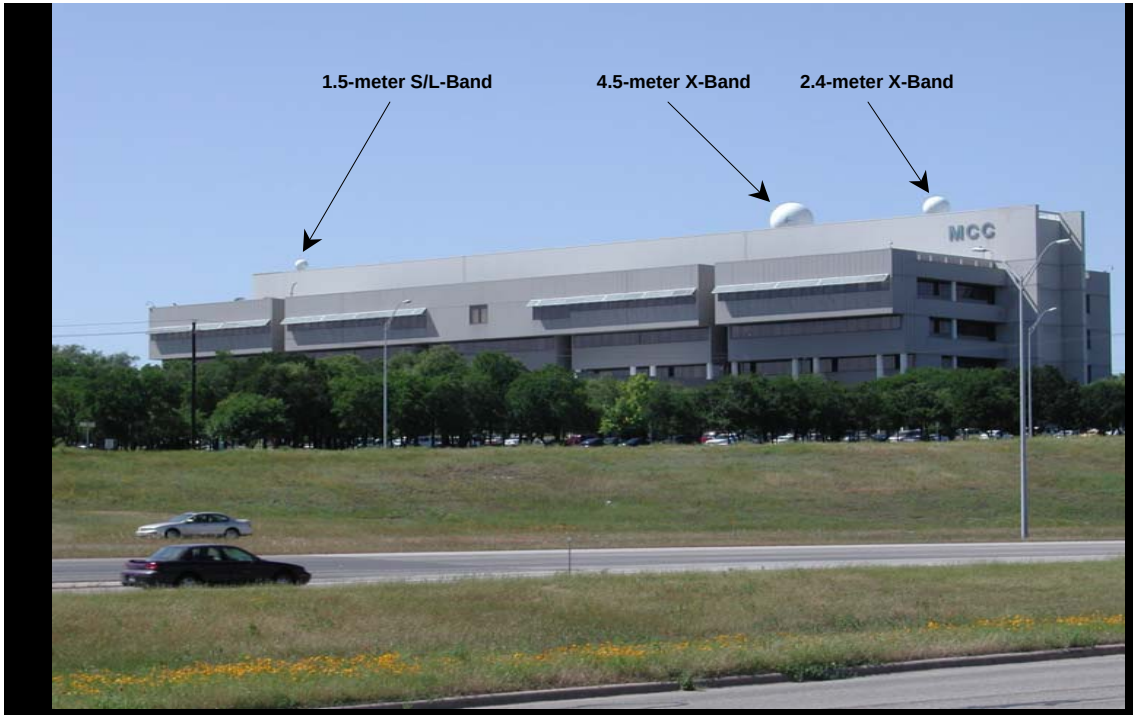
C S R

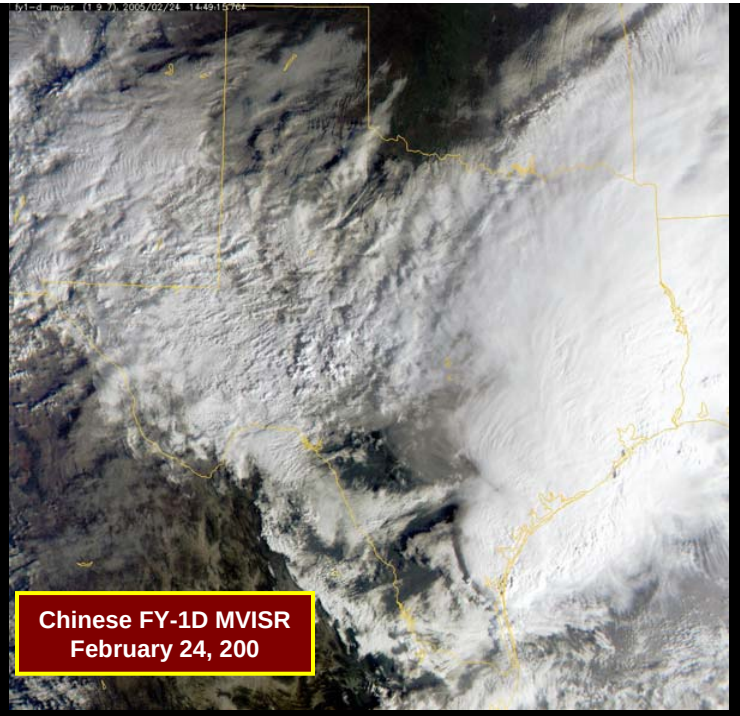
Center for Space Research

Gordon Wells

March 2, 2005




1.5-meter S/L-Band
4.5-meter X-Band
2.4-meter X-Band
MCC


Chinese FY-1D MVISR
February 24, 200

SeaSpace
CORPORATION

NASA Terra MODIS
October 15, 2004

TERRA
Austin: UT-CSR

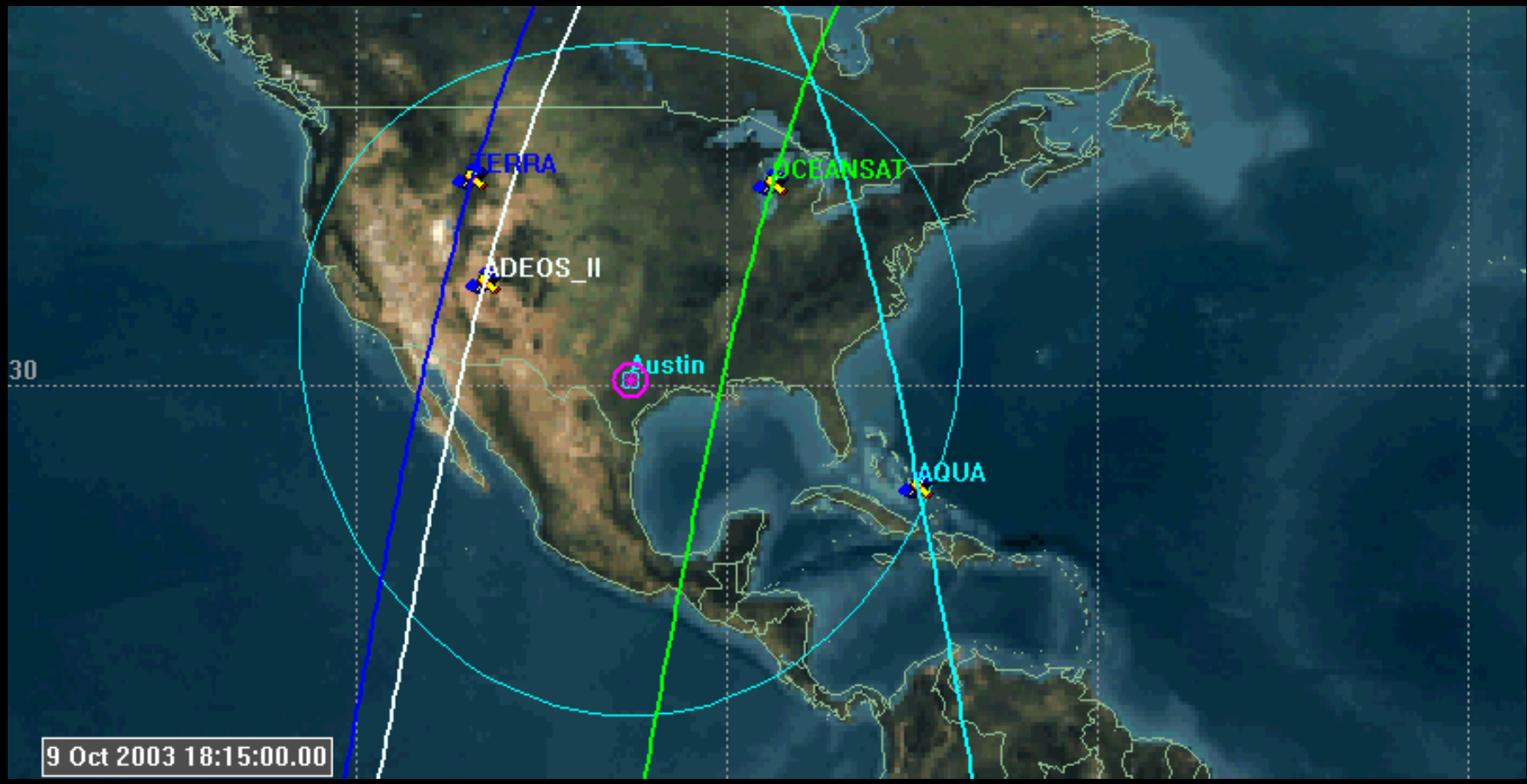
MAGIC
Receiving Lab

Capture Systems

X-Band Pass Collection Schedule

satel	telem	date	jd	start time	durat	lines	antenna
terra-1	teradb	2005/02/25	56	16:06:30	10:40	4935	tatooine
terra-1	teradb	2005/02/25	56	16:06:30	10:40	4893	coruscant
aqua-1	aquadb	2005/02/25	56	09:56:20	06:50	3149	coruscant
aqua-1	aquadb	2005/02/25	56	09:56:19	06:40	2783	tatooine
aqua-1	aquadb	2005/02/25	56	08:16:00	13:20	7045	tatooine
aqua-1	aquadb	2005/02/25	56	08:16:00	13:20	6876	coruscant
aqua-1	aquadb	2005/02/25	56	06:41:30	06:00	2973	tatooine
aqua-1	aquadb	2005/02/25	56	06:41:30	06:00	3032	coruscant
terra-1	teradb	2005/02/25	56	05:39:20	10:50	4814	coruscant
terra-1	teradb	2005/02/25	56	05:39:19	11:00	5109	tatooine
terra-1	teradb	2005/02/25	56	04:00:40	12:40	5961	tatooine
terra-1	teradb	2005/02/25	56	04:00:40	12:40	5922	coruscant
irs-p4	ocm	2005/02/24	55	20:26:09	09:00	4677	tatooine
aqua-1	aquadb	2005/02/24	55	20:11:09	12:40	6651	coruscant
irs-p4	ocm	2005/02/24	55	18:50:59	08:30	12945	tatooine
terra-1	teradb	2005/02/24	55	18:39:50	08:50	2991	coruscant
aqua-1	aquadb	2005/02/24	55	18:34:39	11:00	5751	tatooine
irs-p4	ocm	2005/02/24	55	17:09:39	10:20	9302	tatooine
terra-1	teradb	2005/02/24	55	17:00:20	13:20	5379	coruscant
aqua-1	aquadb	2005/02/24	55	09:11:39	11:30	6048	coruscant
aqua-1	aquadb	2005/02/24	55	09:11:30	11:40	5851	tatooine
aqua-1	aquadb	2005/02/24	55	07:33:40	12:20	6493	coruscant
aqua-1	aquadb	2005/02/24	55	07:33:39	12:20	6454	tatooine
terra-1	teradb	2005/02/24	55	04:55:20	13:00	6103	tatooine
terra-1	teradb	2005/02/24	55	04:55:20	13:00	5967	coruscant
terra-1	teradb	2005/02/24	55	03:19:40	09:40	4469	tatooine

Resolving Orbital Pass Conflicts

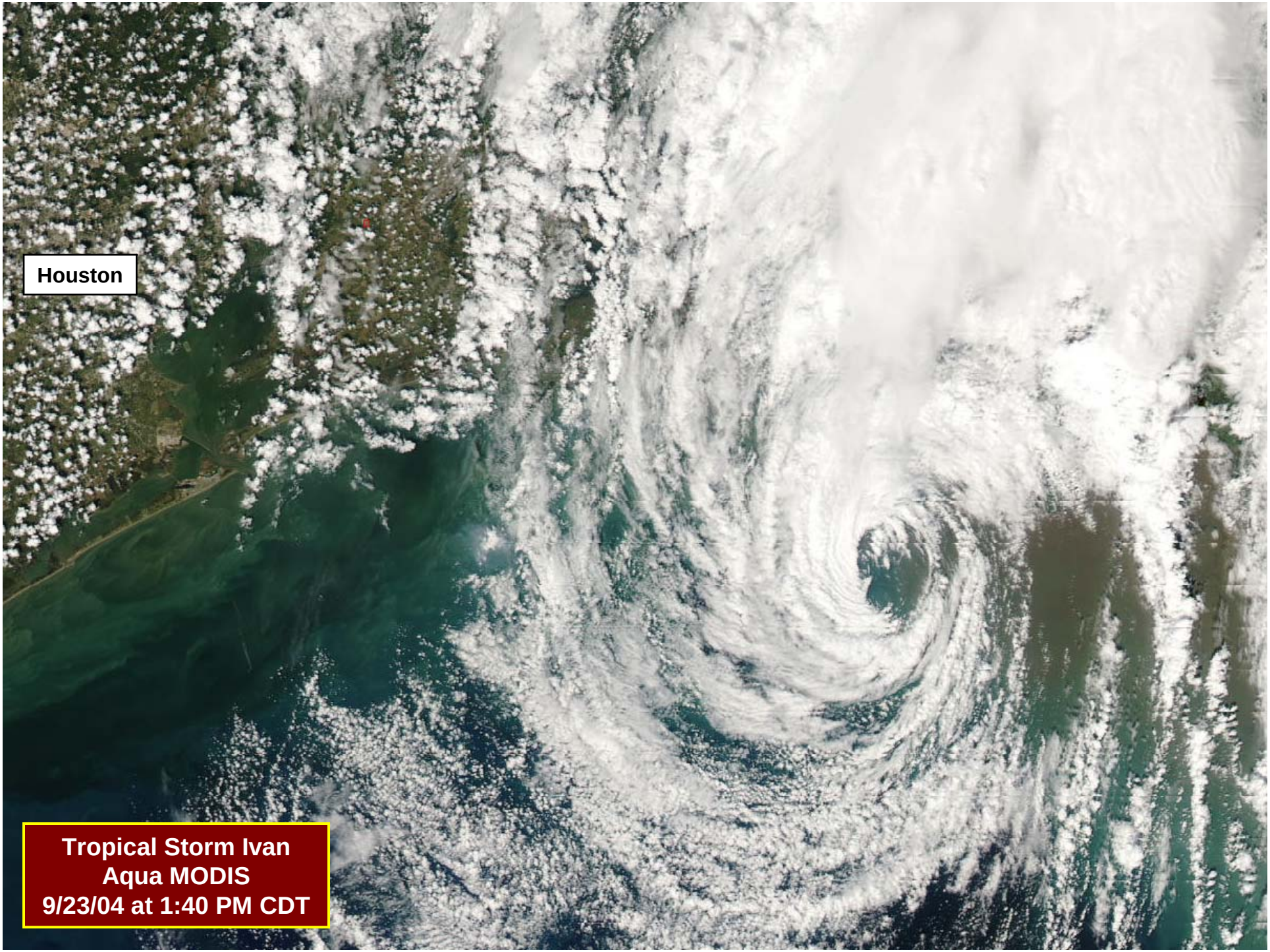


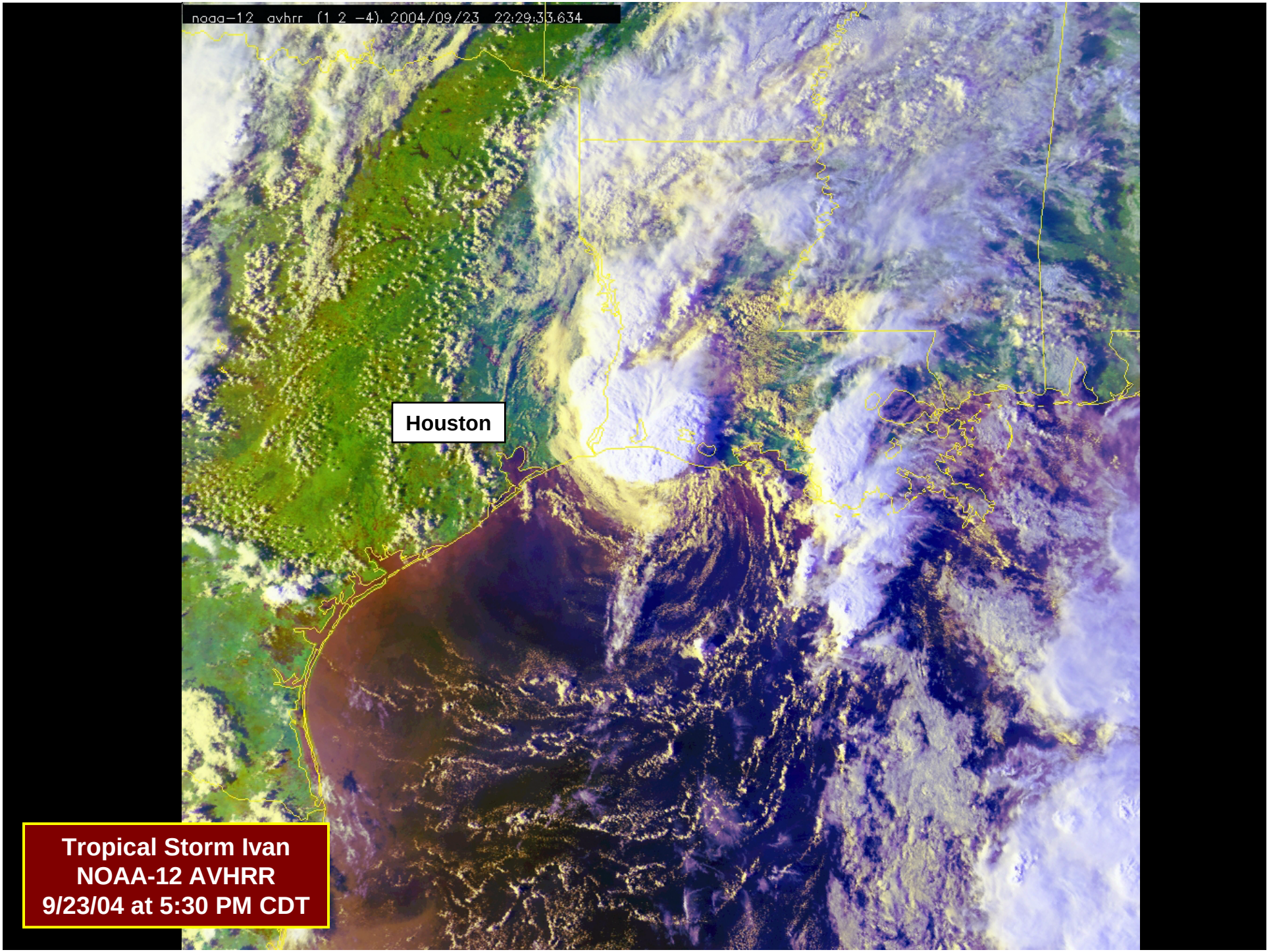
Routine Remote Sensing Observations

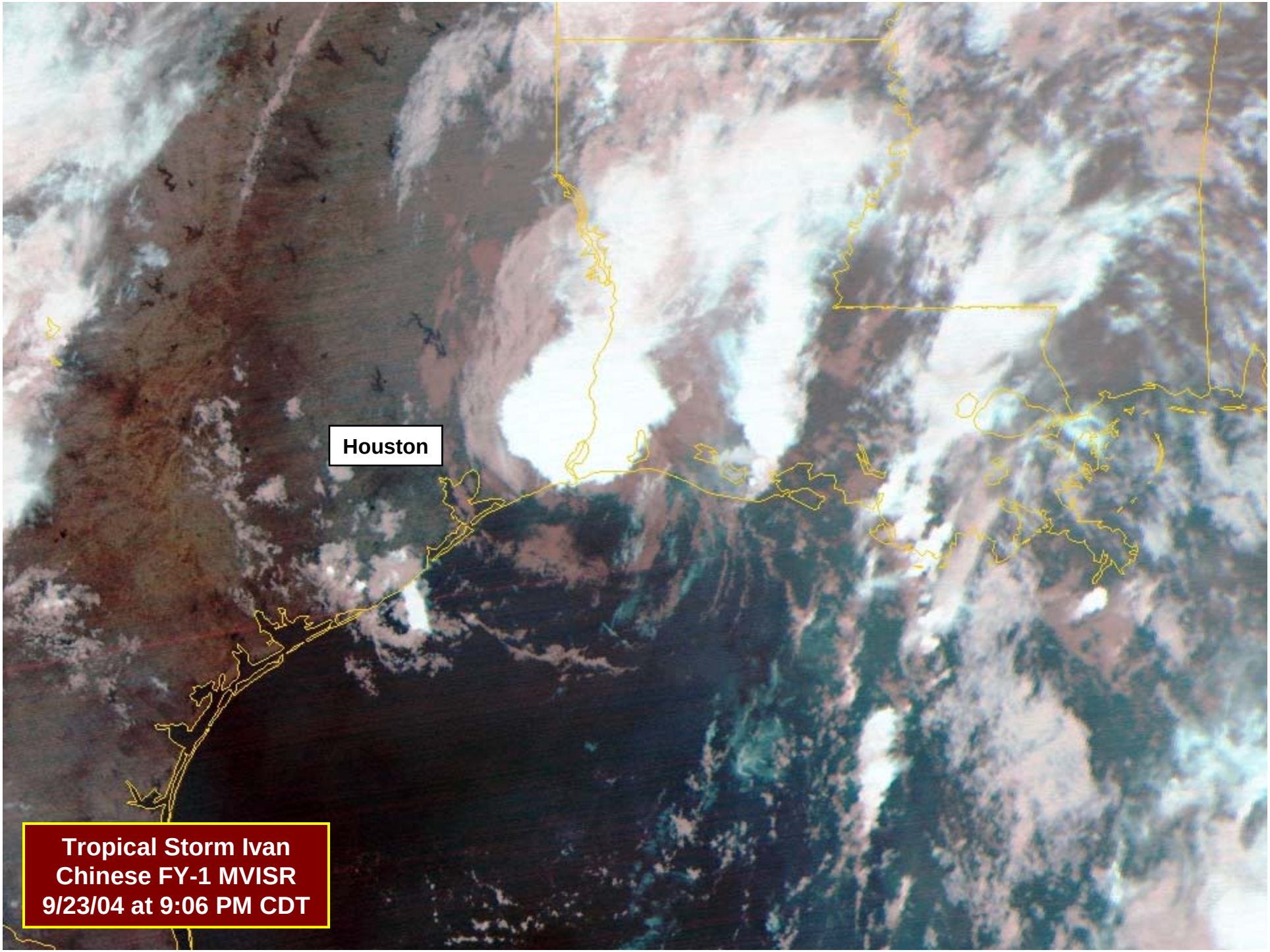
Observation	Sensor	Daily	Periodic	As-Required
Surface Temperature	GOES	X		
	MODIS	X		
Precipitation	NEXRAD	X		
Soil Moisture (Inferred)	GOES	X		
Soil Moisture (Direct)	AMSR-E		X	
Vegetation Stress (NDVI)	AVHRR	X	X	
	IRS-P4 OCM	X		
Vegetation Stress (EVI)	MODIS	X	X	
Vegetation Phenology	MODIS	X	X	
	IRS-P4 OCM		X	
Suspended Organic Materials	IRS-P4 OCM	X		
	MODIS	X	X	
Leaf Area Index	MODIS		X	
Fraction Photosynthetically-Active Radiation	MODIS		X	

Prompt Thermal, Radiation and Blast Effects
6 km (3.7 mi)
Injury from window breakage (3.6 km, 2.2 mi)
2 km (1.2 mi)
Hurricane Greg
Storm Surge
February 18, 2004
5:00 PM CST
TAHC

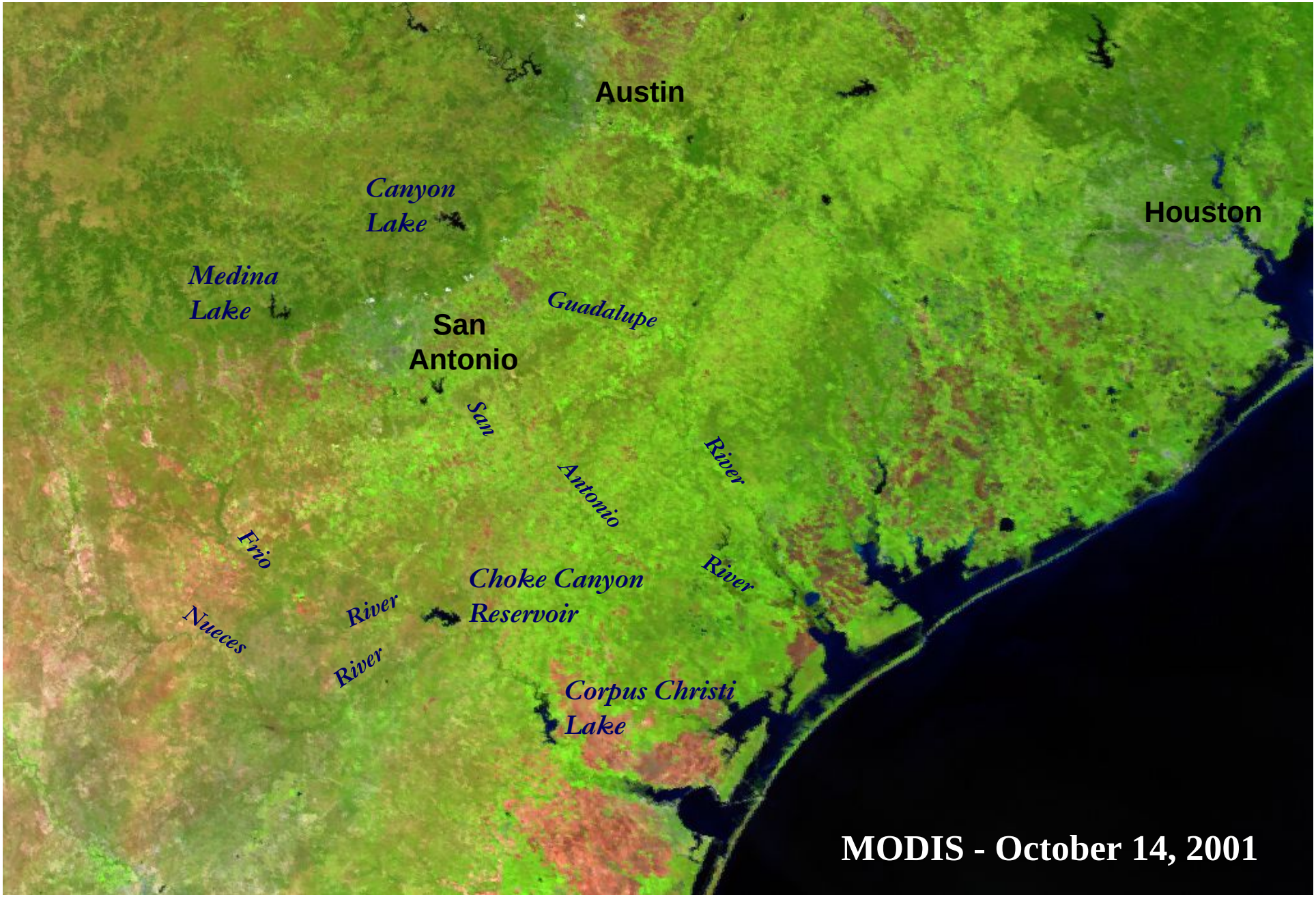
Hurricane Ivan
Aqua MODIS
9/15/04 at 1:50 PM CDT


Houston
Tropical Storm Ivan
Aqua MODIS
9/23/04 at 1:40 PM CDT

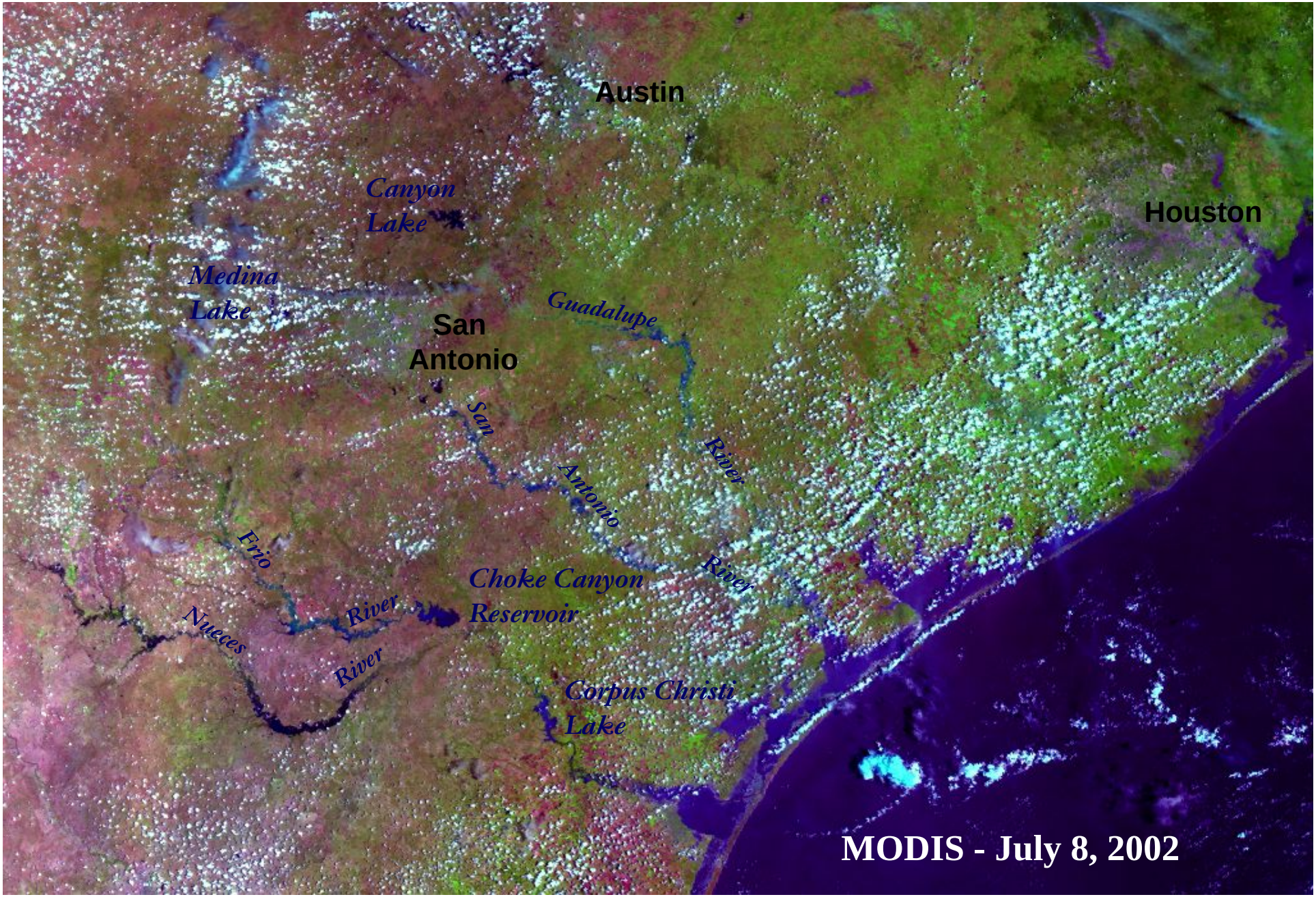

noaa-12 avhrr (1 2 -4), 2004/09/23 22:29:33.634
Houston
Tropical Storm Ivan
NOAA-12 AVHRR
9/23/04 at 5:30 PM CDT


Houston
Tropical Storm Ivan
Chinese FY-1 MVISR
9/23/04 at 9:06 PM CDT

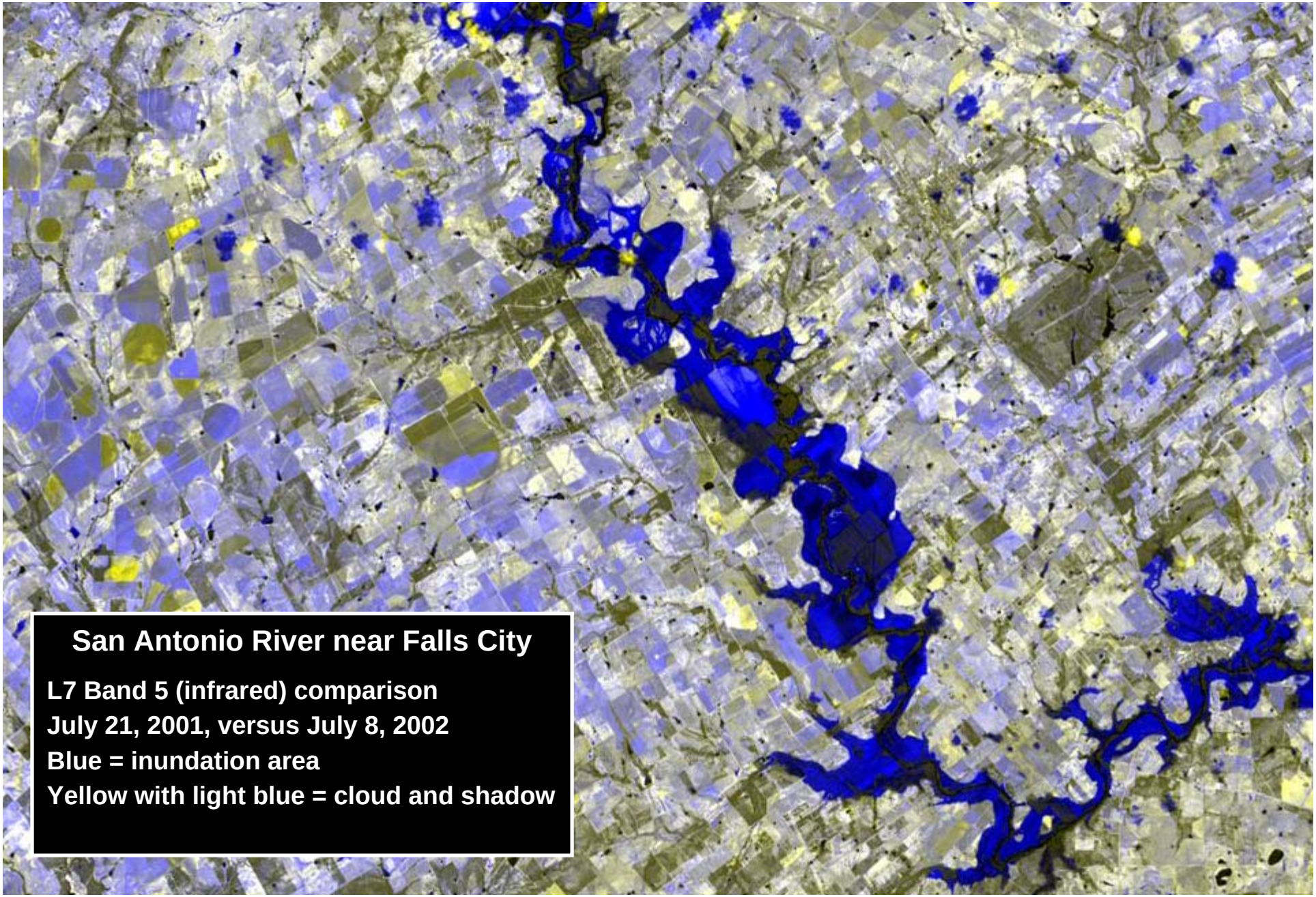
Monitoring An Extreme Hydrologic Event



Monitoring An Extreme Hydrologic Event

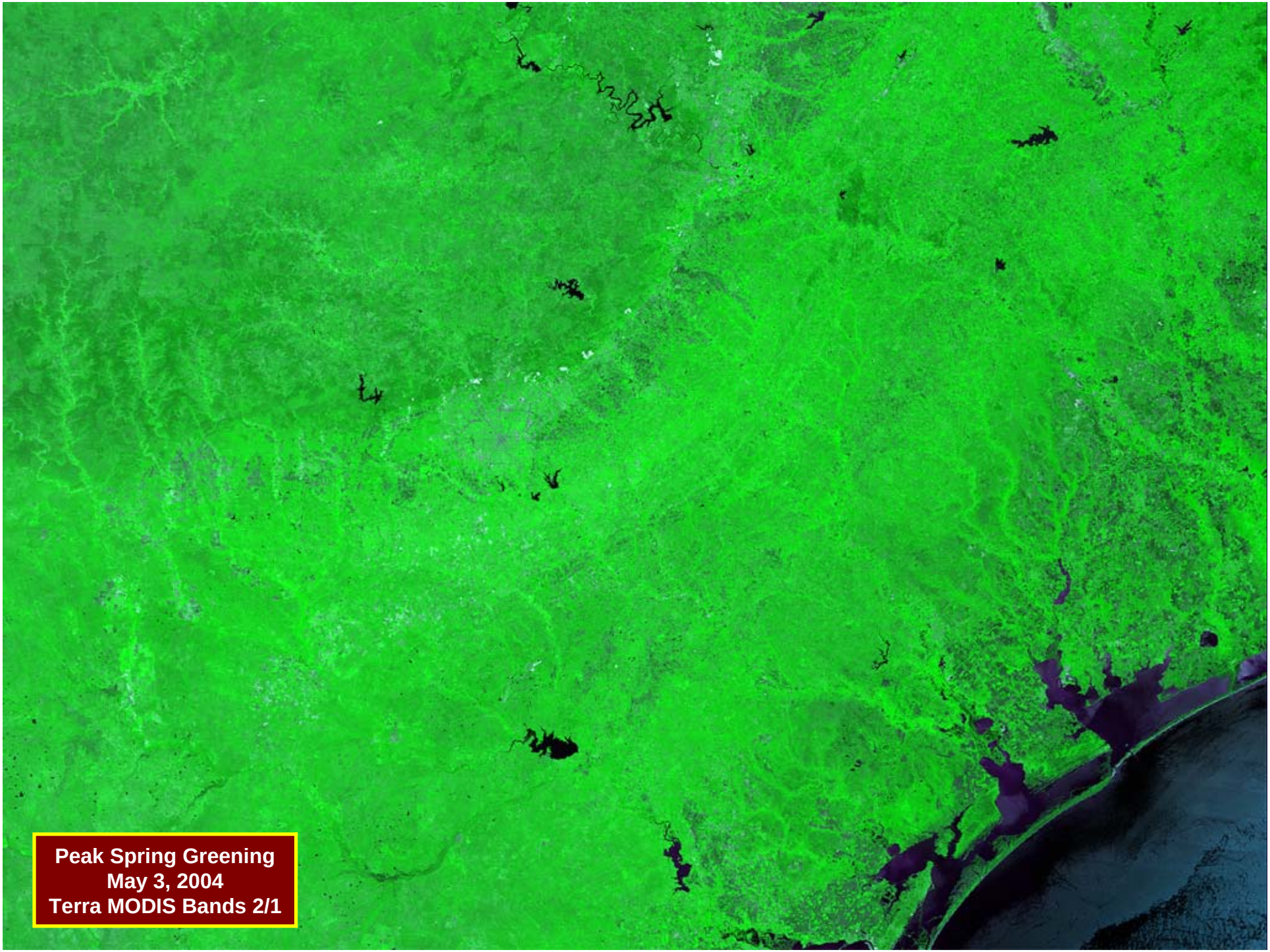


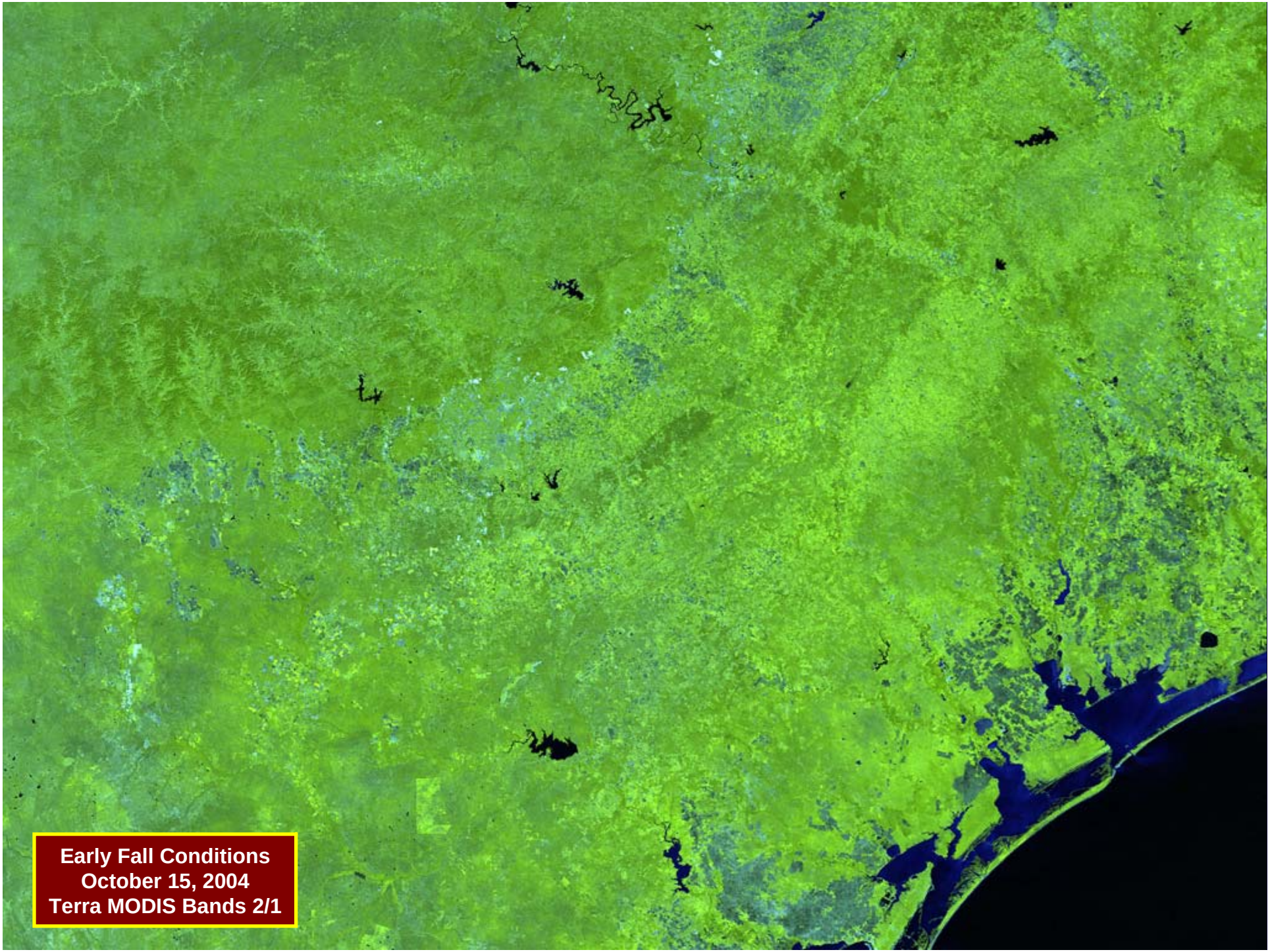
Monitoring An Extreme Hydrologic Event

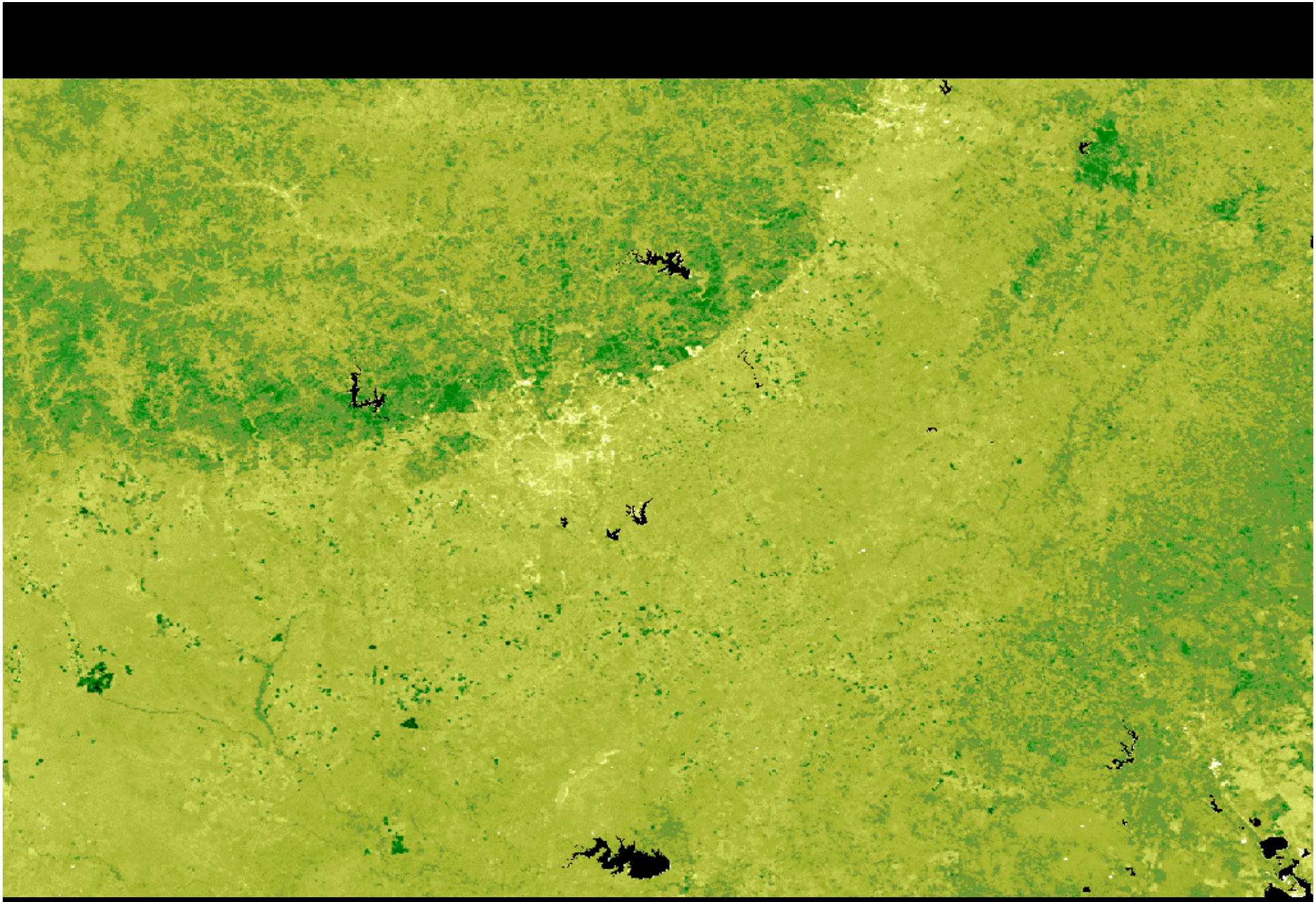


San Antonio River near Falls City

L7 Band 5 (infrared) comparison
July 21, 2001, versus July 8, 2002
Blue = inundation area
Yellow with light blue = cloud and shadow

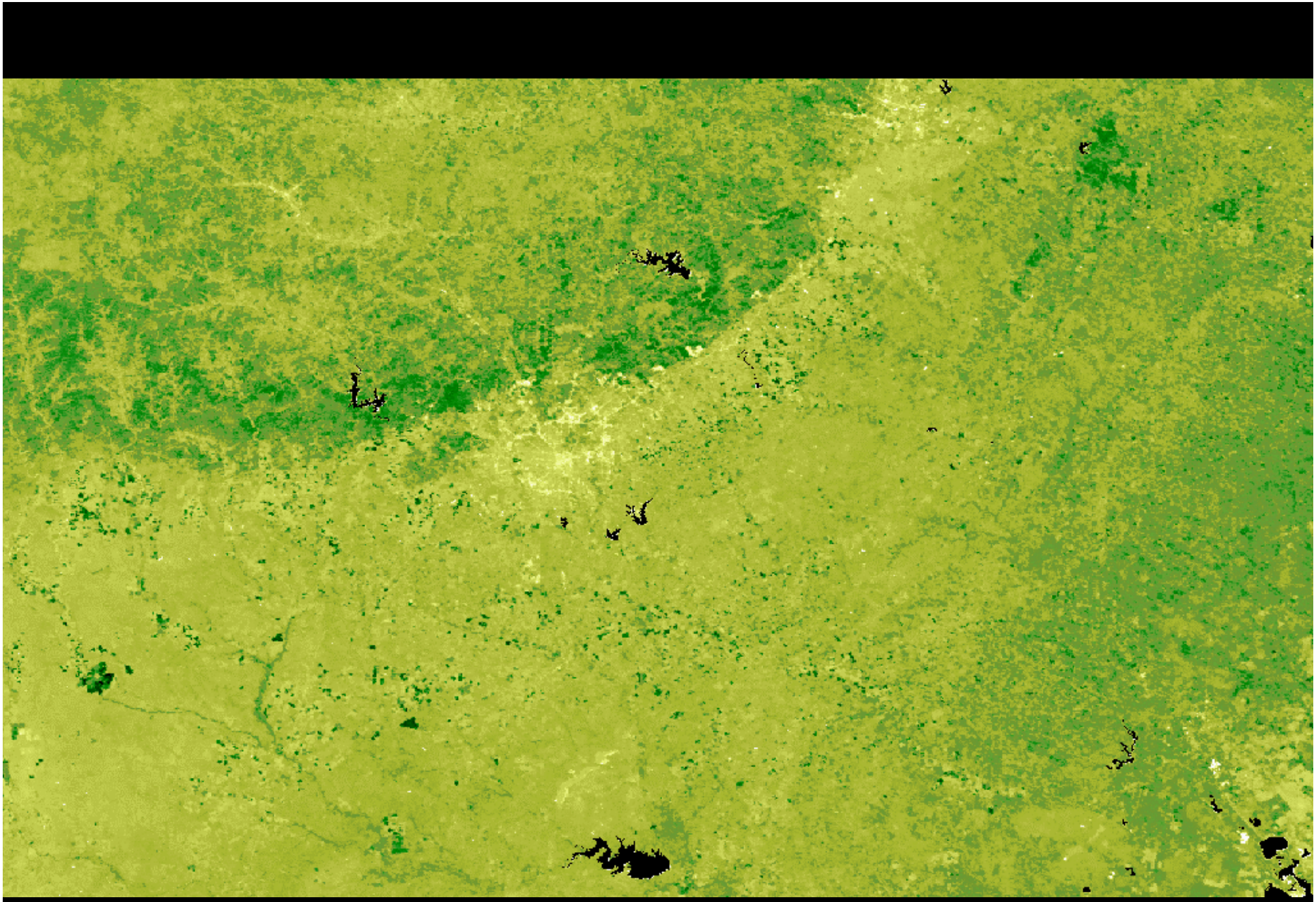

Peak Spring Greening
May 3, 2004
Terra MODIS Bands 2/1


Early Fall Conditions
October 15, 2004
Terra MODIS Bands 2/1



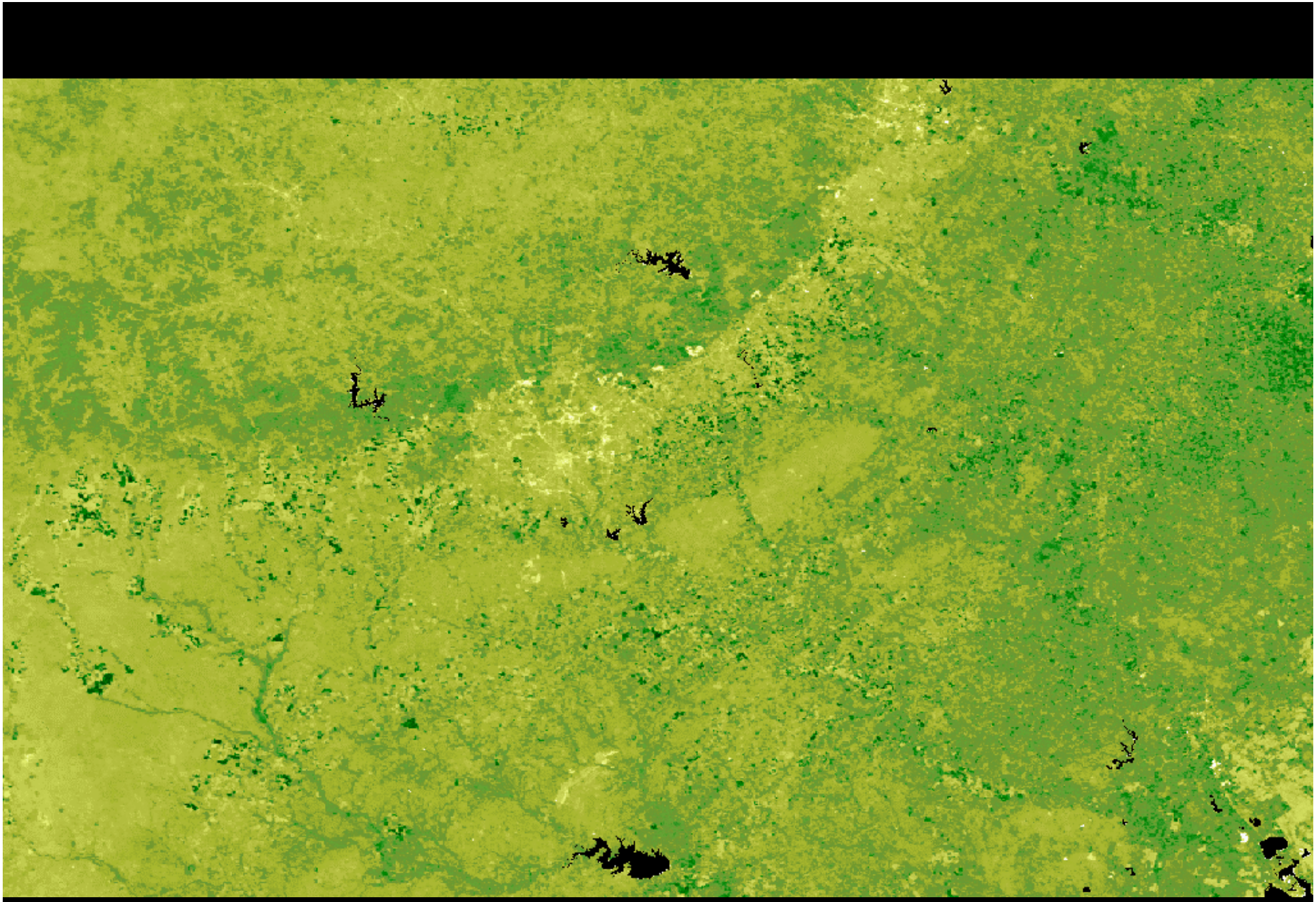
January 2004

CSR MODIS Vegetation
250 meter



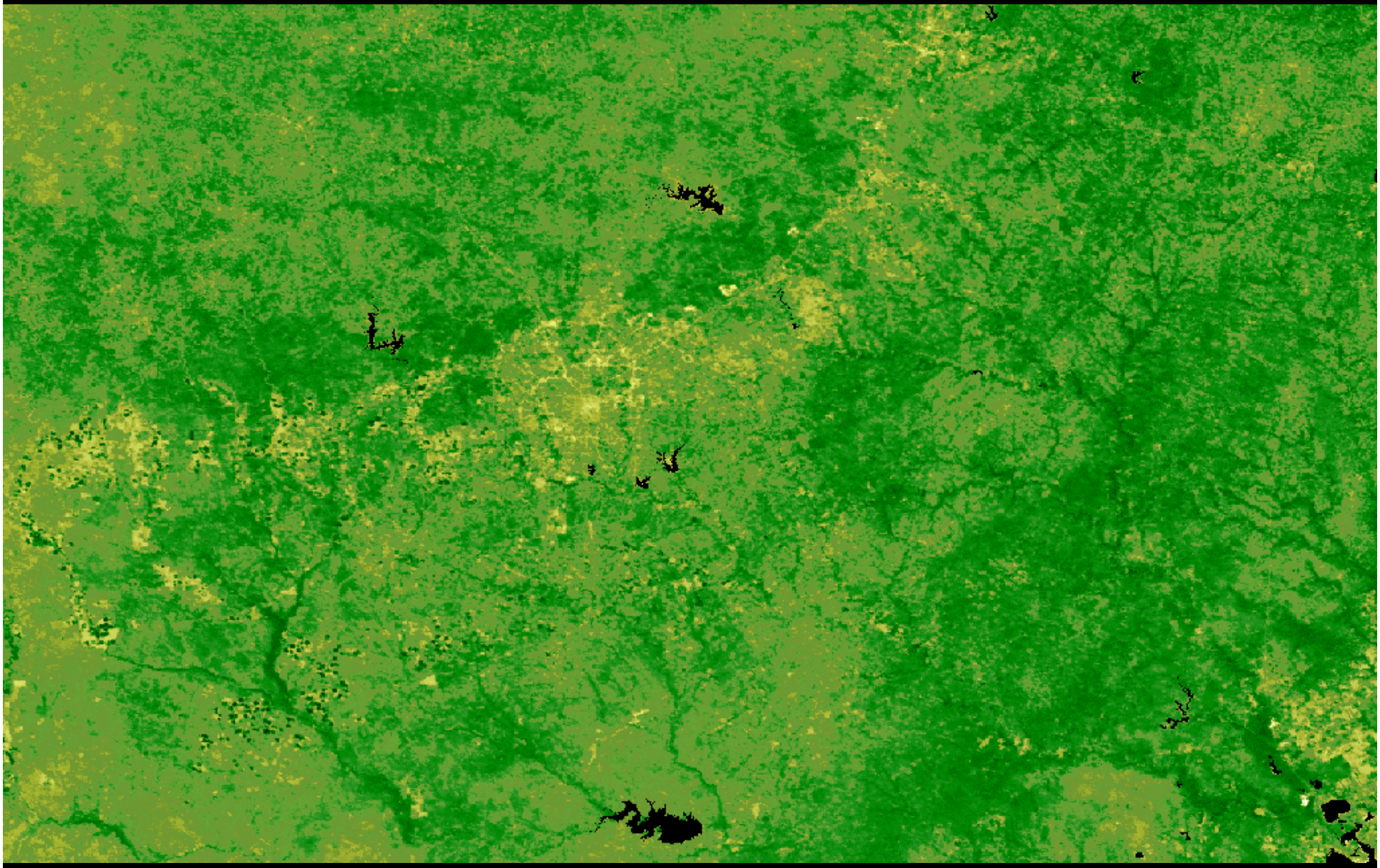
February 2004

CSR MODIS Vegetation
250 meter



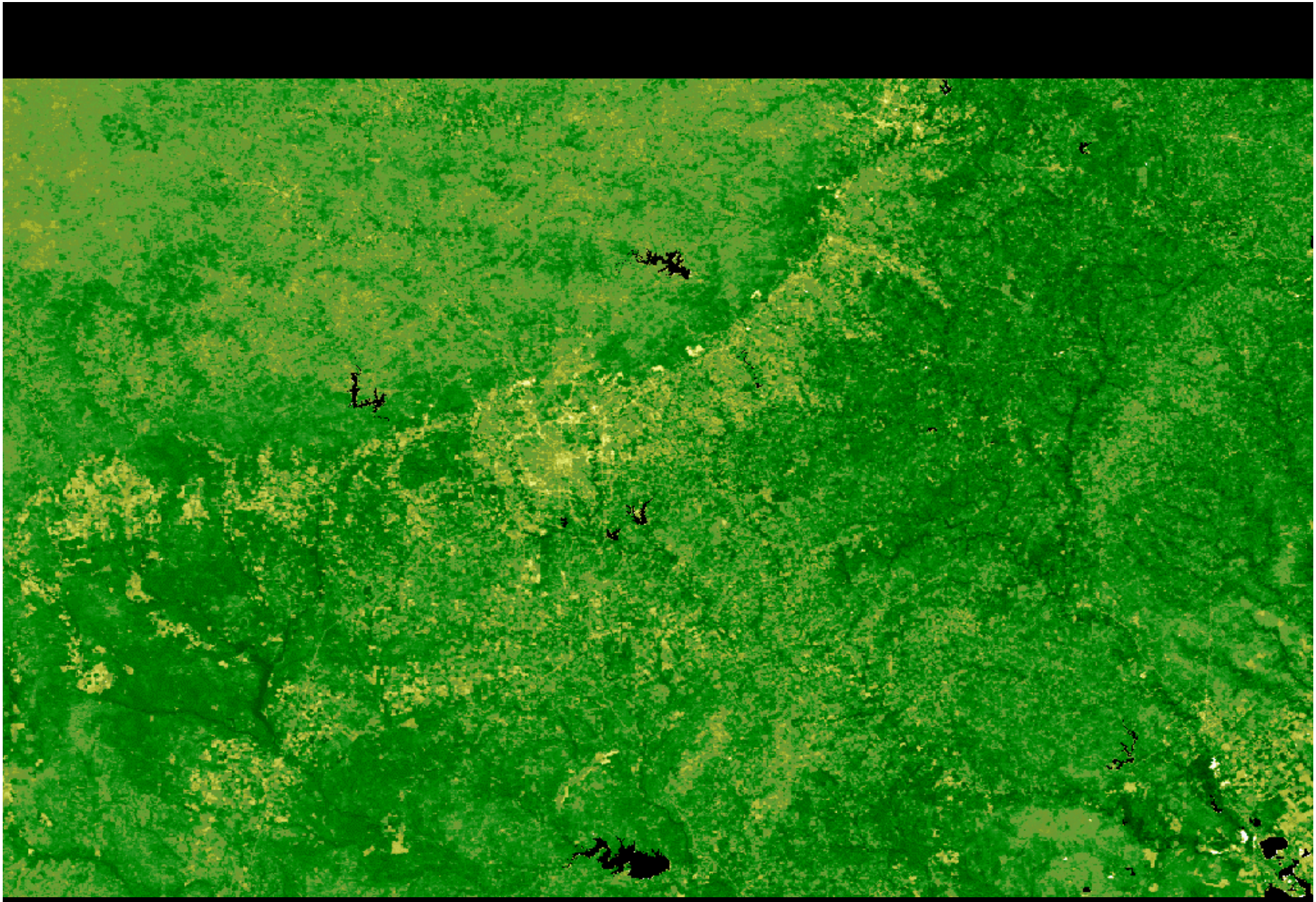
March 2004

CSR MODIS Vegetation
250 meter



April 2004

CSR MODIS Vegetation
250 meter



May 2004

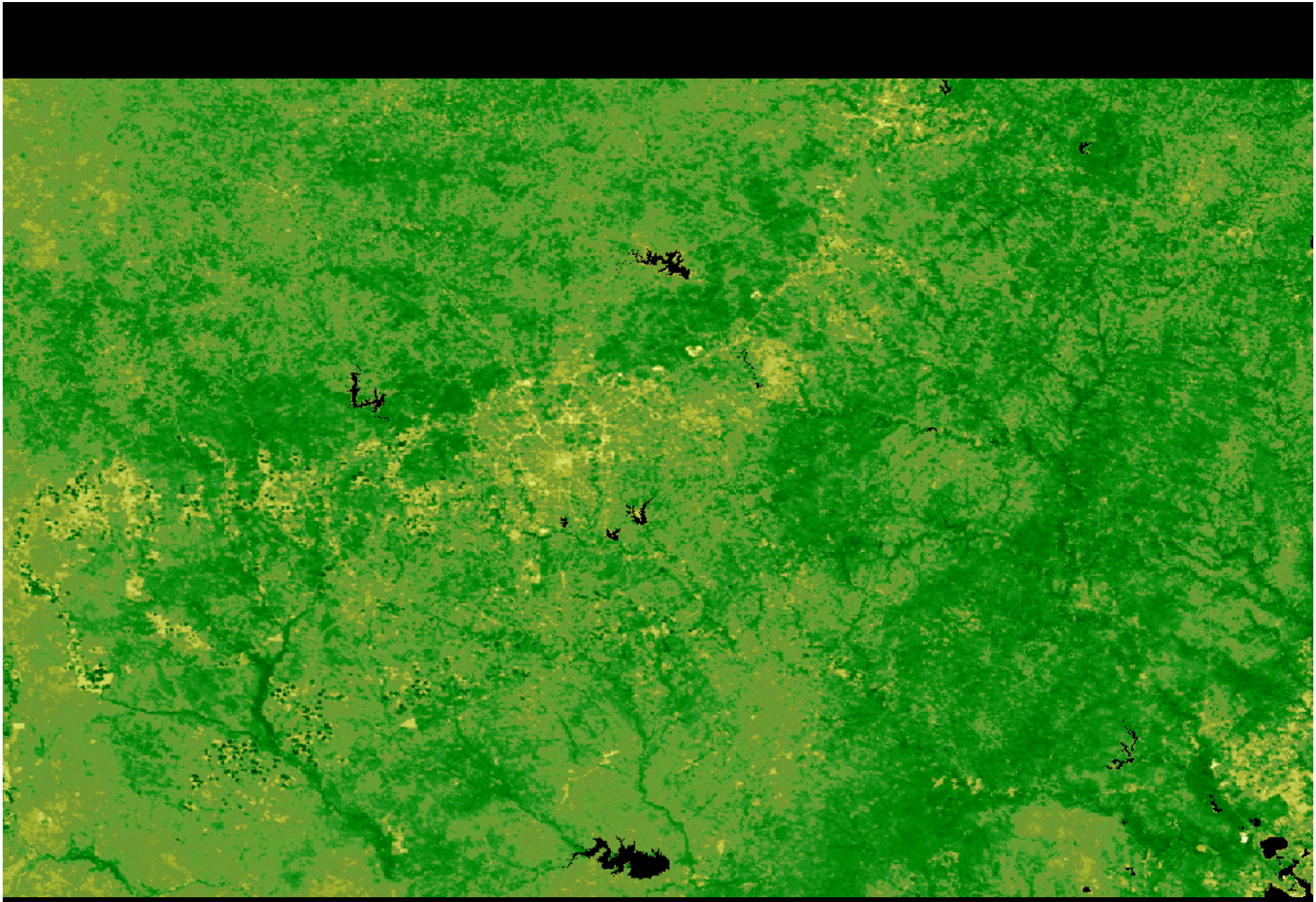
CSR MODIS Vegetation
250 meter

June 2004

CSR MODIS Vegetation
250 meter

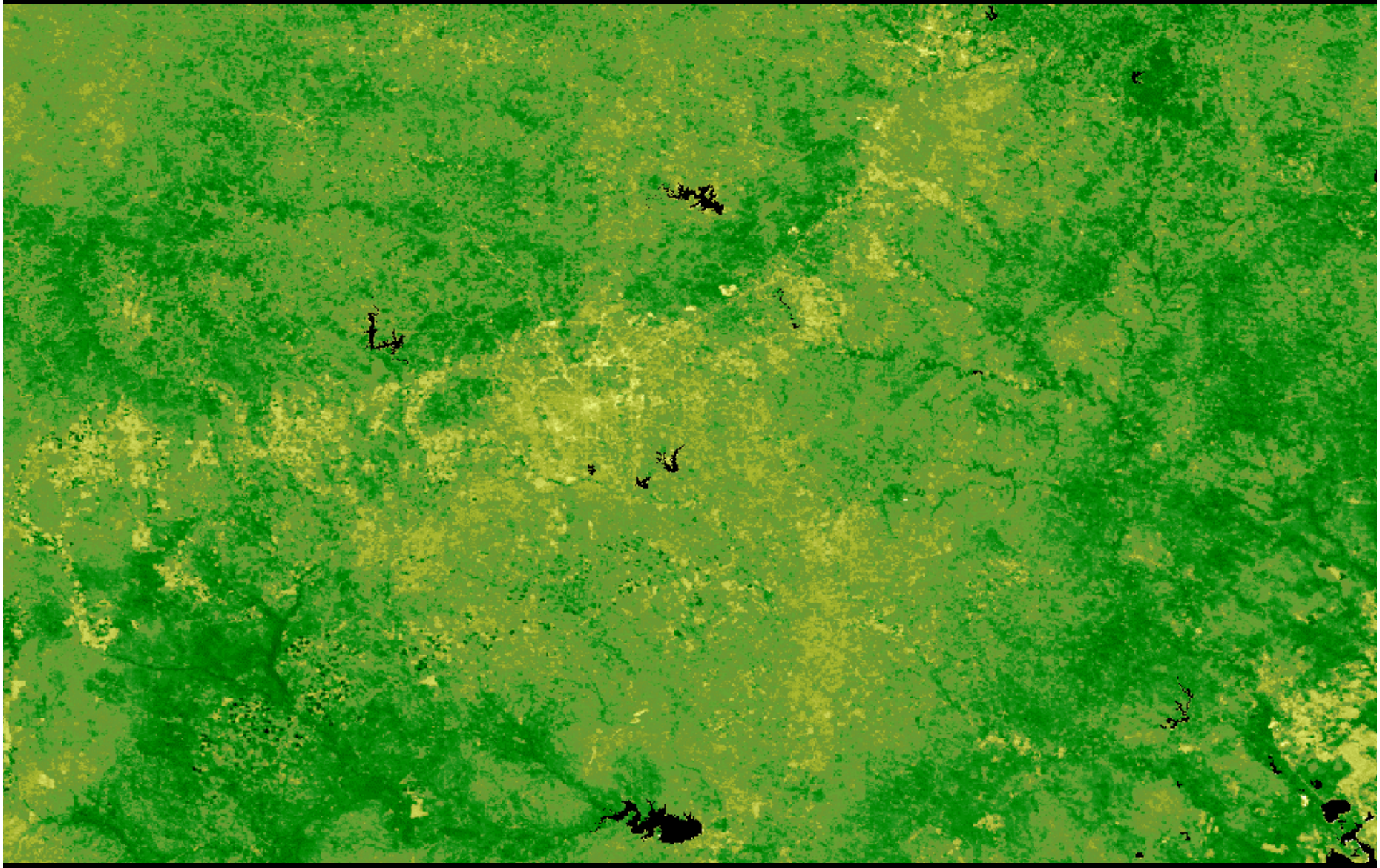
July 2004

CSR MODIS Vegetation
250 meter



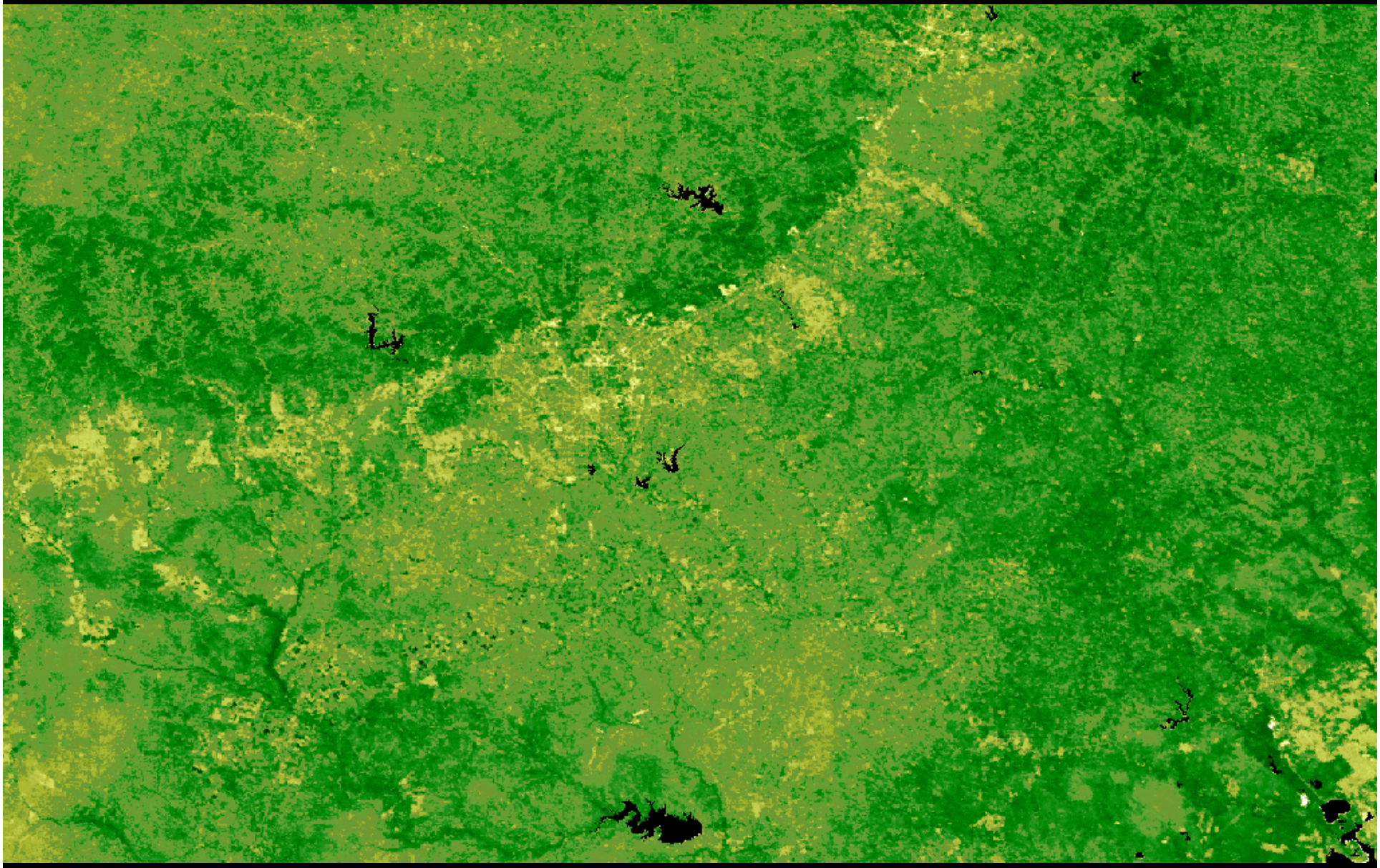
August 2004

CSR MODIS Vegetation
250 meter



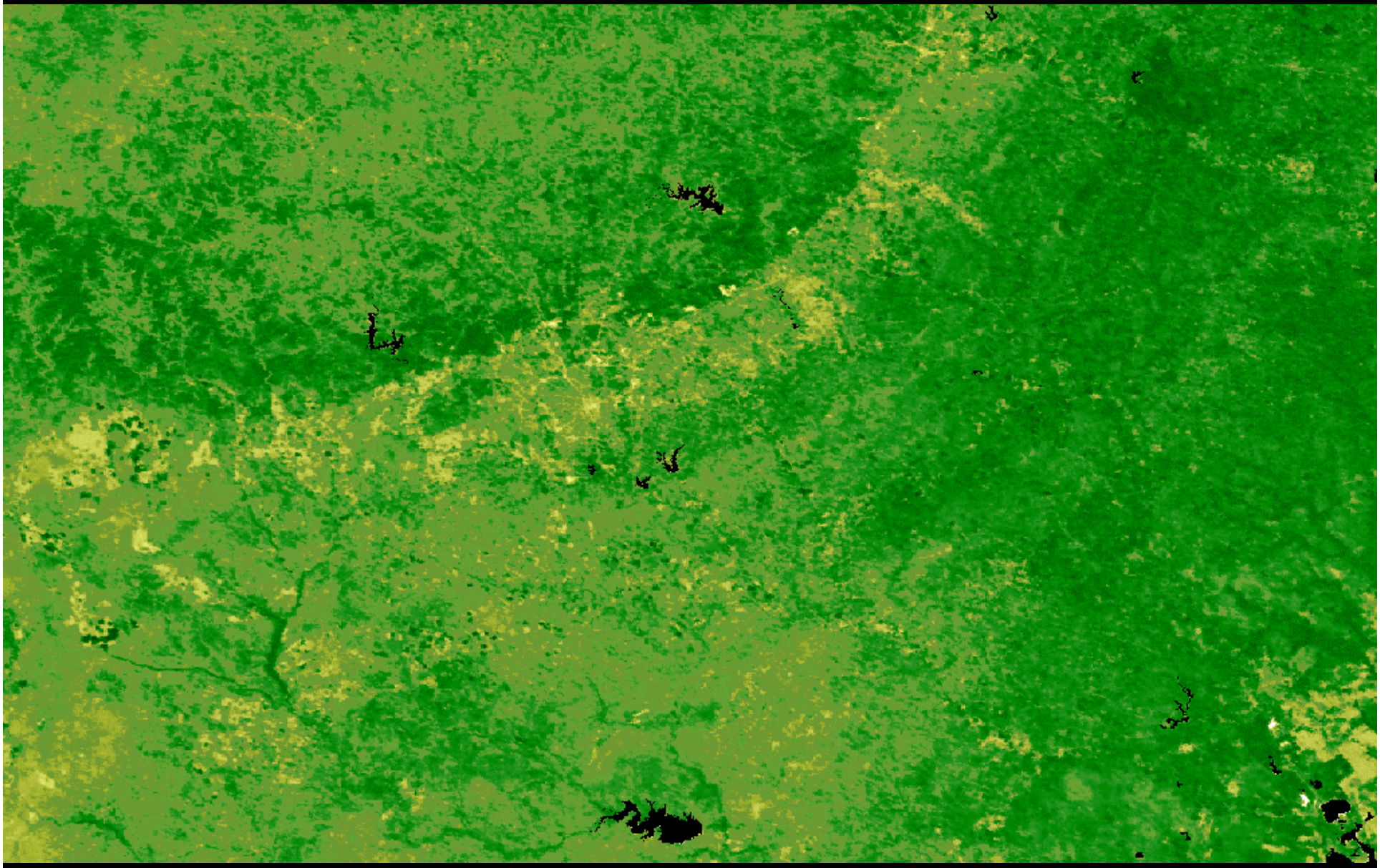
September 2004

CSR MODIS Vegetation
250 meter



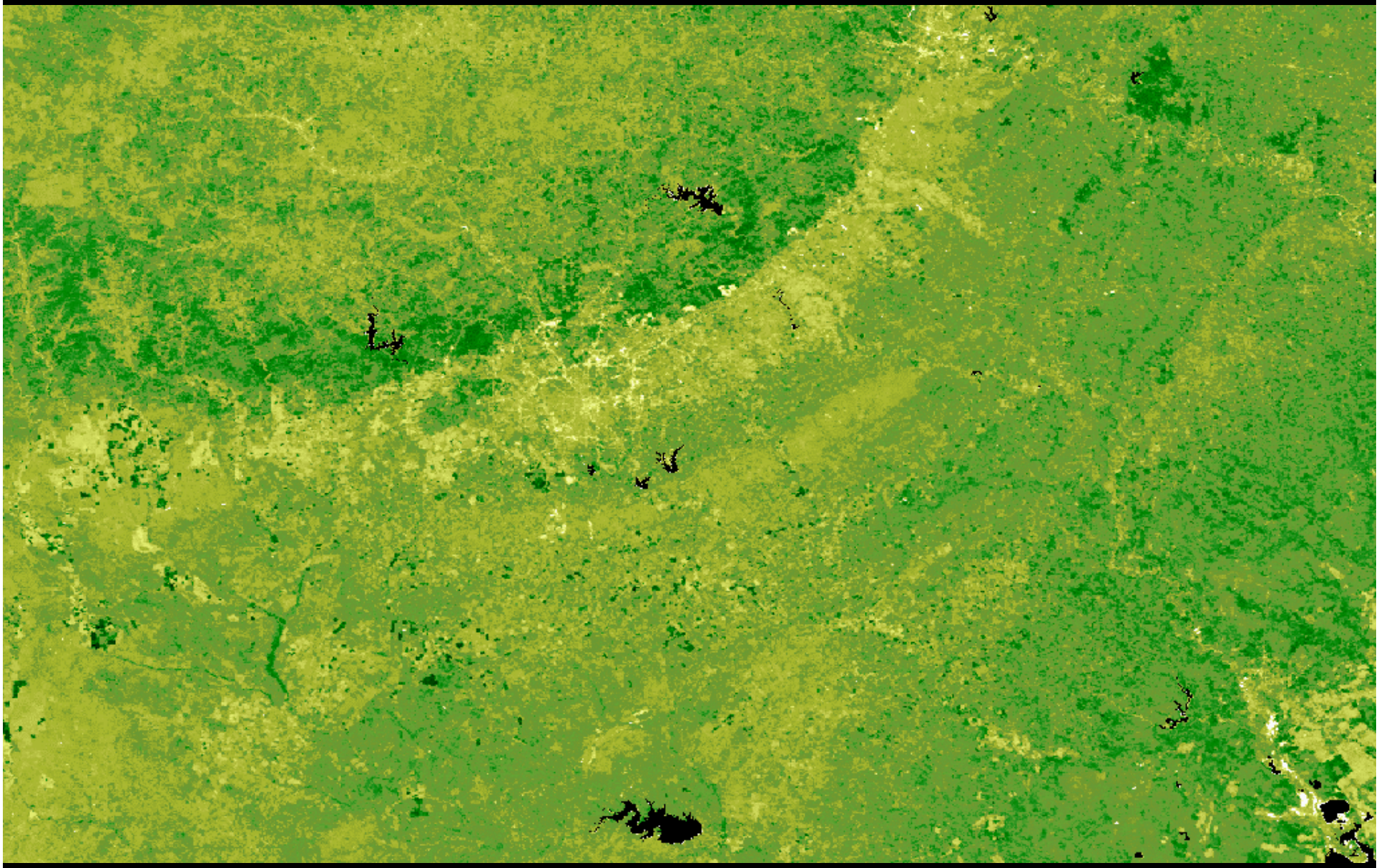
October 2004

CSR MODIS Vegetation
250 meter



November 2004

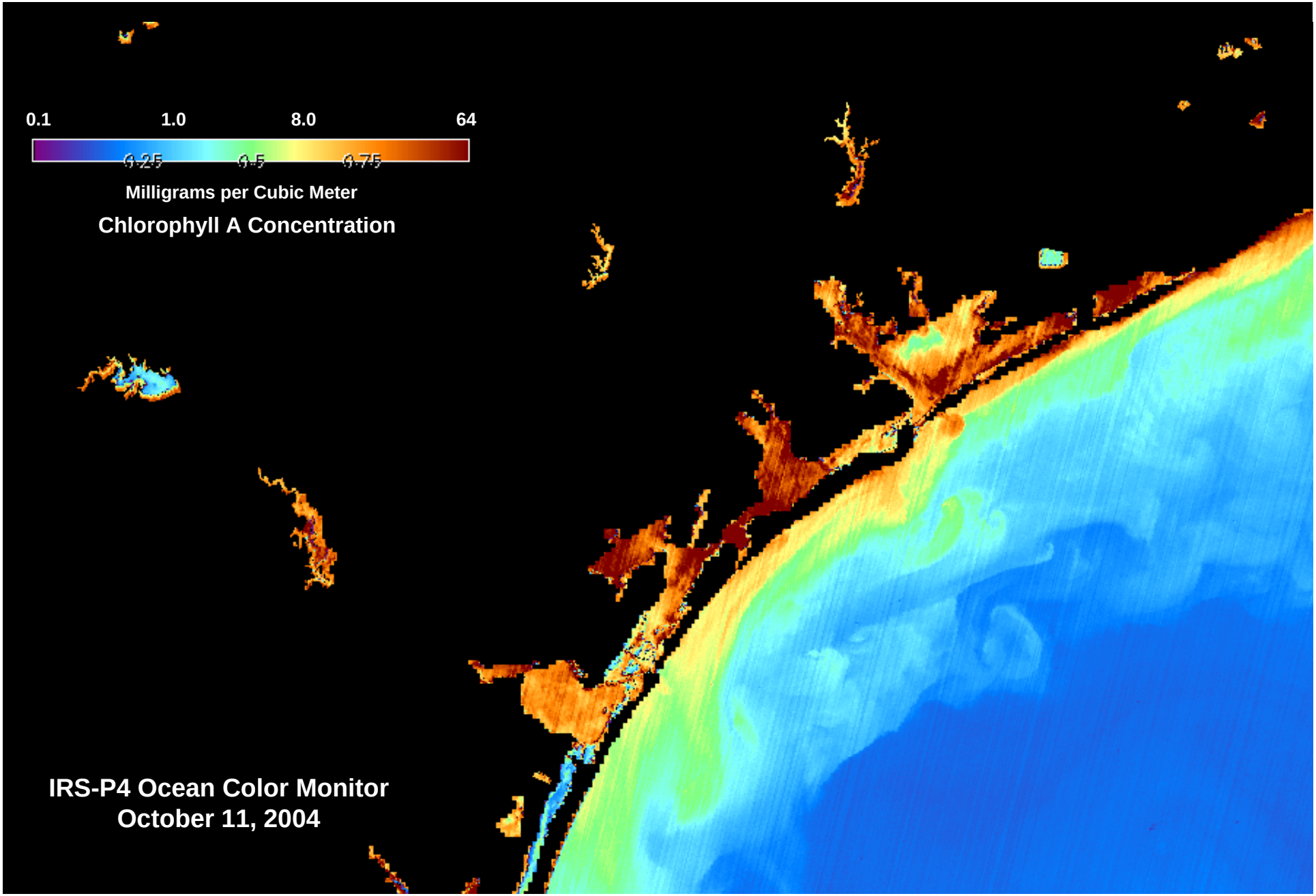
CSR MODIS Vegetation
250 meter



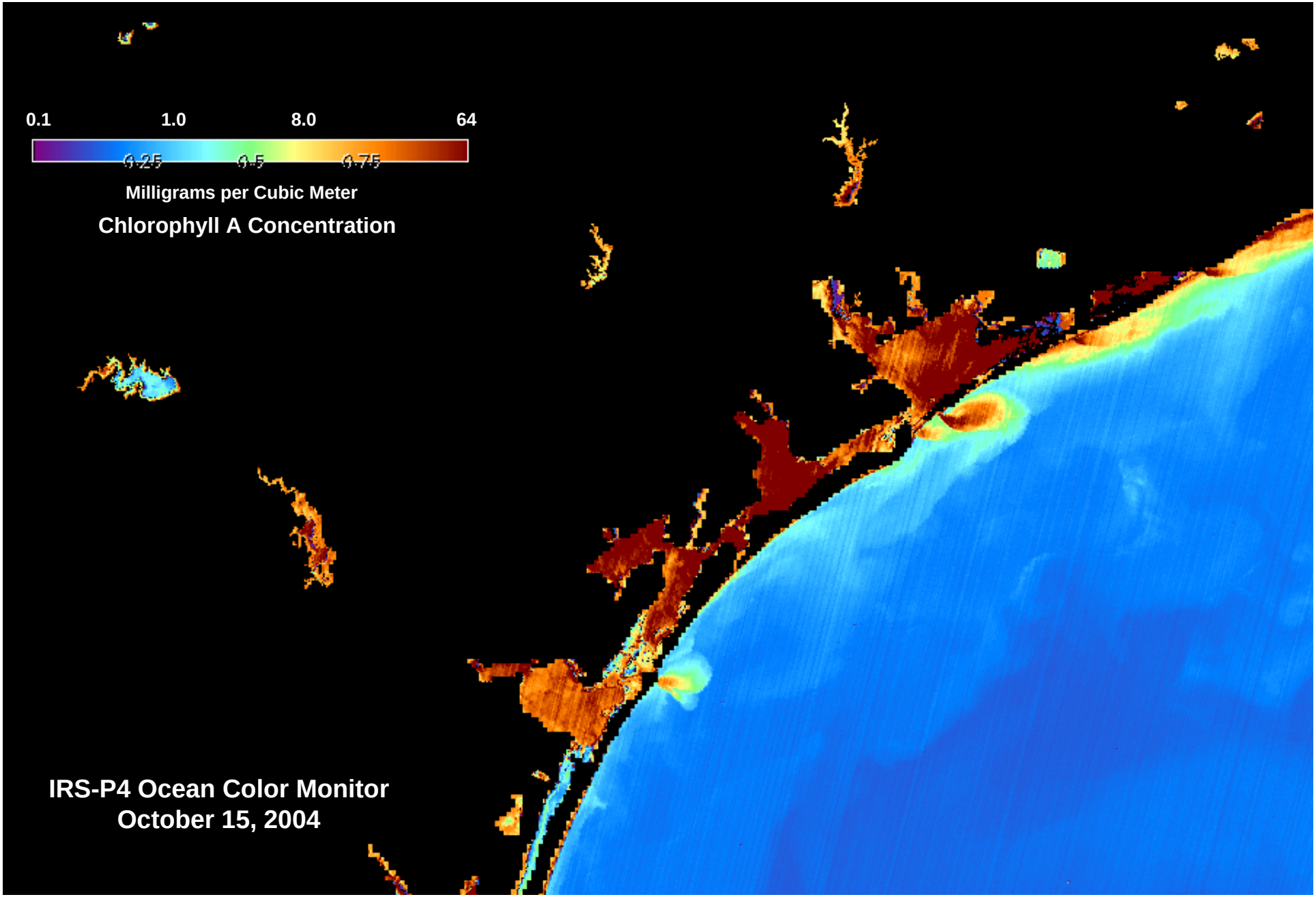
December 2004

CSR MODIS Vegetation
250 meter

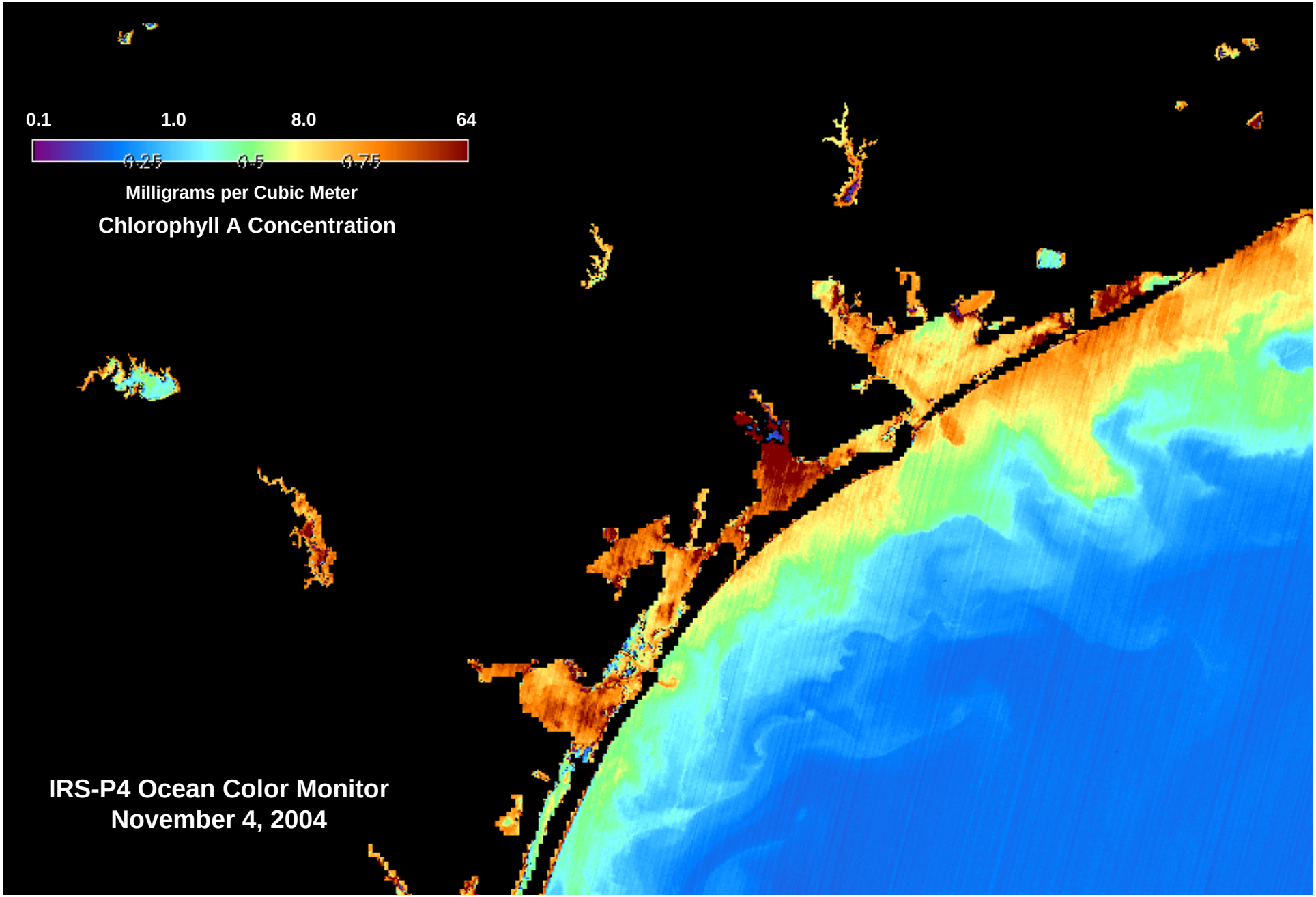
Monitoring Bay and Estuarine Processes



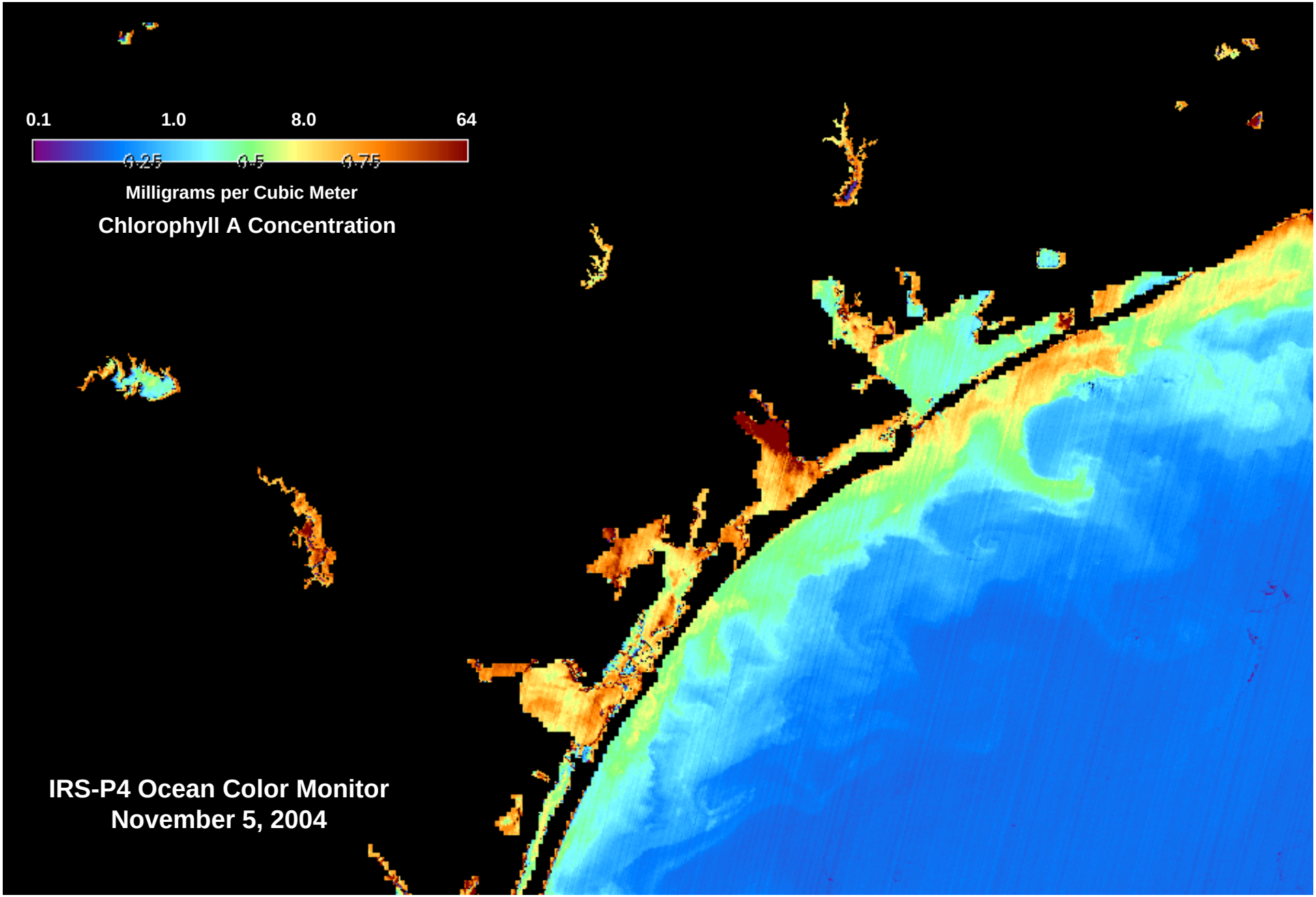
Monitoring Bay and Estuarine Processes



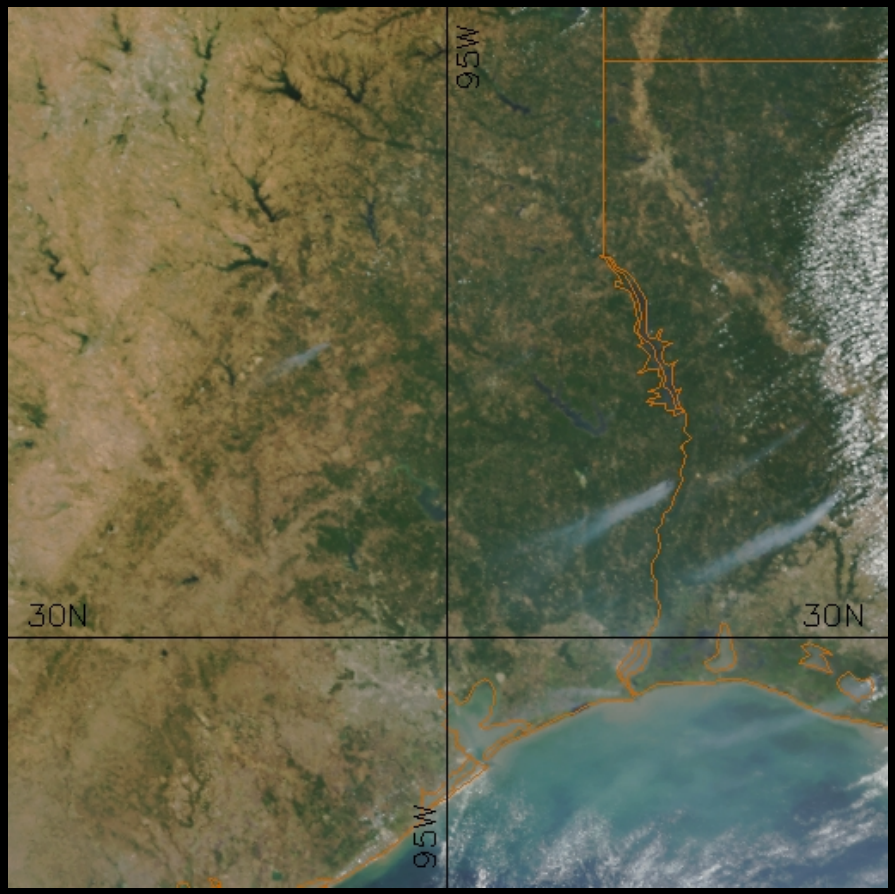
Monitoring Bay and Estuarine Processes

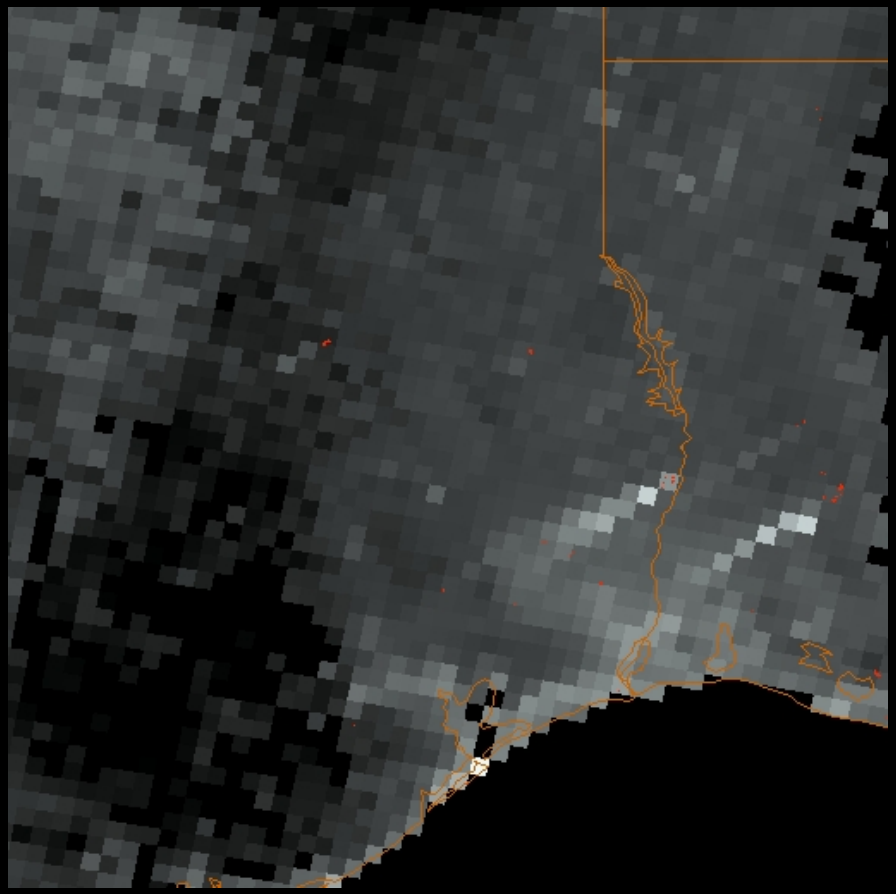


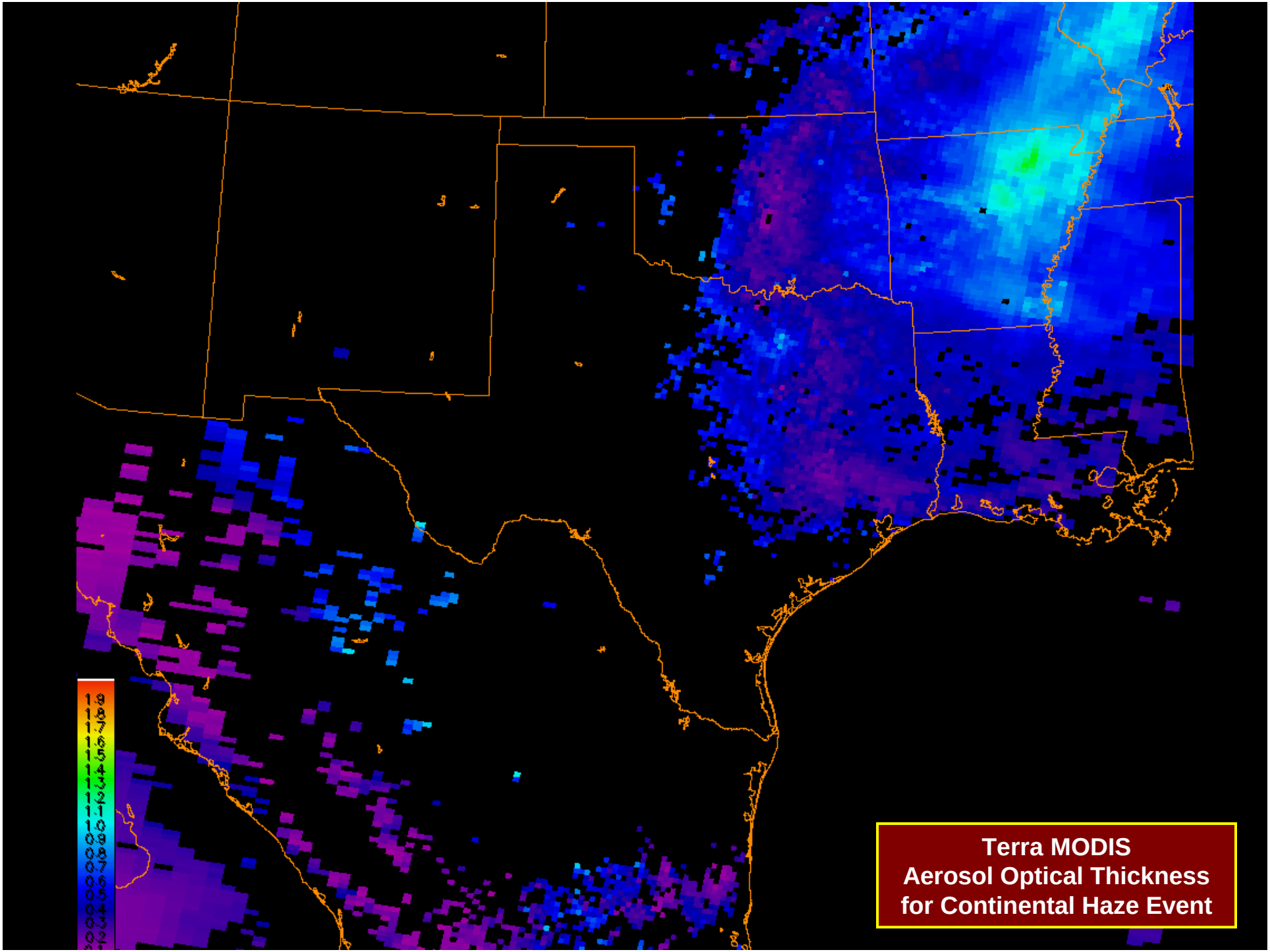
Monitoring Bay and Estuarine Processes

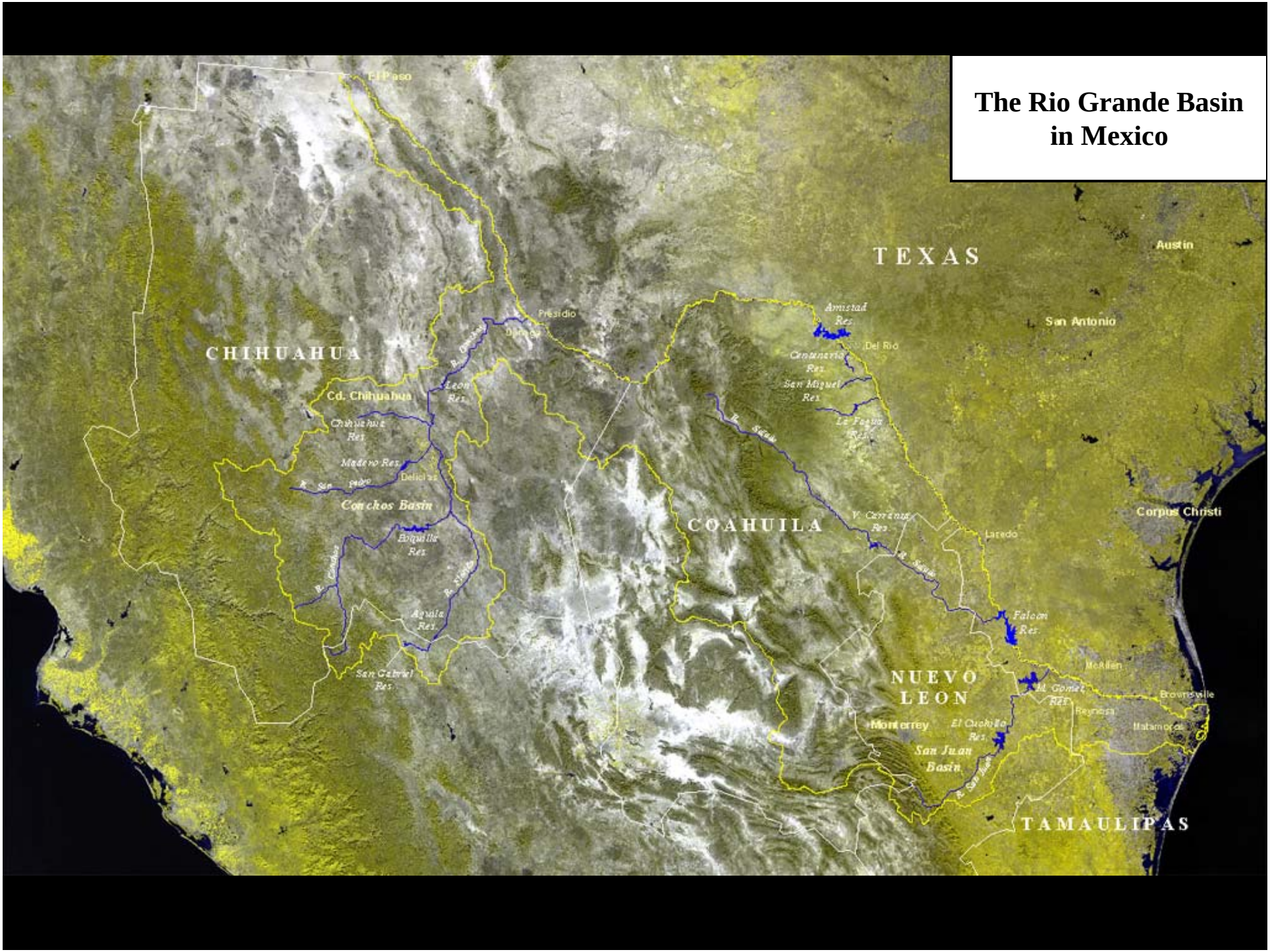


MOODIS Aerosol Optical Depth Products






Terra MODIS
Aerosol Optical Thickness
for Continental Haze Event


The Rio Grande Basin in Mexico
TEXAS
Austin
San Antonio
Corpus Christi
CHIHUAHUA
COAHUILA
NUEVO LEON
TAMAULIPAS
El Paso
Presidio
Del Rio
Laredo
McAllen
Brownsville
Reynosa
Matamoros
Monterrey
Cd. Chihuahua
Conchos Basin
San Juan Basin
Amistad Res.
Falcon Res.
Leon Res.
Madero Res.
Chihuahua Res.
Ebiquilla Res.
Aguila Res.
San Gabriel Res.
Centenario Res.
San Miguel Res.
La Fragua Res.
V. Carranza Res.
El Cuchillo Res.
M. Gomez Res.
R. Conchos
R. Sabinas
R. San Juan
R. Salado

Venustiano Carranza Reservoir, Coahuila

April 15, 2004

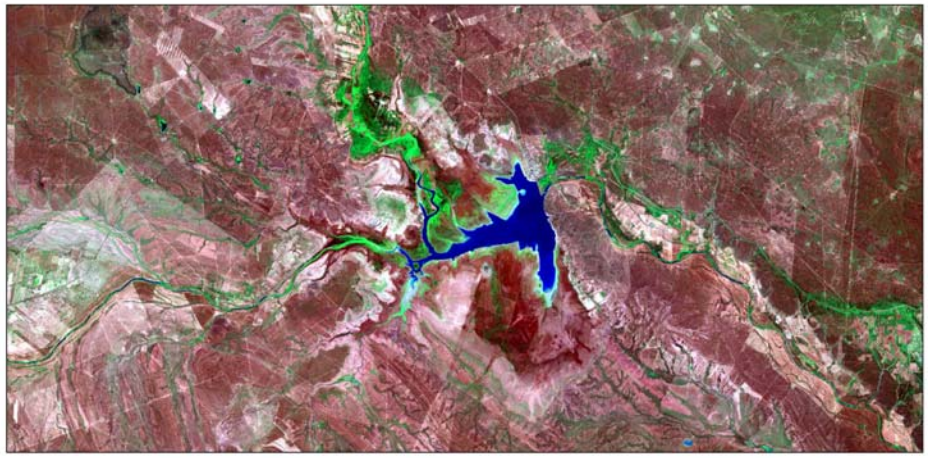
Pool Elevation: 257.04 m

Storage: 523,719 acre-feet

May 15, 2003

Pool Elevation: 247.67 m

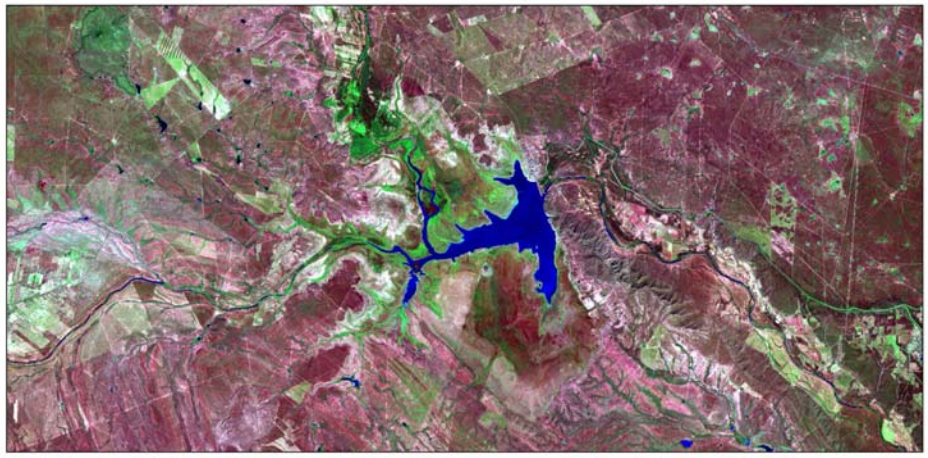
Storage: 25,943 acre-feet



December 6, 2002

Pool Elevation: 248.22 m

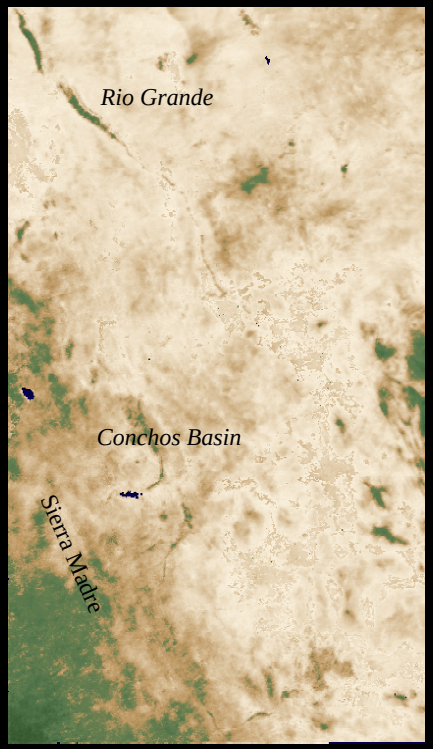
Storage: 32,420 acre-feet



Persistent and Extraordinary Drought in Chihuahua?

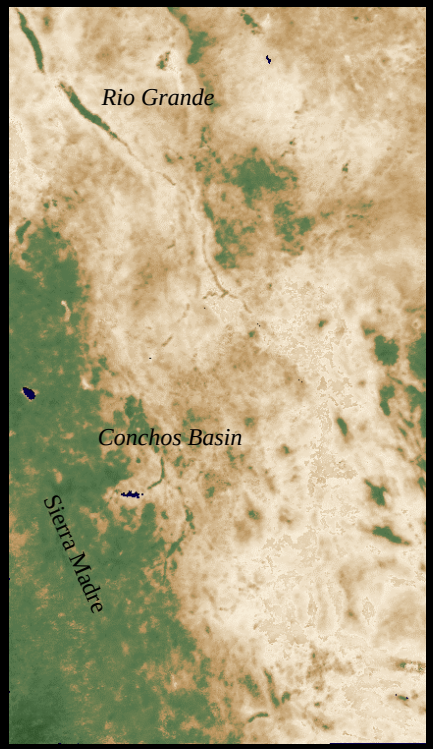
Annual Vegetation Peak, Conchos Basin, Chihuahua

1995
September 17



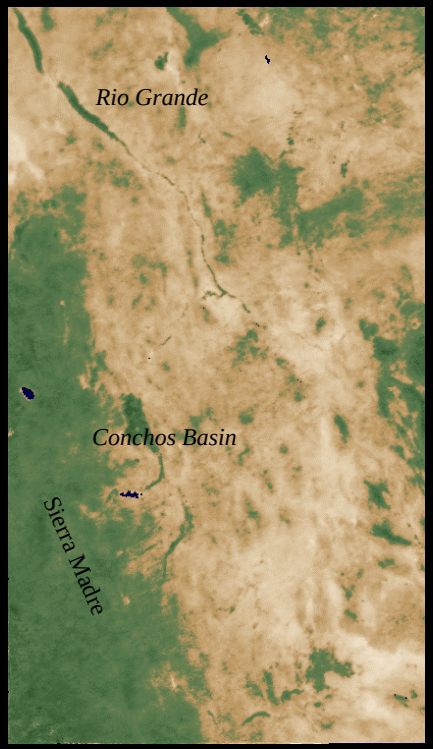
Very Dry

1996
September 16



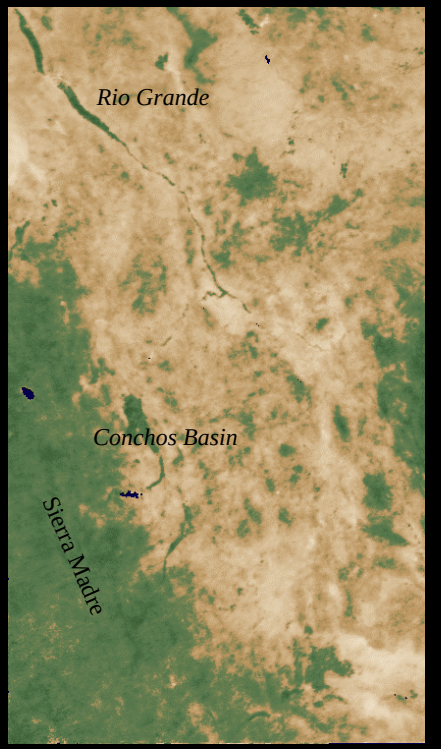
Near Average

1997
September 17



Wet

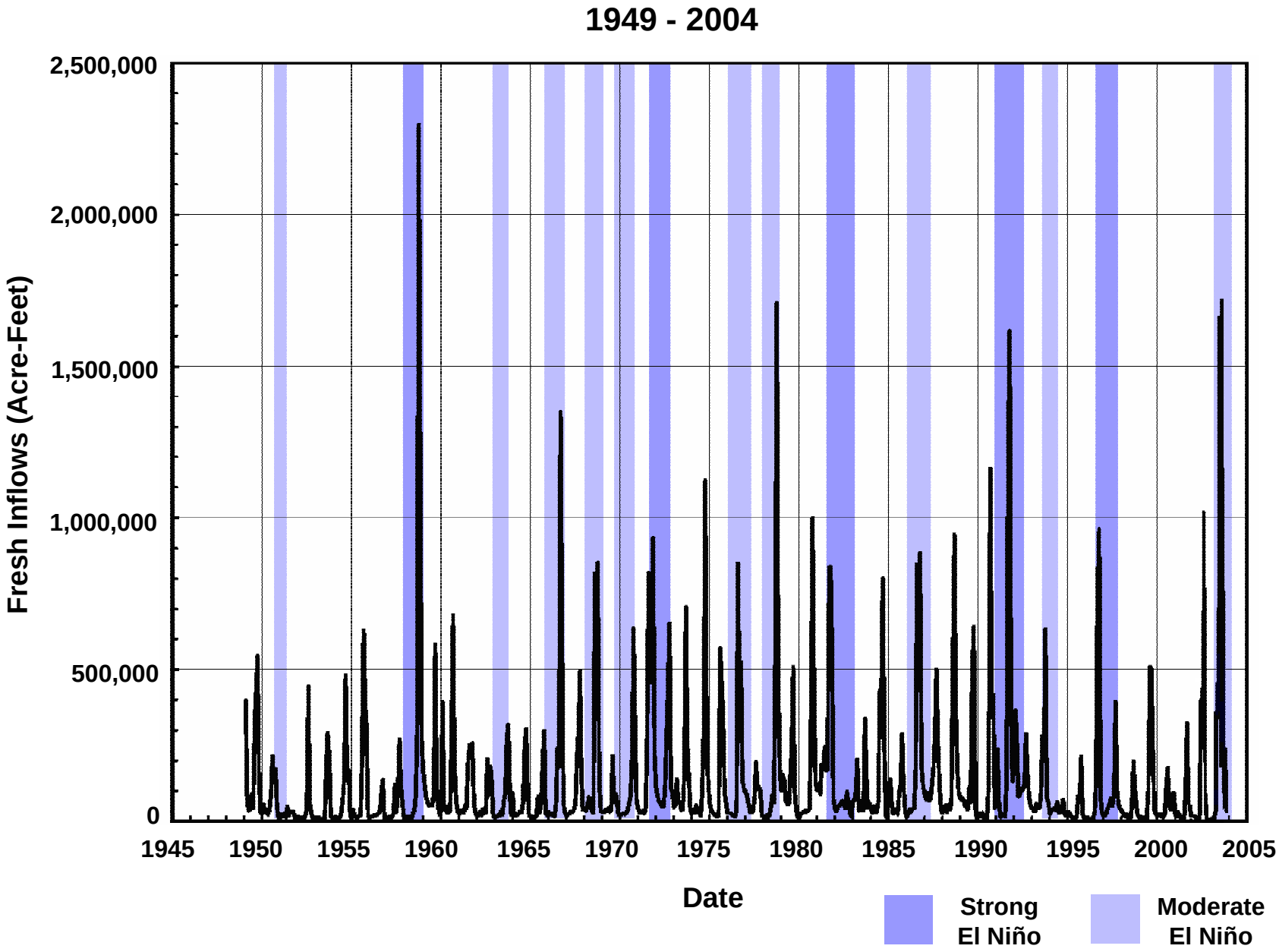
1998
September 17



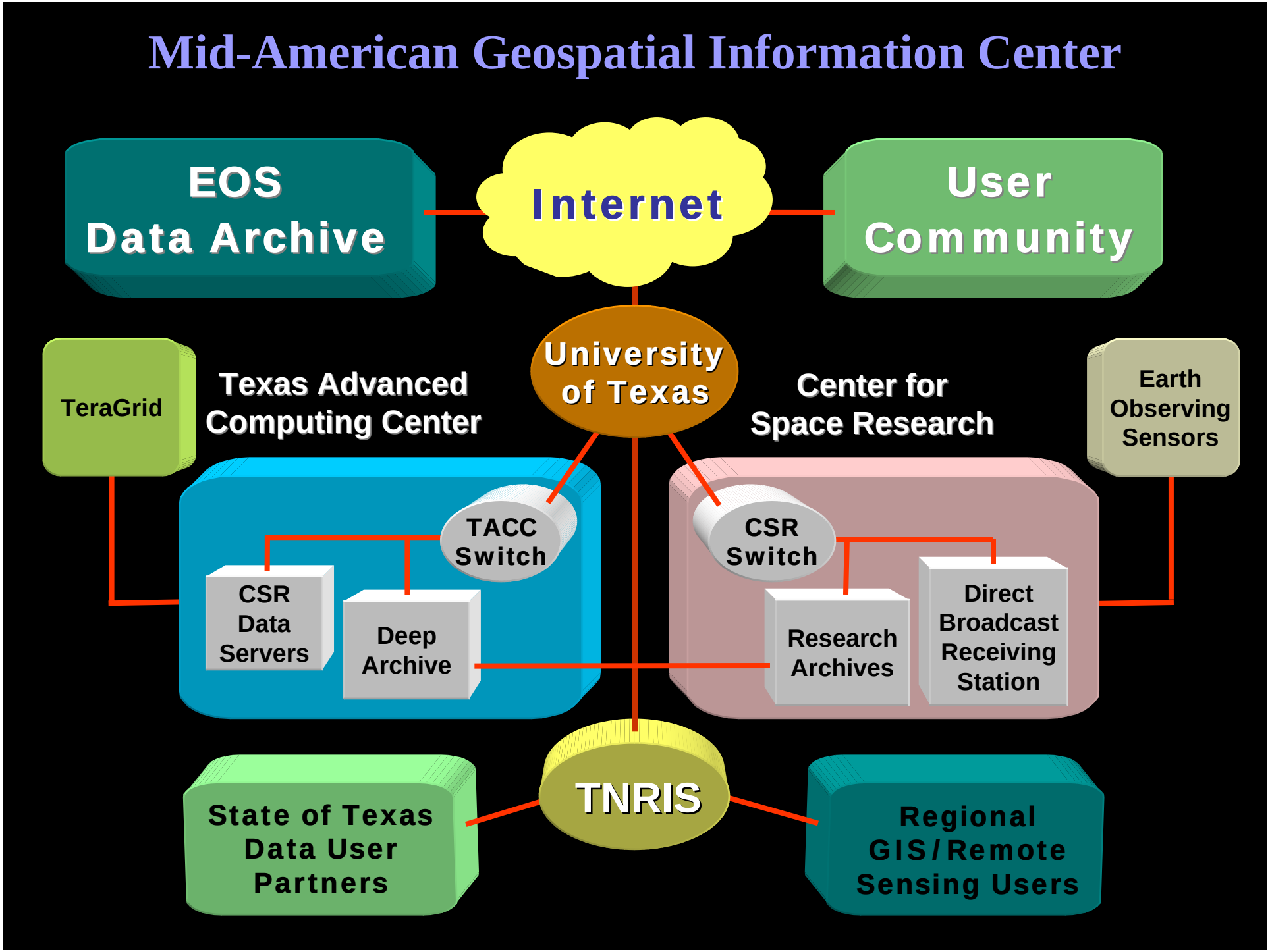
Wet

Cloud-free composite satellite images of the Conchos Basin can be analyzed to provide a more objective determination of prevailing climatic conditions than rainfall measurements from meteorological stations located far from the Rio Conchos. The peak greening of natural vegetation can be used to compare conditions during dry years and wet years.

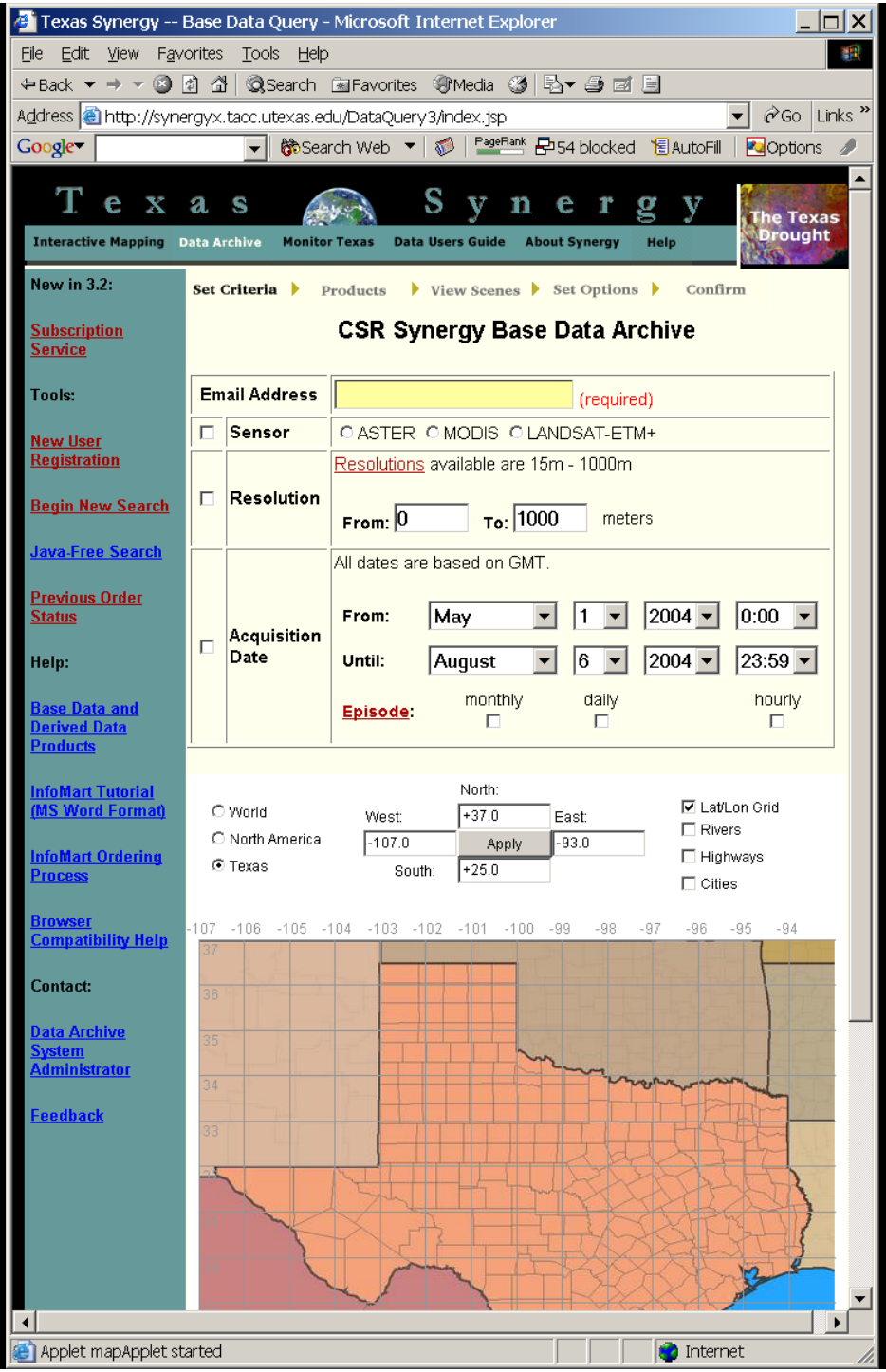
El Niño Influence Upon Fresh Inflows in the Rio Grande Basin



Mid-American Geospatial Information Center



- Terra ASTER
- Terra/Aqua MODIS
- Landsat 7 ETM+



Data Services
Texas Synergy Data Query

Available Products

☐	26 Images	MOD03	Modis L1b Geolocation Fields (Terra)
☐	30 Images	MYD03	Modis L1b Geolocation Fields (Aqua)
☐	27 Images	MOD021KM	Modis L1b 1 Kilometer Data (Terra)
☐	12 Images	MOD02HKM	Modis L1b Half Kilometer Data (Terra)
☐	13 Images	MOD02QKM	Modis L1b Quarter Kilometer Data (Terra)
☑	32 Images	MYD021KM	Modis L1b 1 Kilometer Data (Aqua)
☐	17 Images	MYD02HKM	Modis L1b Half Kilometer Data (Aqua)
☐	17 Images	MYD02QKM	Modis L1b Quarter Kilometer Data (Aqua)

Go Back Go on to View Scenes

Product: MYD021KM
Images selected: 1

Output Format
- ◉ BSQ (Band Sequential)
- ○ HDF-EOS (Native Eosdis Format)

Projection
- ○ GEO
- ○ UTM
- ◉ TCMS/AEA
- ○ TCMS/LC

Bands
- ☑ 250m Reflective Solar Bands Aggr. to 1000m
- ☑ 500m Reflective Solar Bands Aggr. to 1000m
- ☐ 1000m Reflective Solar Bands
- ☐ 1000m Thermal Emissive Bands

Download File Packing Format:

○ None ◉ .zip ○ .tar ○ .gz (gzip) ○ .z (compress) ○ .tar.gz (gzipped tar)

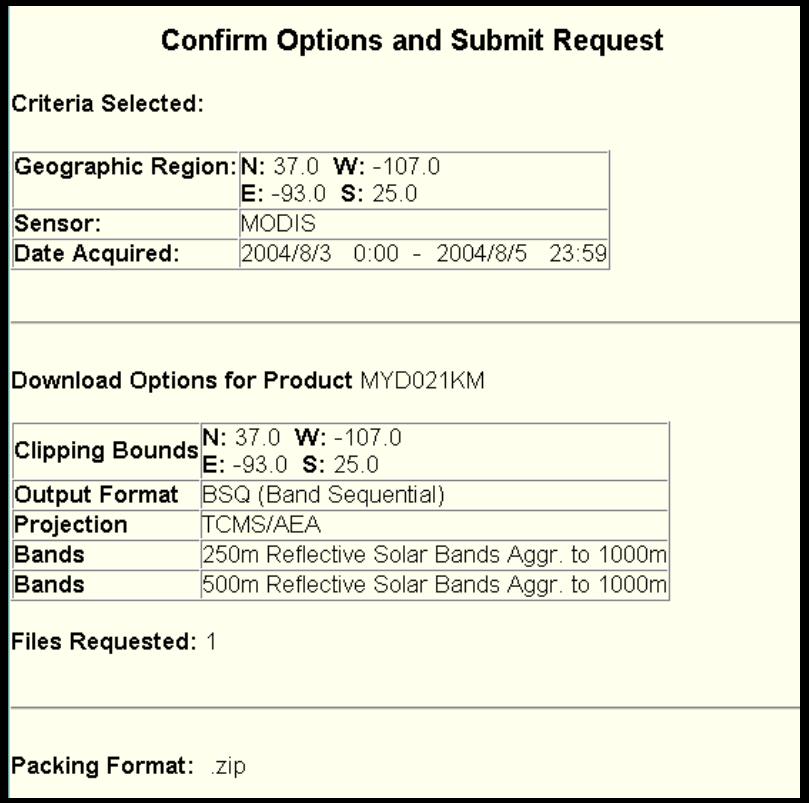
Clipping Bounds:

(Taken from your previous query selection)
(Texas Bounds: N=+37°, S=+25°, W=-107°, E=-93°)

North: 37.0
West: -107.0
East: -93.0
South: 25.0

☐ Use image coordinates (Your longitude and latitude bounds will be ignored)

Data Services
Texas Synergy Data Query



Confirm Options and Submit Request

Criteria Selected:

Geographic Region:	**N:** 37.0 **W:** -107.0 **E:** -93.0 **S:** 25.0
Sensor:	MODIS
Date Acquired:	2004/8/3 0:00 - 2004/8/5 23:59

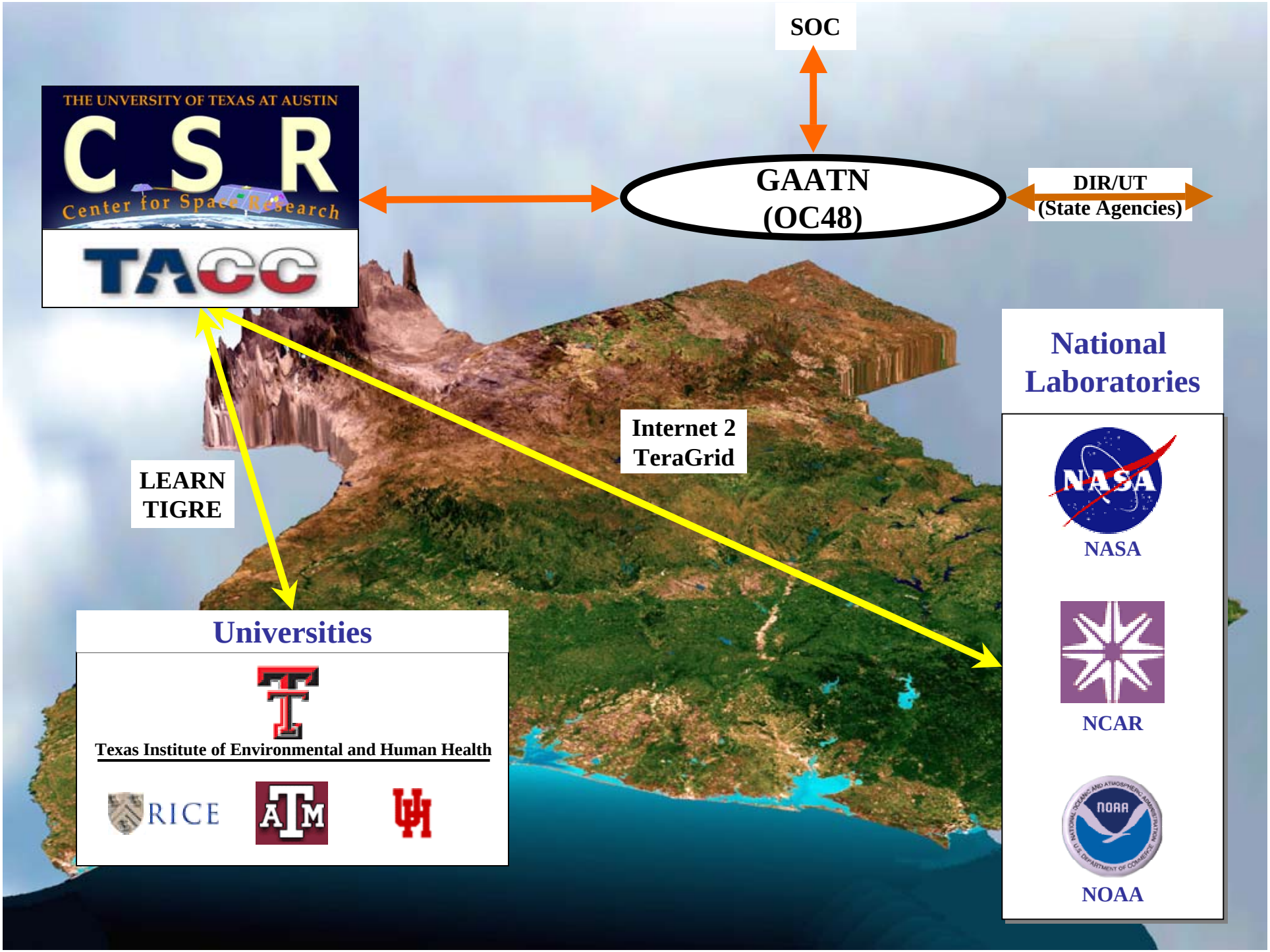
Download Options for Product MYD021KM

Clipping Bounds	**N:** 37.0 **W:** -107.0 **E:** -93.0 **S:** 25.0
Output Format	BSQ (Band Sequential)
Projection	TCMS/AEA
Bands	250m Reflective Solar Bands Aggr. to 1000m
Bands	500m Reflective Solar Bands Aggr. to 1000m

Files Requested: 1

Packing Format: .zip

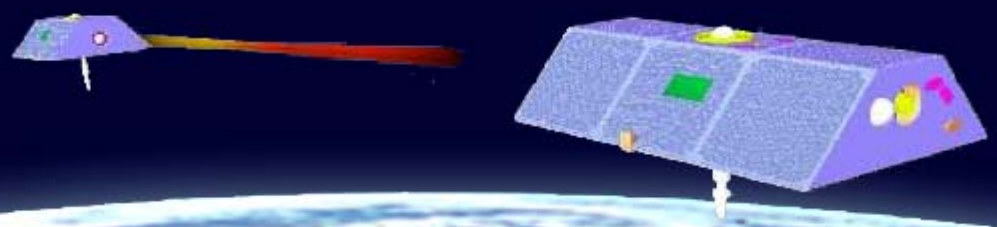
Email notifications are sent to the requestor indicating the order was placed and ready for pick up via an FTP link.


SOC
THE UNVERSITY OF TEXAS AT AUSTIN
C S R
Center for Space Research
TACC
GAATN
(OC48)
DIR/UT
(State Agencies)
Internet 2
TeraGrid
LEARN
TIGRE
National
Laboratories
NASA
NASA
NCAR
NOAA
NOAA
Universities
Texas Institute of Environmental and Human Health
RICE

The TeraGrid

Current Projects

- NAIP Orthoimagery Review
- LULC Classification for Biogenic Emissions
- Forgotten River Invasive Species Detection
- Modeling for Hurricane Evacuation Planning



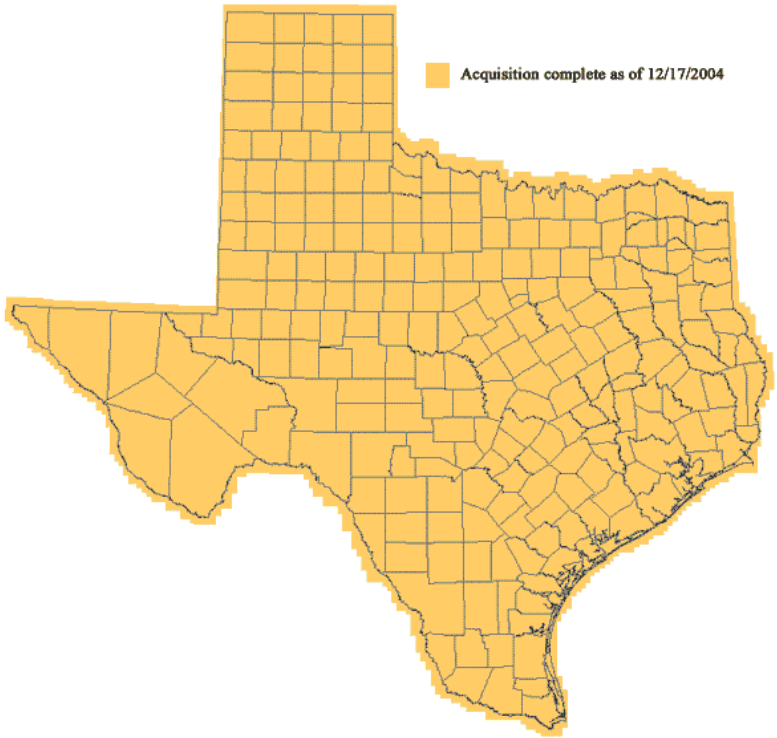
National Agriculture Imagery Program

News / Status | Technical Documents | Sample Data | Reports | Flight Weather

National Agriculture Imagery Program for Texas

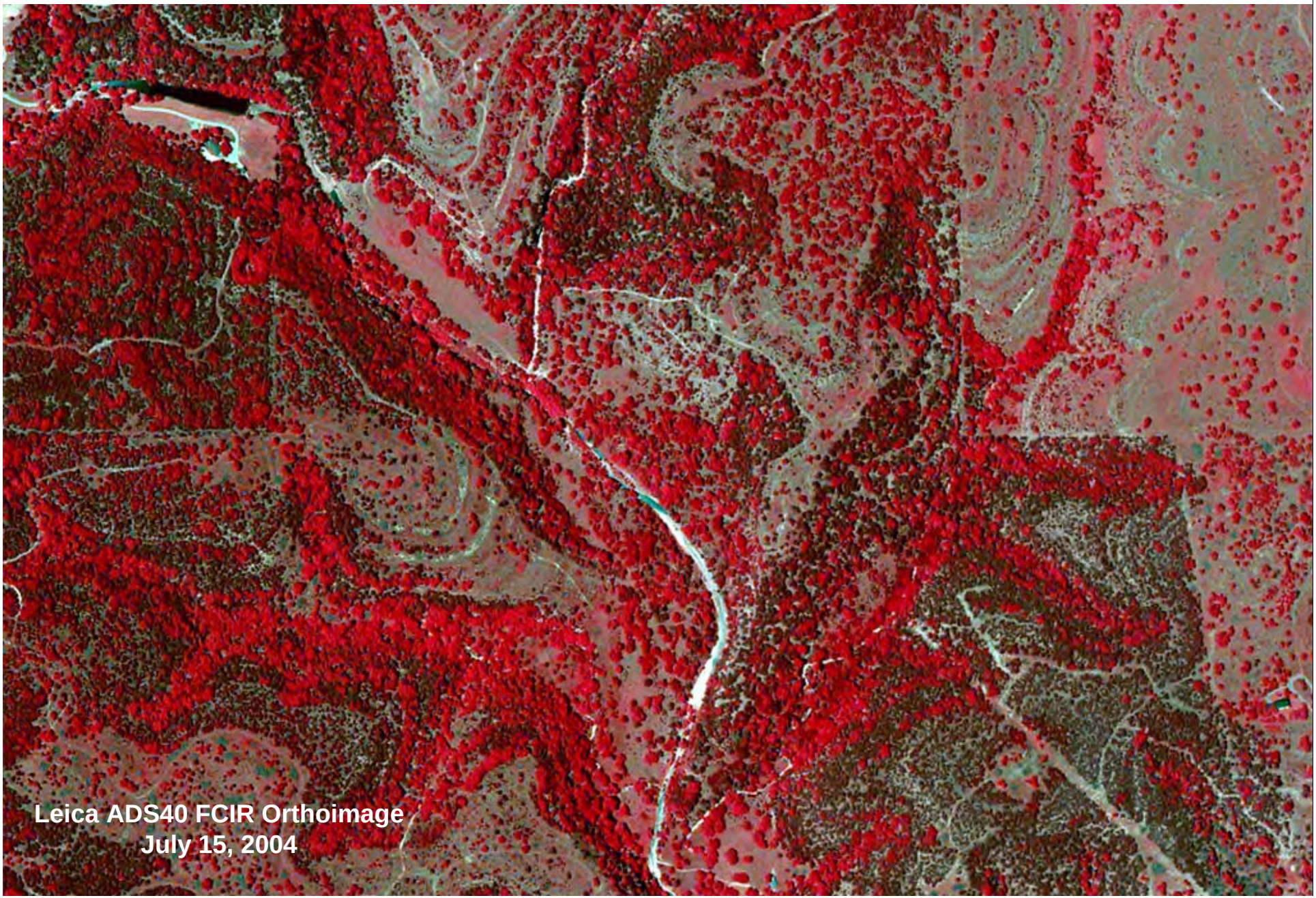
http://naip.csr.utexas.edu

NAIP Photography Aquisition Status as of December 17, 2004

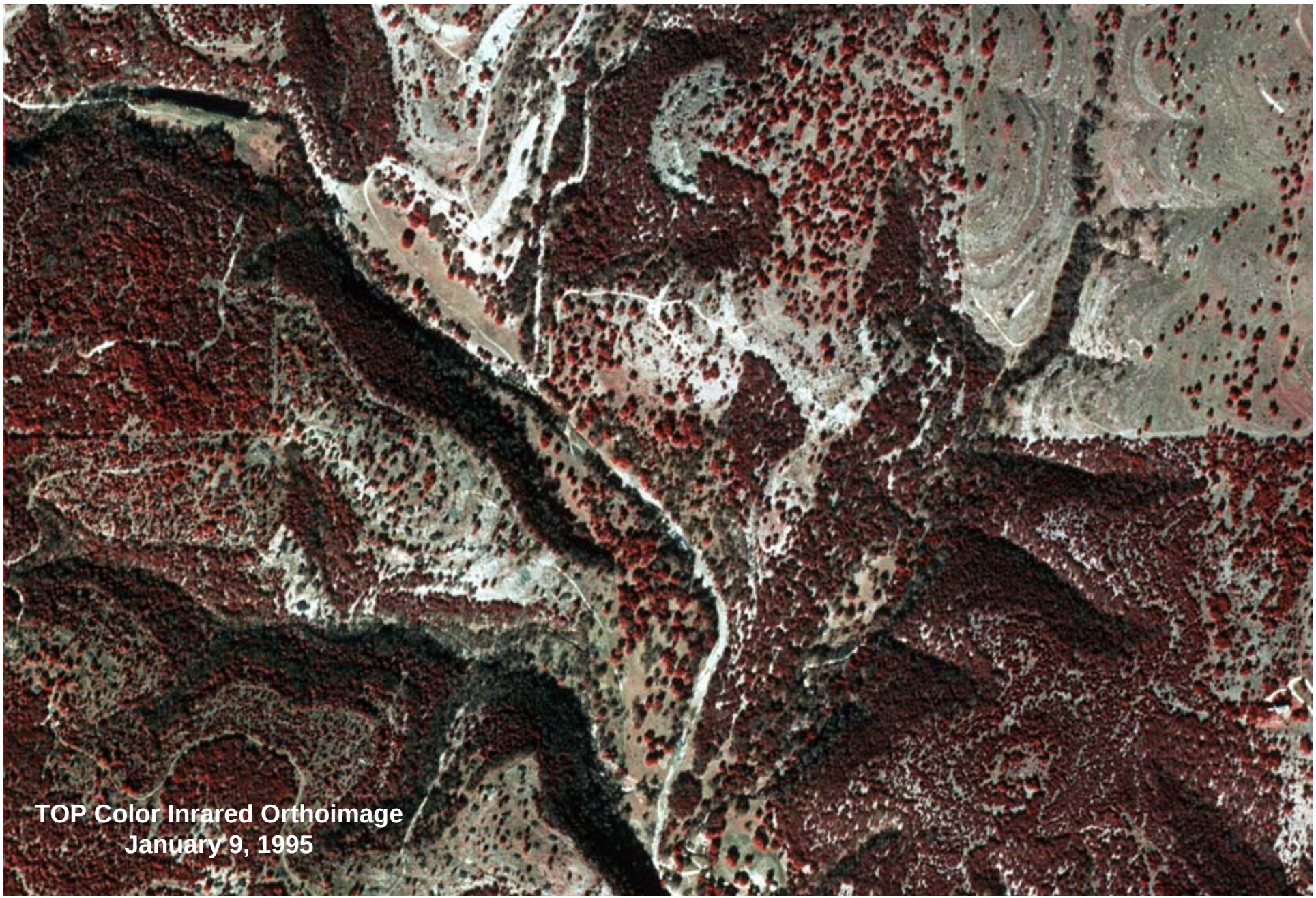


Flight Weather

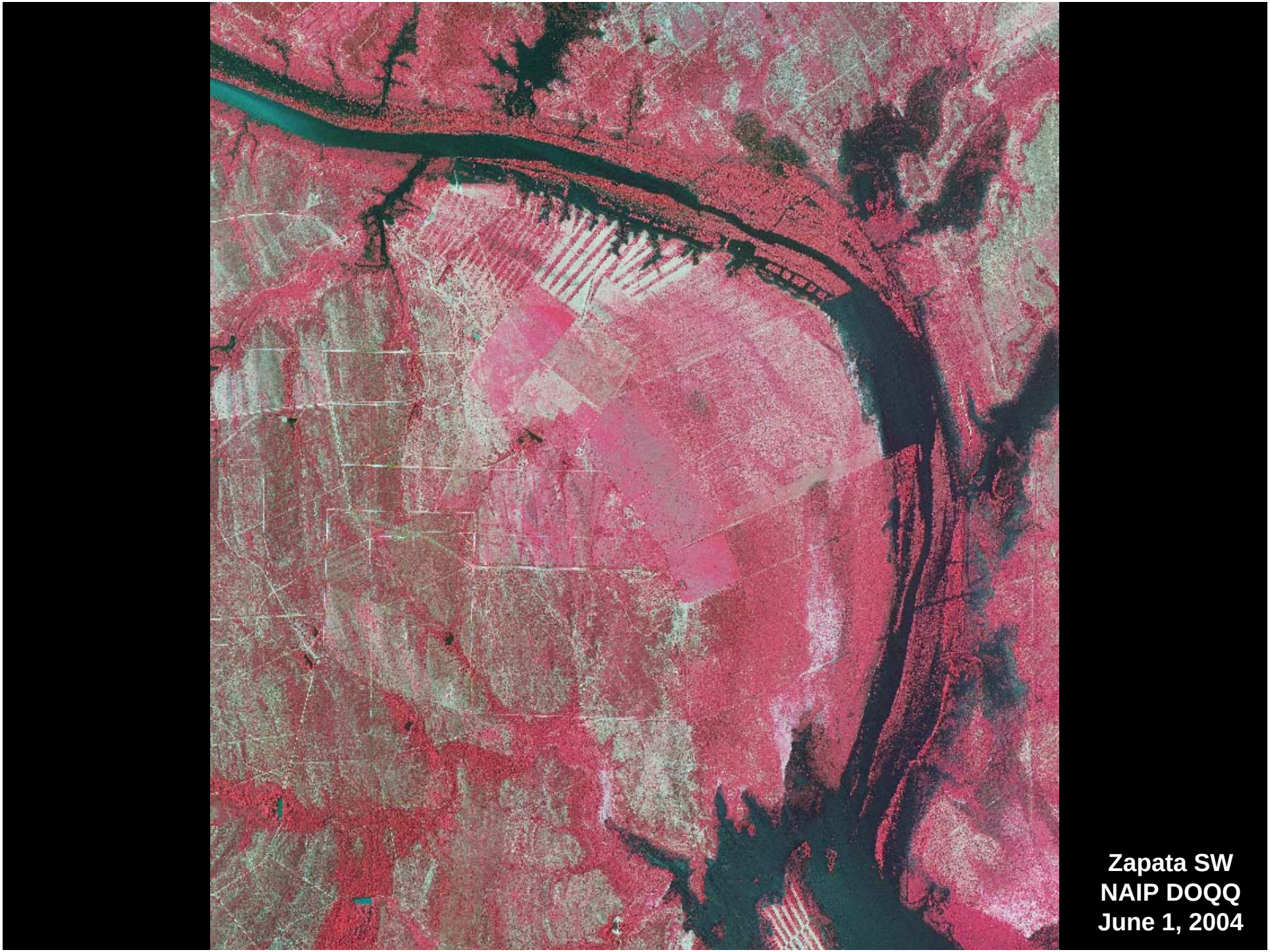
Comprehensive ADS40 Collection Program



First Generation Digital Orthoimagery

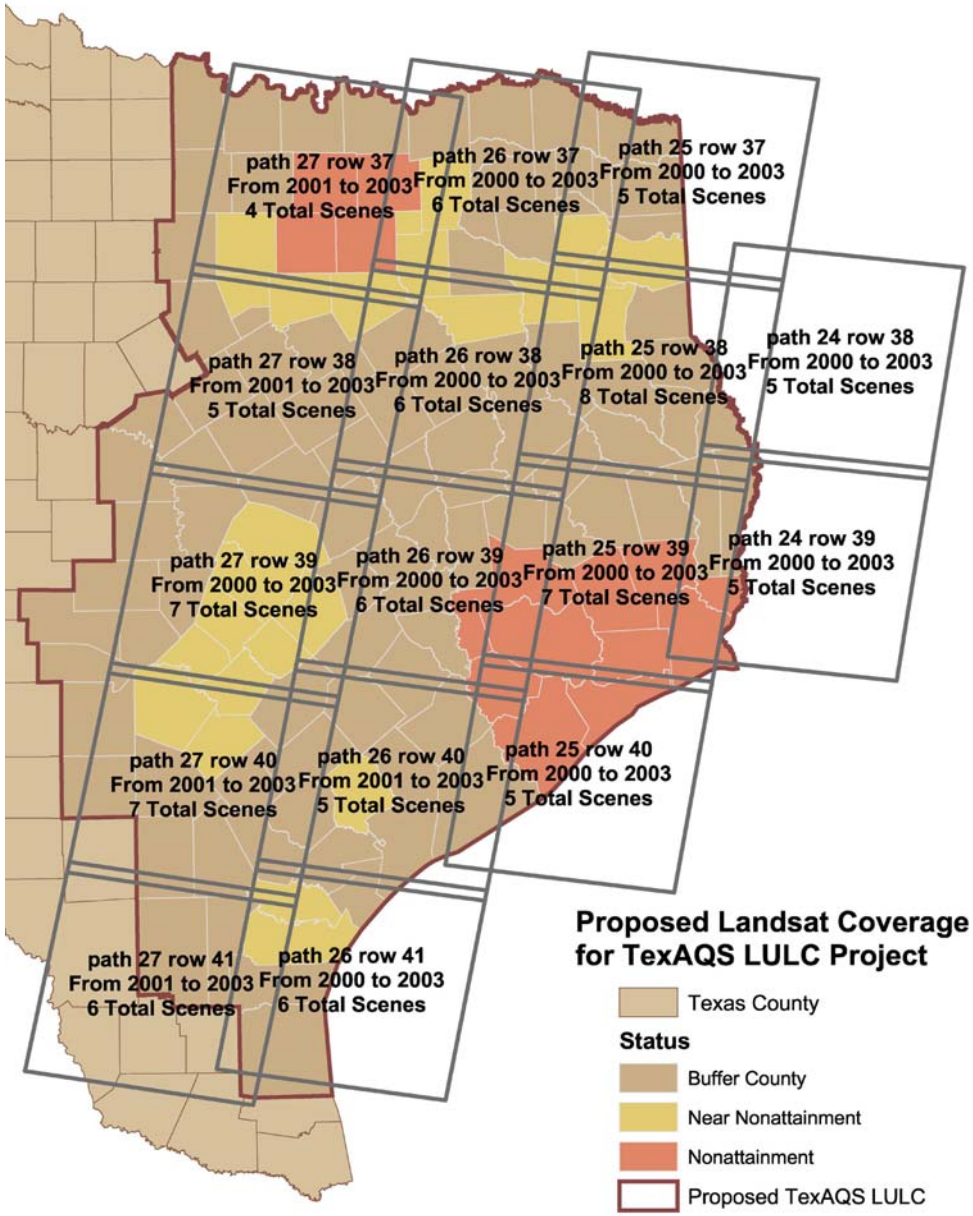


Zapata SW
TOP DOQQ
Jan. 13, 1995

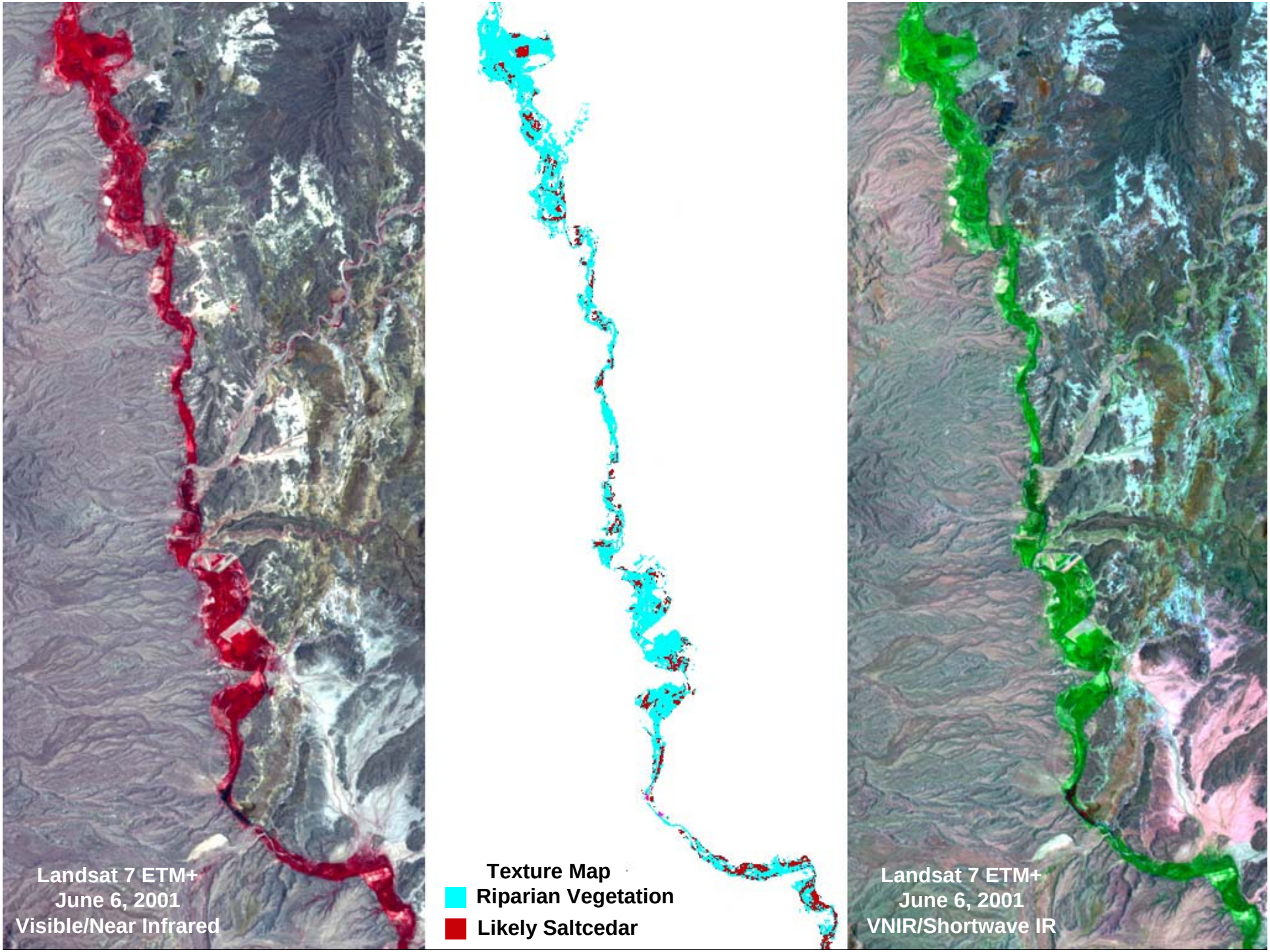


Zapata SW
NAIP DOQQ
June 1, 2004

LULC Classification for Biogenic Emissions



110,000 square miles


Landsat 7 ETM+
June 6, 2001
Visible/Near Infrared
Texture Map
Riparian Vegetation
Likely Saltcedar
Landsat 7 ETM+
June 6, 2001
VNIR/Shortwave IR

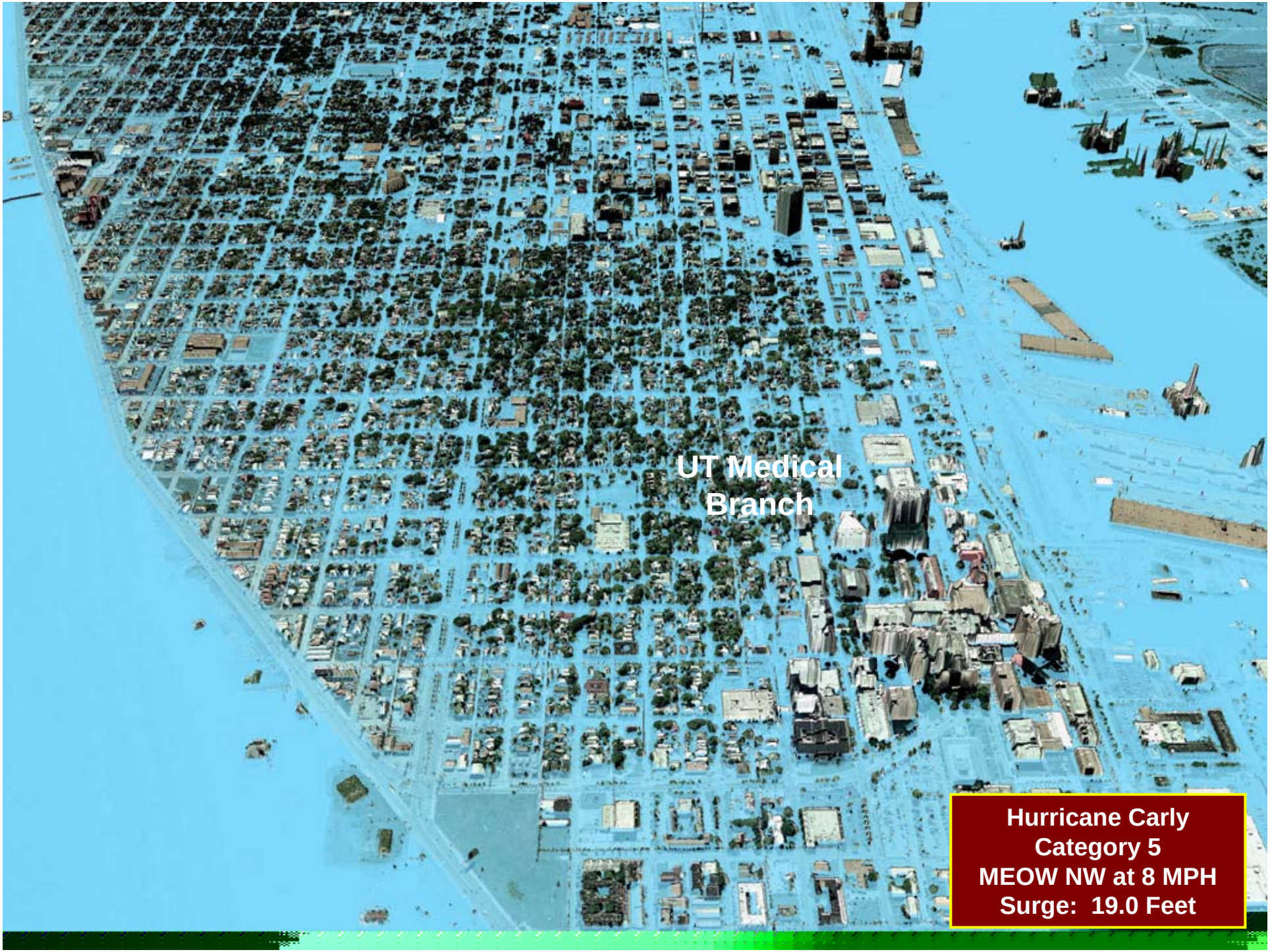
UT Medical
Branch
Houston-Galveston
Study Area
Mean Sea Level

UT Medical
Branch
Hurricane Carly
9/11 at 0100 CDT
MEOW NW at 8 MPH
Surge: 4.5 Feet

UT Medical
Branch
Hurricane Carly
9/11 at 0500 CDT
MEOW NW at 8 MPH
Surge: 8.5 Feet

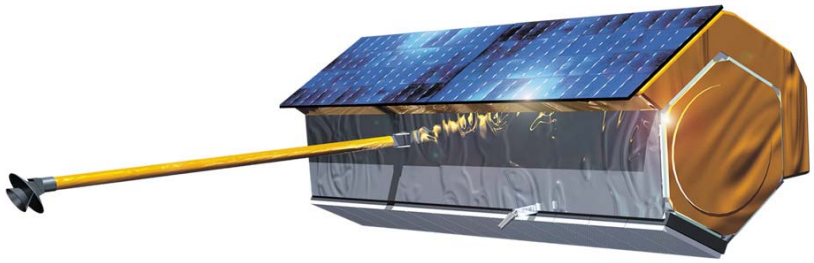
UT Medical
Branch
Hurricane Carly
9/11 at 1000 CDT
MEOW NW at 8 MPH
Surge: 12.8 Feet

UT Medical
Branch
Hurricane Carly
9/11 at 1500 CDT
MEOW NW at 8 MPH
Surge: 15.8 Feet

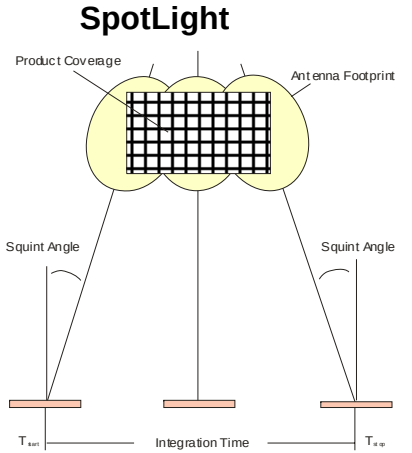

UT Medical
Branch
Hurricane Carly
Category 5
MEOW NW at 8 MPH
Surge: 19.0 Feet

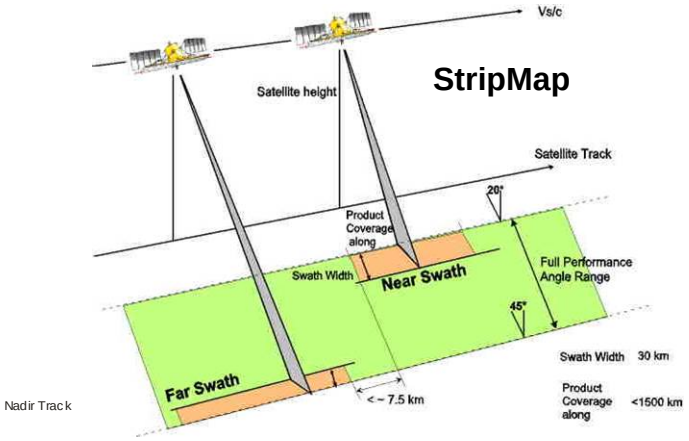
IRS-P6 RESOURCESAT
AWiFS 56-meter GSD

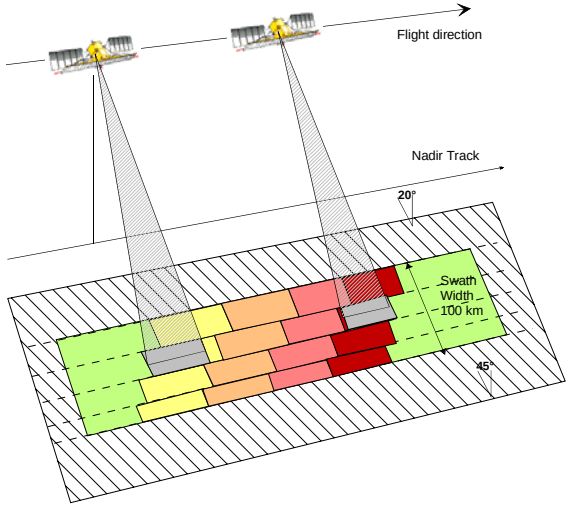
TerraSAR-X Satellite



- **1023 kg wet mass**
- **800 W orbit average power**
- **Antenna: 4900 x 850 x 300 mm (Lx WxH)**
- **12 Antenna Panels, 384 TR-Modules**
- **Single, Dual & Quad Polarization**
- **256 Gbit Mass Memory**
- **300 Mbit/s Downlink in X-Band**
- **Launcher Dnepr-1 from Baikonour**
- **Orbit SS Dusk Dawn 515 km**







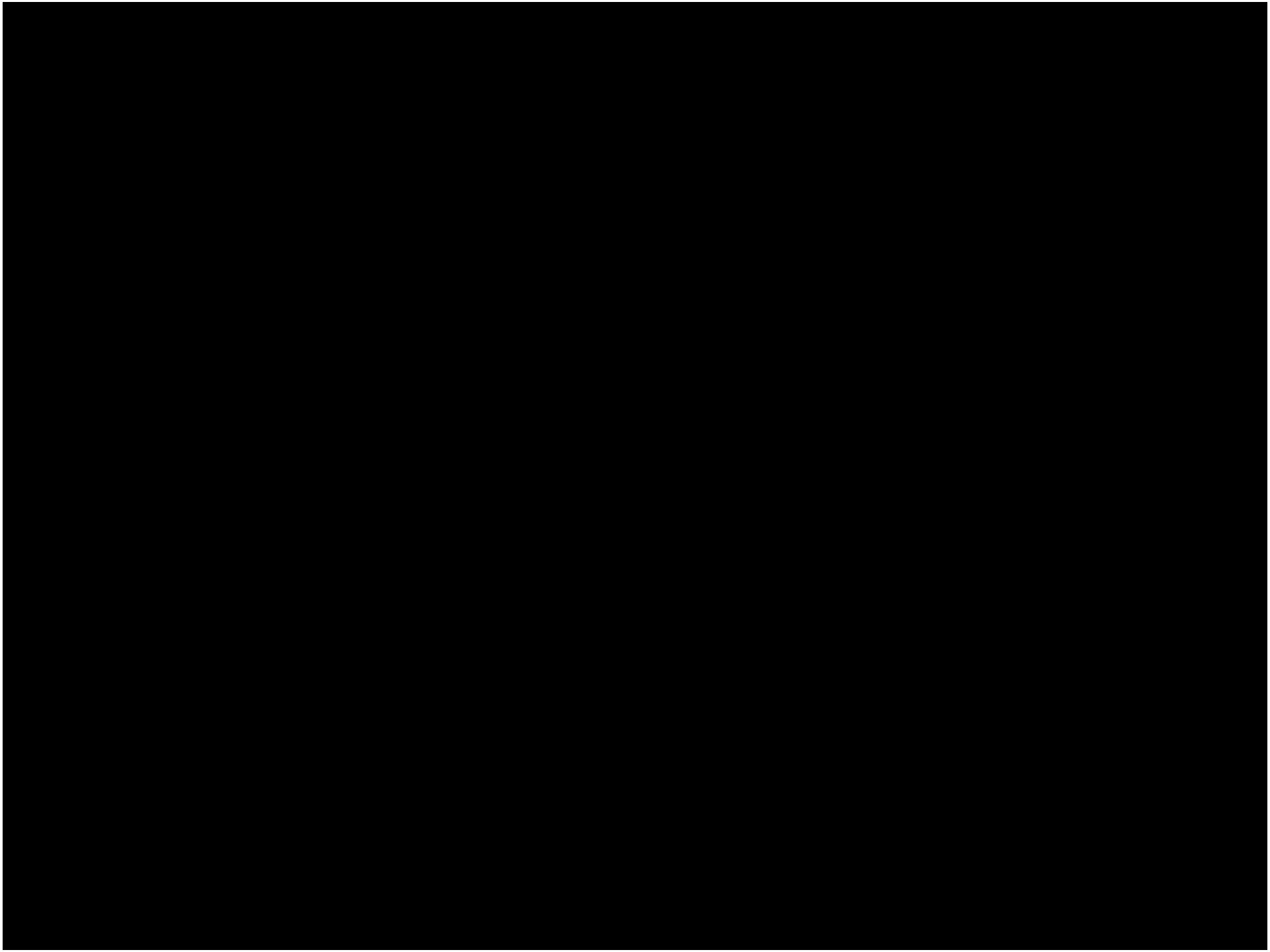
< 2 days site access time (90%)

German Remote Sensing Data Center

Simulated TerraSAR-X Image

Test Site Oberpfaffenhofen (1.5 m resolution) ESAR X-band data

TerraSAR-X
SAR Simulation

Data and More Information

- magic.csr.utexas.edu
- synergyx.tacc.utexas.edu