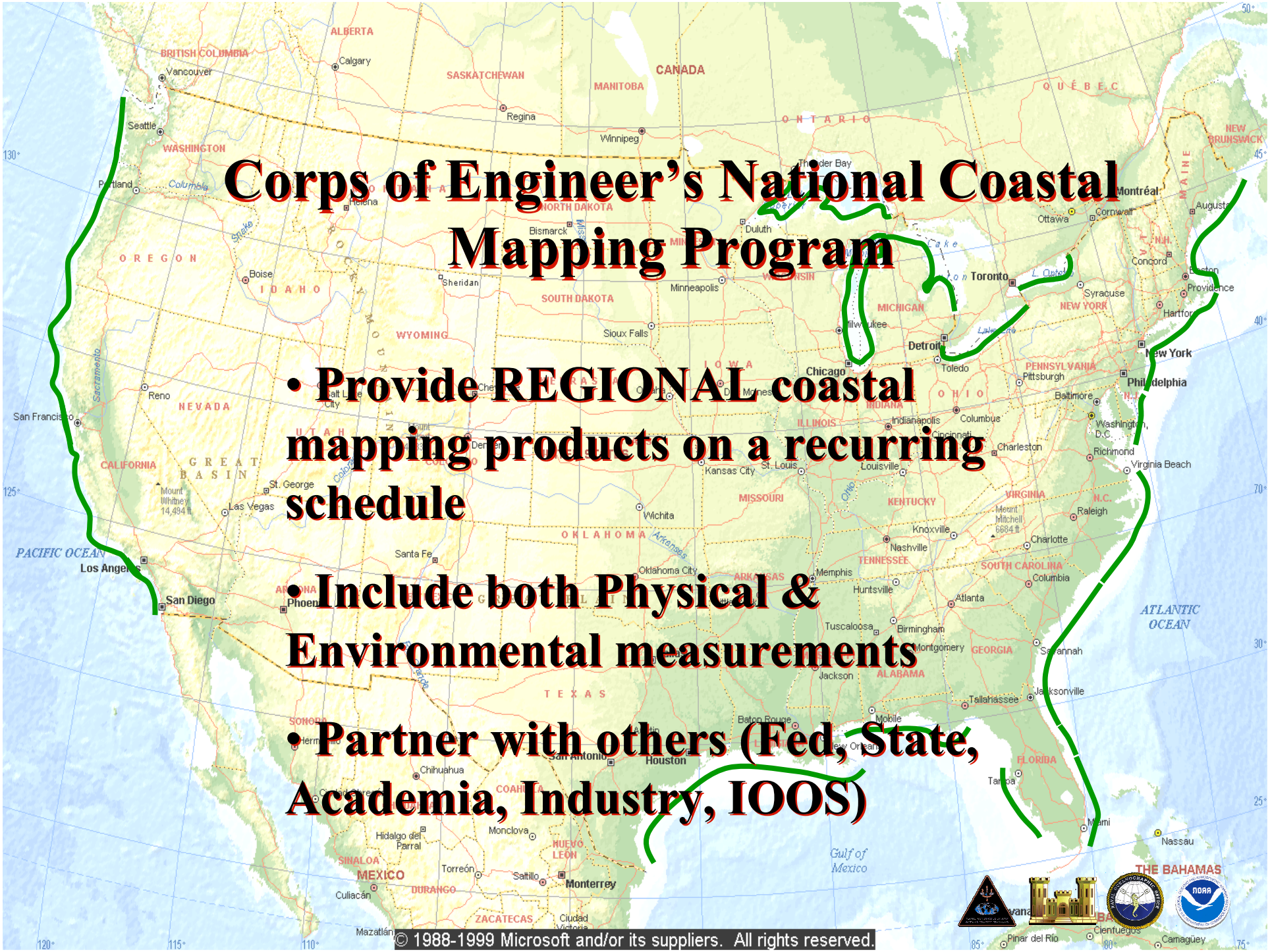
US Army Corps of Engineers' National Coastal Mapping Program

Joint Airborne Lidar Bathymetry Technical Center of Expertise

Jennifer Wozencraft

Agenda

1. Program & Organization
2. 2004, 2005 & 2006 Operations
3. Data & Products
4. Summary


Corps of Engineer's National Coastal Mapping Program
• Provide REGIONAL coastal mapping products on a recurring schedule
•Include both Physical & Environmental measurements
•Partner with others (Fed, State, Academia, Industry, IOOS)
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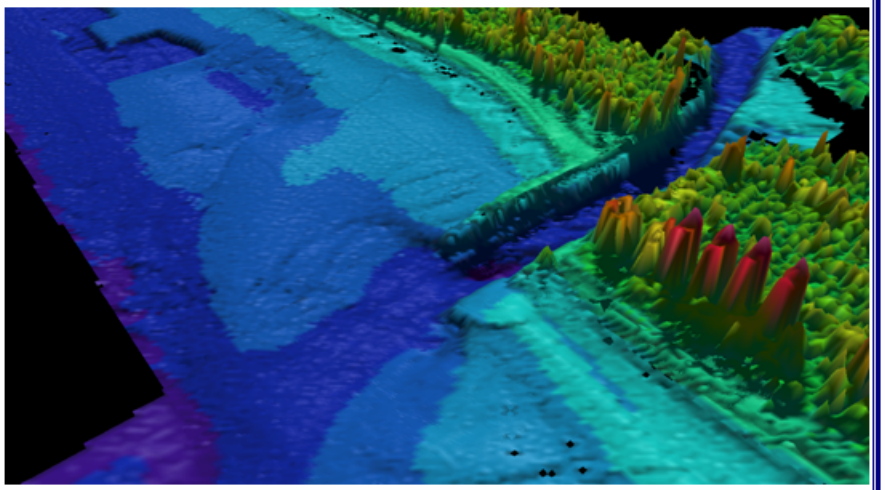
Coastal Mapping PDT

PROGRAM MANAGEMENT PLAN

for the

US ARMY CORPS OF ENGINEERS
REGIONAL COASTAL MAPPING
PROGRAM



Joint Airborne Lidar Bathymetry
Technical Center of Expertise

JALBTCX PDT Aug 2004 version2.doc

JALBTCX PDT			
Division	**Name**	**Organization**	
South Atlantic	Greg Baer	MT-E	
Wilmington	John McCormick	TS-EC	
Charleston	Sara Brown	TS-DH	
Savannah	Caro Abercrombie	EN-HC	
Jacksonville	Dan Haubner	PD-P	
Mobile	Linda Lillycrop	EN-HH	
North Atlantic	Larry Cocchieri	DM-PP	
Norfolk	Mark Hudgins	TS-EW	
Baltimore	Greg Bass	EN-GH	
Philadelphia	Monica Chasten	EC-H	
New York	Jen Irish	EN	
New England	John Winkelman	EP-EW	
Lakes & Rivers	John Kangas	E-EW	
Buffalo	Tom Bender	TD-DC	
Detroit	Phillip Ross	HH-E	
Chicago	Andrew Benzinger	TS-HH	
North Western	Patti Etzel	CM-WP-N	Al Swobod
Seattle	Bernard Hargrave Jr	PM	
Portland	Heidi Moritz	EC-HY	
South Pacific	George Domurant	CM-O	
Los Angles	Art Shak	ED-DC	
San Francisco			
Pacific Ocean			
Hawaii	Tom Smith	EC-T	
Alaska	Ken Eisses	EN-HH	
Mississippi Valley			
New Orleans	Jay Ratcliff	ED-SS	
South Western			
Galveston	Jeff Waters	PE-PL	

Board of Directors

Greg Baer - SAD
Charley Chesnutt - IWR
Larry Cocchieri - NAD
George Domurat - SPD
Patti Etzel – NWD
Wynne Fuller - SAM
Barry Holliday - HQUSACE
John Kangas - LRD
MK Miles - HQUSACE
Tom Richardson - ERDC

Joint Airborne Lidar Bathymetry Technical Center of Expertise

Operations

USACE | **Navy**

Technology Evolution

Coastal Measurements & Data Usage | **Sensors & Systems** | **NOAA**

Optech

itres

U.S. Army Corps of Engineers MOBILE DISTRICT

U.S. Naval Research Laboratory Stennis Space Center, MS

NASA EARTH SCIENCE APPLICATIONS DIRECTORATE John C. Stennis Space Center

Welcome to the US Army Corps of Engineers
Engineer Research and Development Center
Waterways Experiment Station, Vicksburg, MS

Department of Marine Science of The University of Southern Mississippi

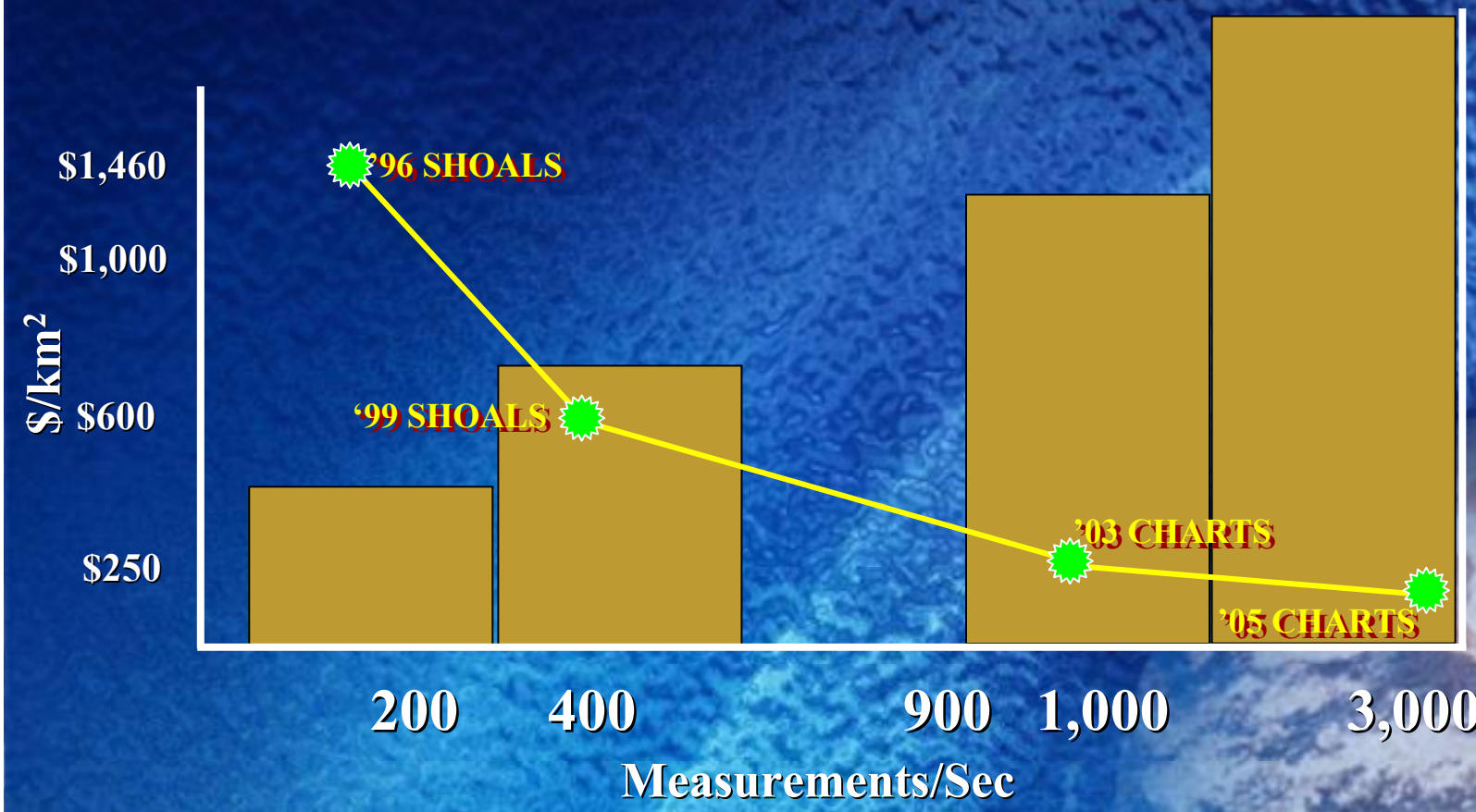
NAVAL OCEANOGRAPHIC OFFICE

NOAA Satellites and Information
National Environmental Satellite, Data, and Information Service

fugro

Leveraging Federal, State, Academia, and Industry

JALBTCX Accomplishments



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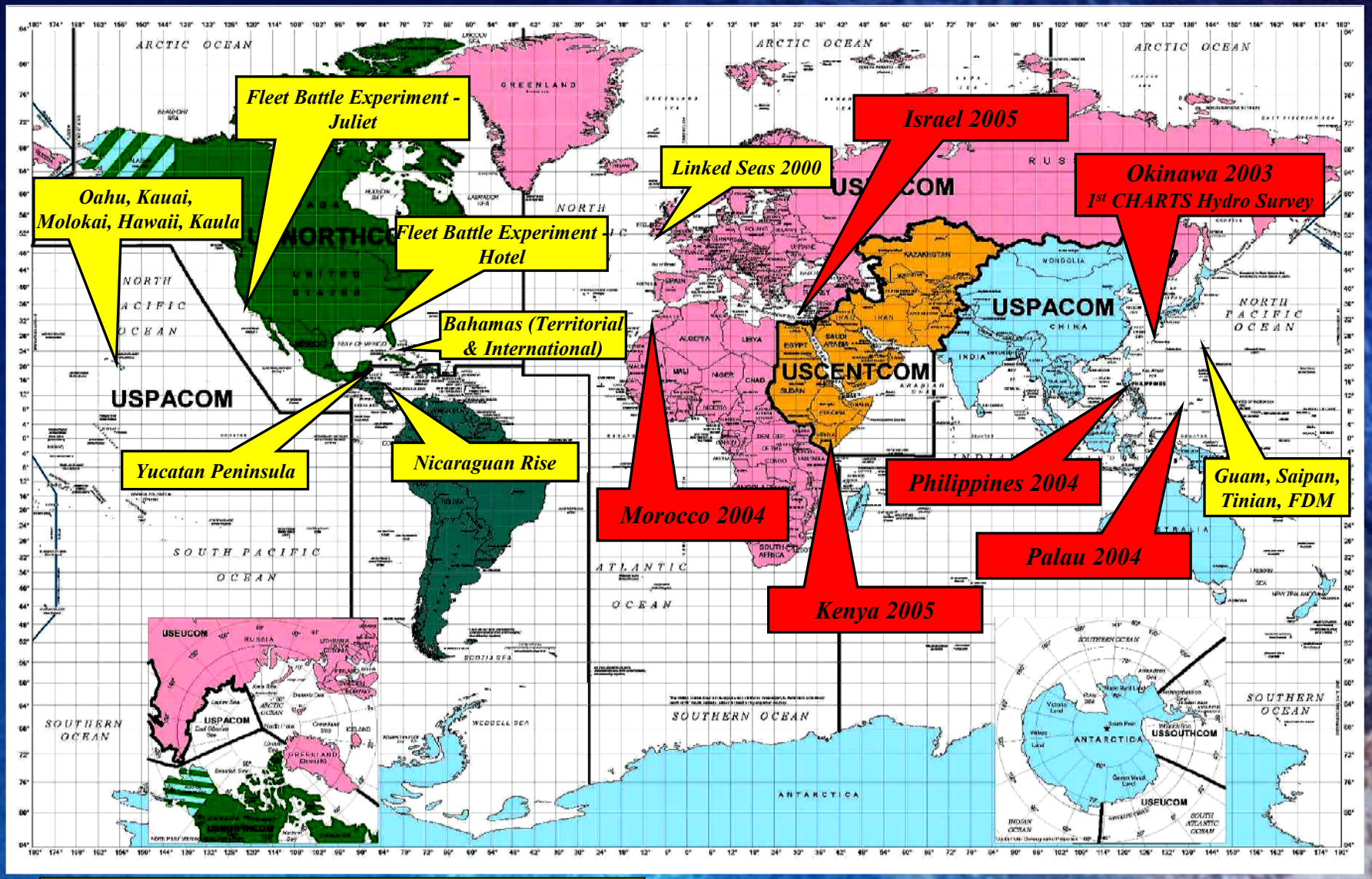
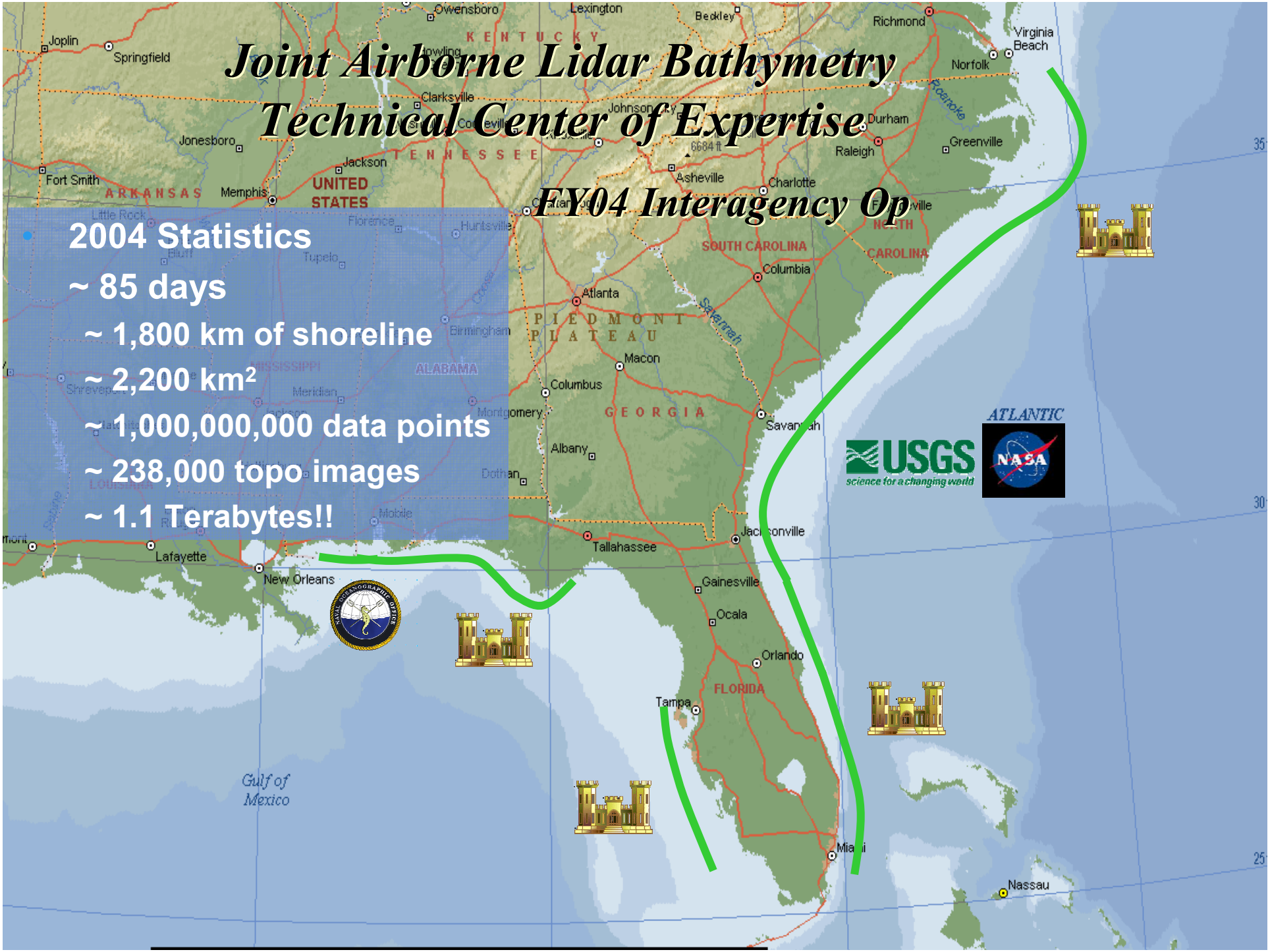
Coastal Charting Operations for Navy

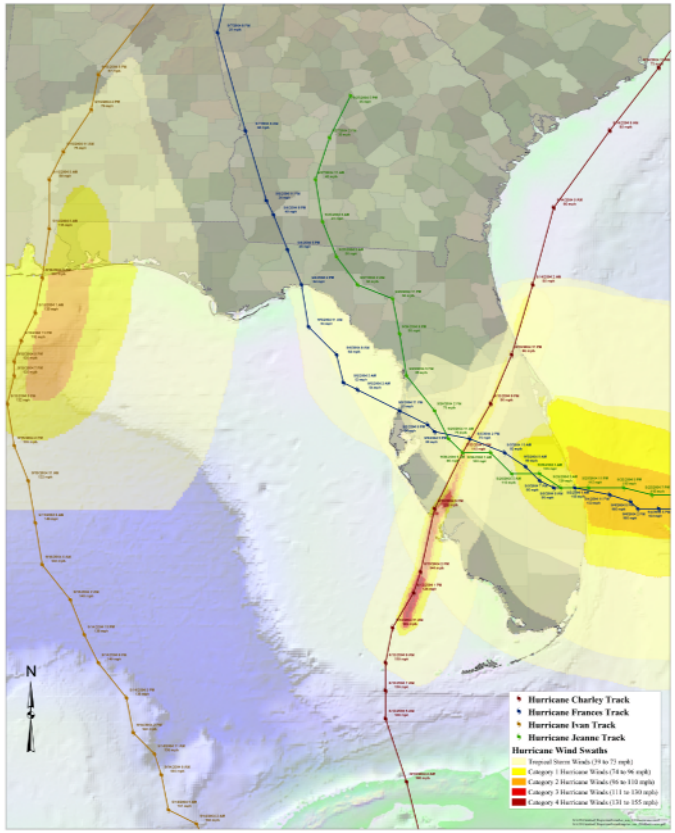


USACE SHOALS System (1996 – 2002)

US Navy CHARTS System (2003-present)

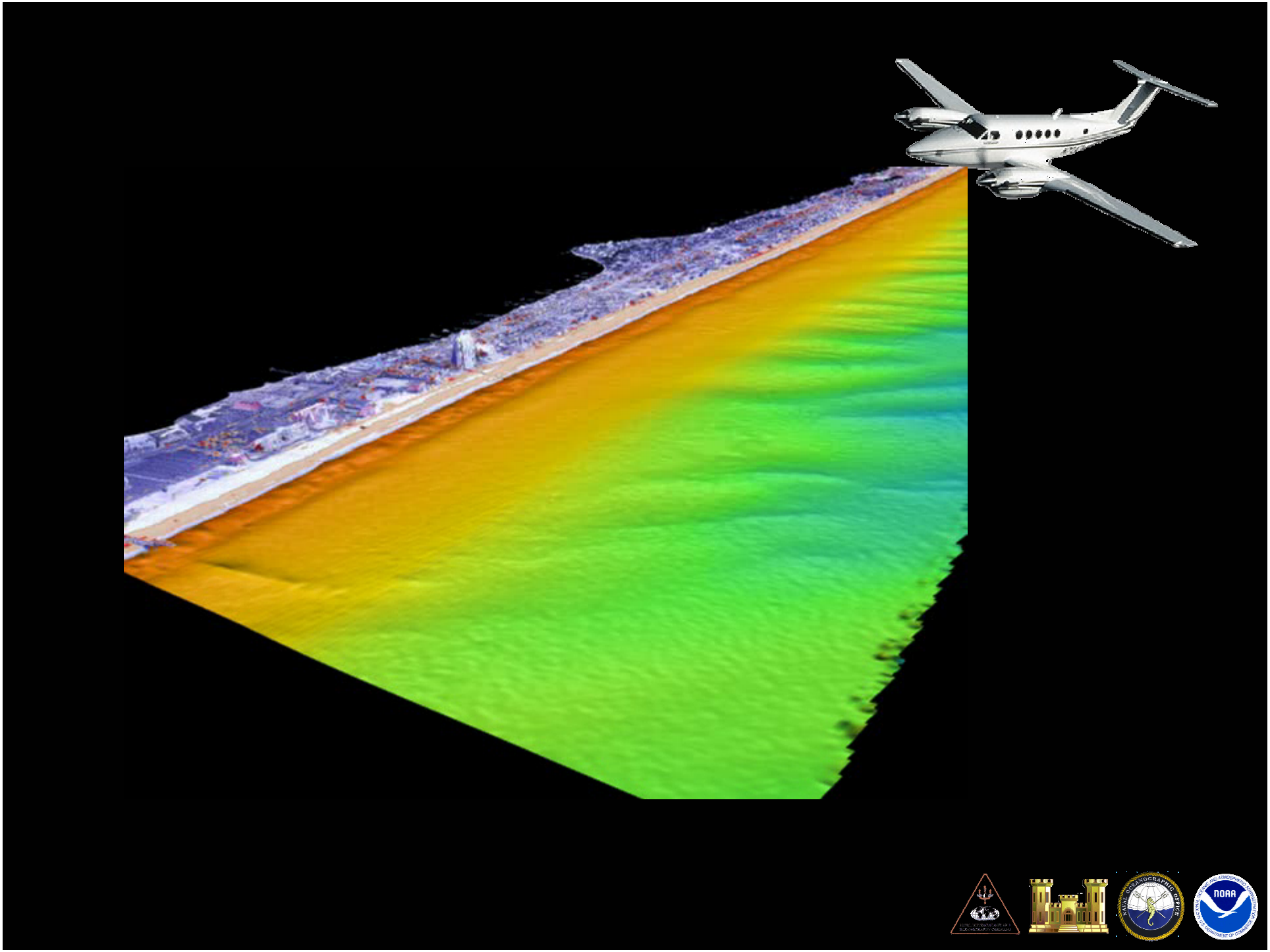

Joint Airborne Lidar Bathymetry
Technical Center of Expertise
FY04 Interagency Op
2004 Statistics
~ 85 days
~ 1,800 km of shoreline
~ 2,200 km²
~ 1,000,000,000 data points
~ 238,000 topo images
~ 1.1 Terabytes!!
USGS
science for a changing world
NASA
ATLANTIC
Gulf of Mexico
Owensboro
Lexington
Beckley
Richmond
Virginia Beach
Norfolk
Joplin
Springfield
KENTUCKY
Clarksville
Johnson City
Durham
Roanoke
Jonesboro
TENNESSEE
Greenville
Raleigh
Fort Smith
Jackson
Asheville
Charlotte
ARKANSAS
Memphis
UNITED STATES
Little Rock
Florence
Huntsville
SOUTH CAROLINA
NORTH CAROLINA
Columbia
Tupelo
Atlanta
Savannah
PIEDMONT PLATEAU
Birmingham
Macon
MISSISSIPPI
ALABAMA
Columbus
Meridian
Montgomery
GEORGIA
Savannah
Albany
Dothan
Mobile
Jacksonville
Tallahassee
Lafayette
New Orleans
Gainesville
Ocala
Orlando
FLORIDA
Tampa
Miami
Nassau
35
30
25

Post-Hurricanes

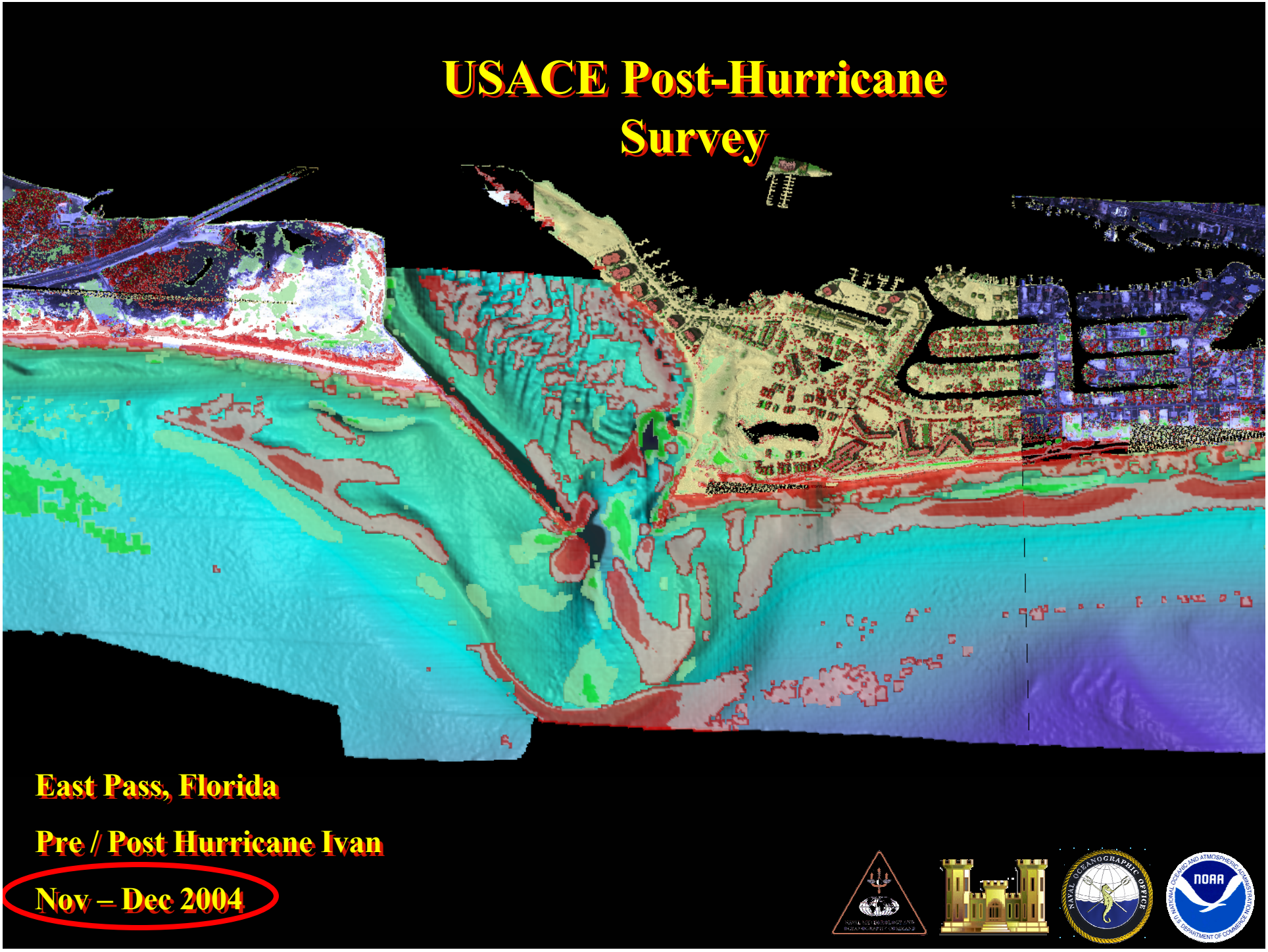


2004 Hurricanes Impacting Southeastern U.S.A.
Hurricane Wind Swaths

- Post-storms only
  - ~ 35 days (including down days)
  - ~ 680 miles of shoreline
  - ~ 1,300 km^2
  - ~ 15 Federal Shore Protection Projects
  - Data for FSPs delivered prior to leaving field!!
  - 680 Gigabytes!!
  - **Total FY2004 USACE 1.7 Terabytes**



USACE Post-Hurricane Survey



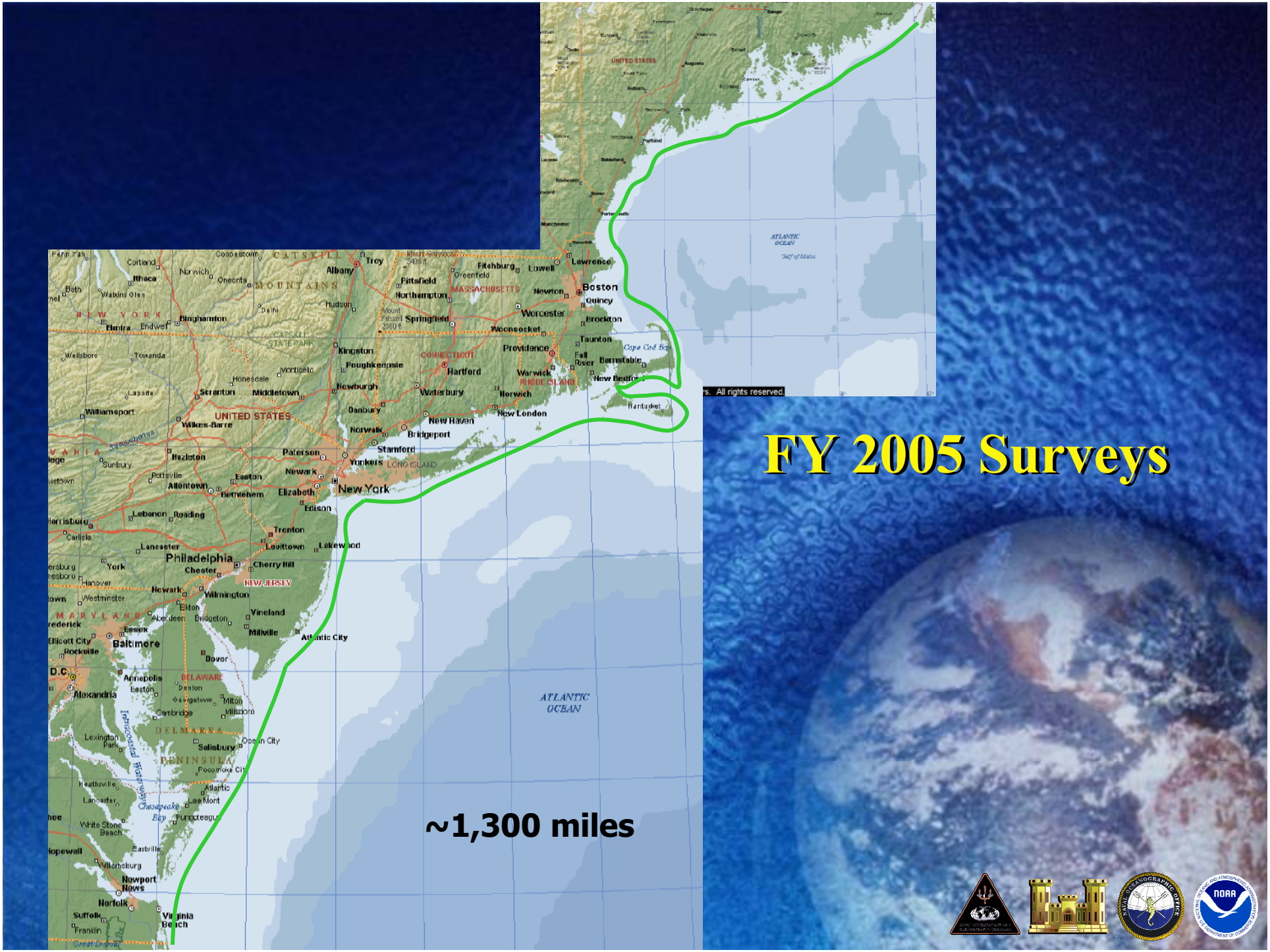
East Pass, Florida

Pre / Post Hurricane Ivan

Nov – Dec 2004

Post-Hurricane Reconstruction

16 federal projects
$200,000,000 reconstruction


FY 2005 Surveys
~1,300 miles
ATLANTIC OCEAN
Boston
New York
Philadelphia
Baltimore
Albany
Hartford
Providence
Worcester
Springfield
Lowell
Lawrence
Newark
Trenton
Atlantic City
Norfolk
Virginia Beach
Newport News
Salisbury
Ocean City
Dover
Wilmington
Stamford
Bridgeport
New Haven
New London
Waterbury
Newburgh
Poughkeepsie
Kingston
Scranton
Wilkes-Barre
Allentown
Reading
Lancaster
Harrisburg
Pittsfield
Northampton
Fitchburg
Quincy
Brockton
Taunton
Fall River
Barnstable
New Bedford
Nantucket
Cape Cod Bay
Warwick
Woonsocket
Norwich
Danbury
Norwalk
Yorkers
Paterson
Elizabeth
Edison
Lakewood
Cherry Hill
Millville
Vineland
Dover
Annapolis
Alexandria
D.C.
Baltimore
Elkton
Aberdeen
Bethlehem
Easton
Pottsville
Williamsport
Sunbury
Hazleton
Honesdale
Middletown
Monticello
Wellsboro
Elmira
Binghamton
Ithaca
Cortland
Norwich
Oneonta
Troy
Hudson
Delhi
Watkins Glen
Beth
Endwell
Trowanda
Lapaire
Greenfield
Mount Frissell 2380 ft
CATSKILL MOUNTAINS
CATSKILL STATE PARK
NEW YORK
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
LONG ISLAND
NEW JERSEY
DELAWARE
MARYLAND
DELMARVA PENINSULA
UNITED STATES
ATLANTIC OCEAN
Chesapeake Bay
Intracoastal Waterway
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White Stone Beach
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Suffolk
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Great Dismal
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Purgoteague
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Bridgeton
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Hanover
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Levittown
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Sharon
Portland
Augusta
Bangor
Rockland
Auburn
Lewiston
Manchester
Concord
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Portsmouth
Haverhill
Lowell
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Brockton
Taunton
Fall River
Barnstable
New Bedford
Nantucket
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Providence
Warwick
Woonsocket
Norwich
Worcester
Springfield
Northampton
Pittsfield
Fitchburg
Greenfield
Newton
Waterbury
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Haverhill
NOAA

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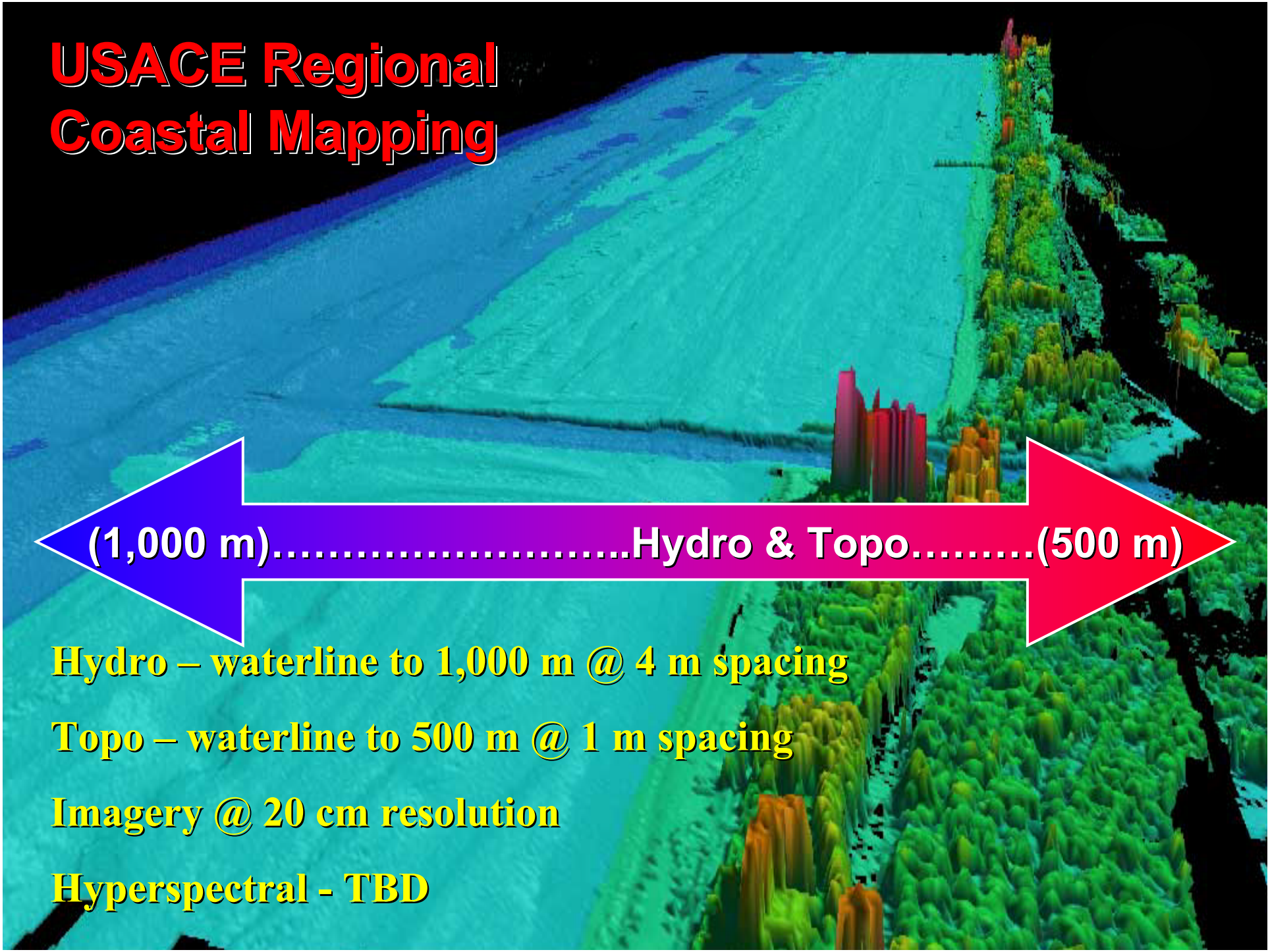
USACE Regional Coastal Mapping



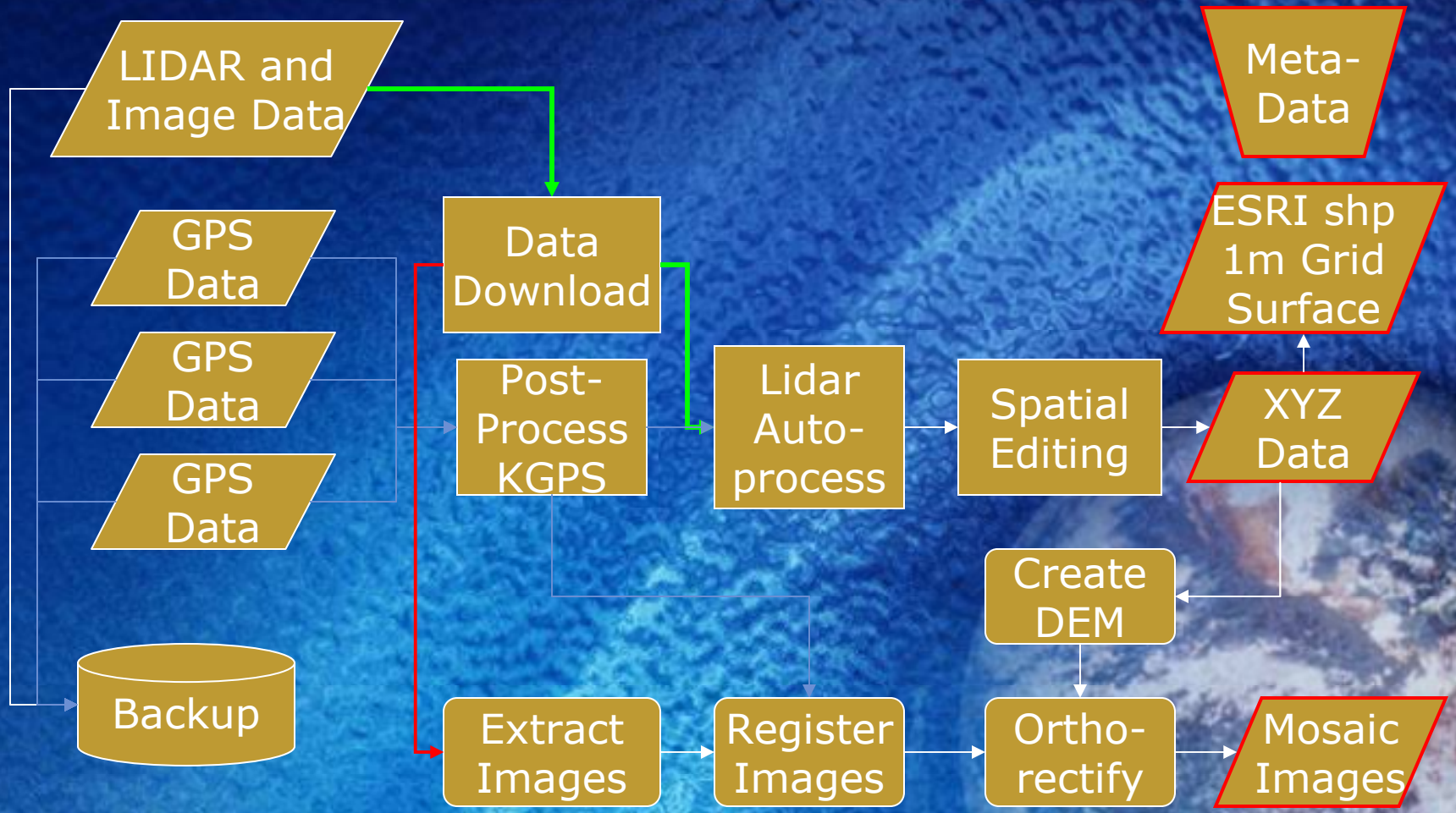
Hydro – waterline to 1,000 m @ 4 m spacing

Topo – waterline to 500 m @ 1 m spacing

Imagery @ 20 cm resolution

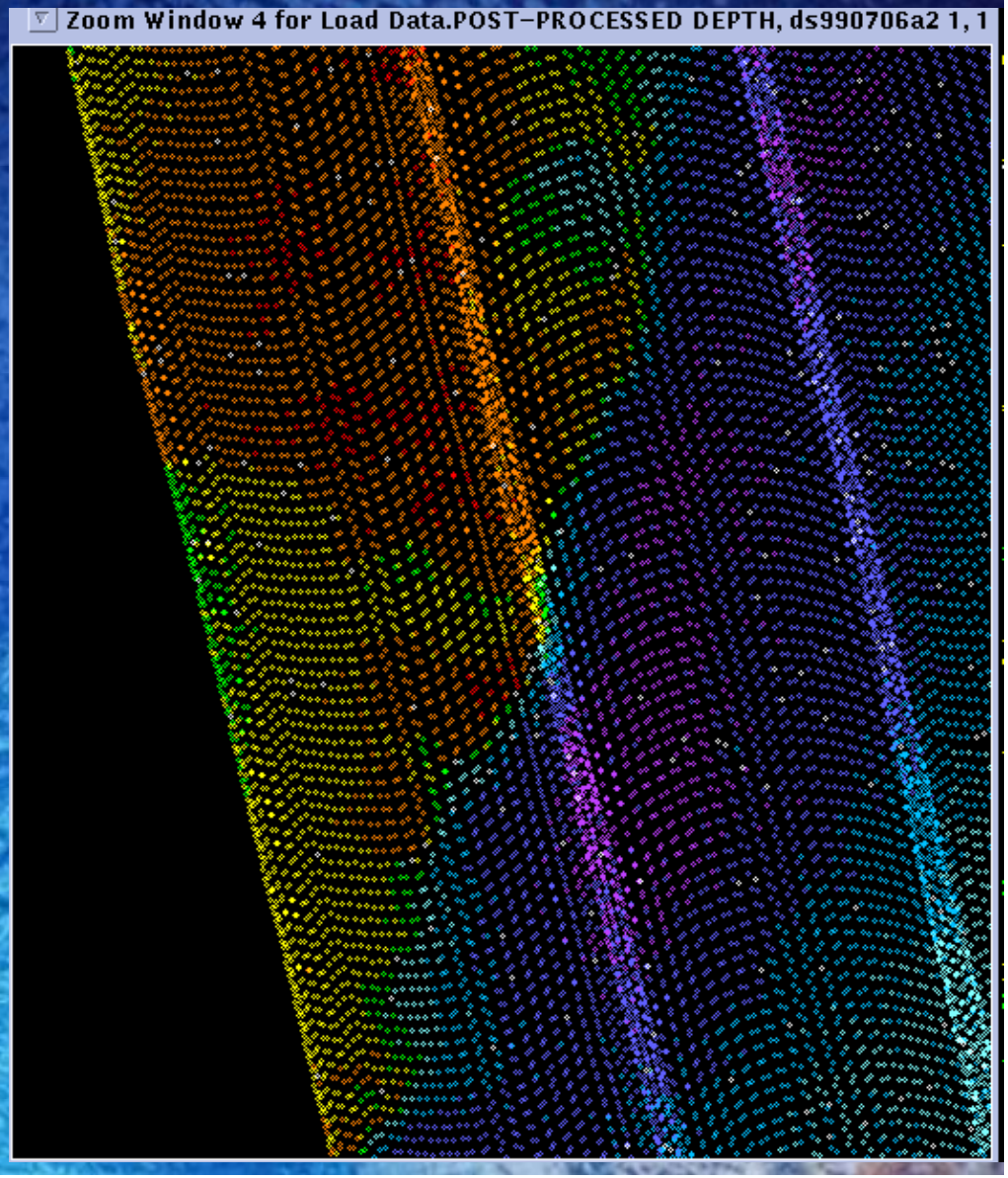
Hyperspectral - TBD

Data Processing & Products



Elevation Data Characteristics

- Point data X,Y,Z ascii files
- Land @ 1m x 1m
- Hydro @ 4m x 4m
- ~250 Meg / mile



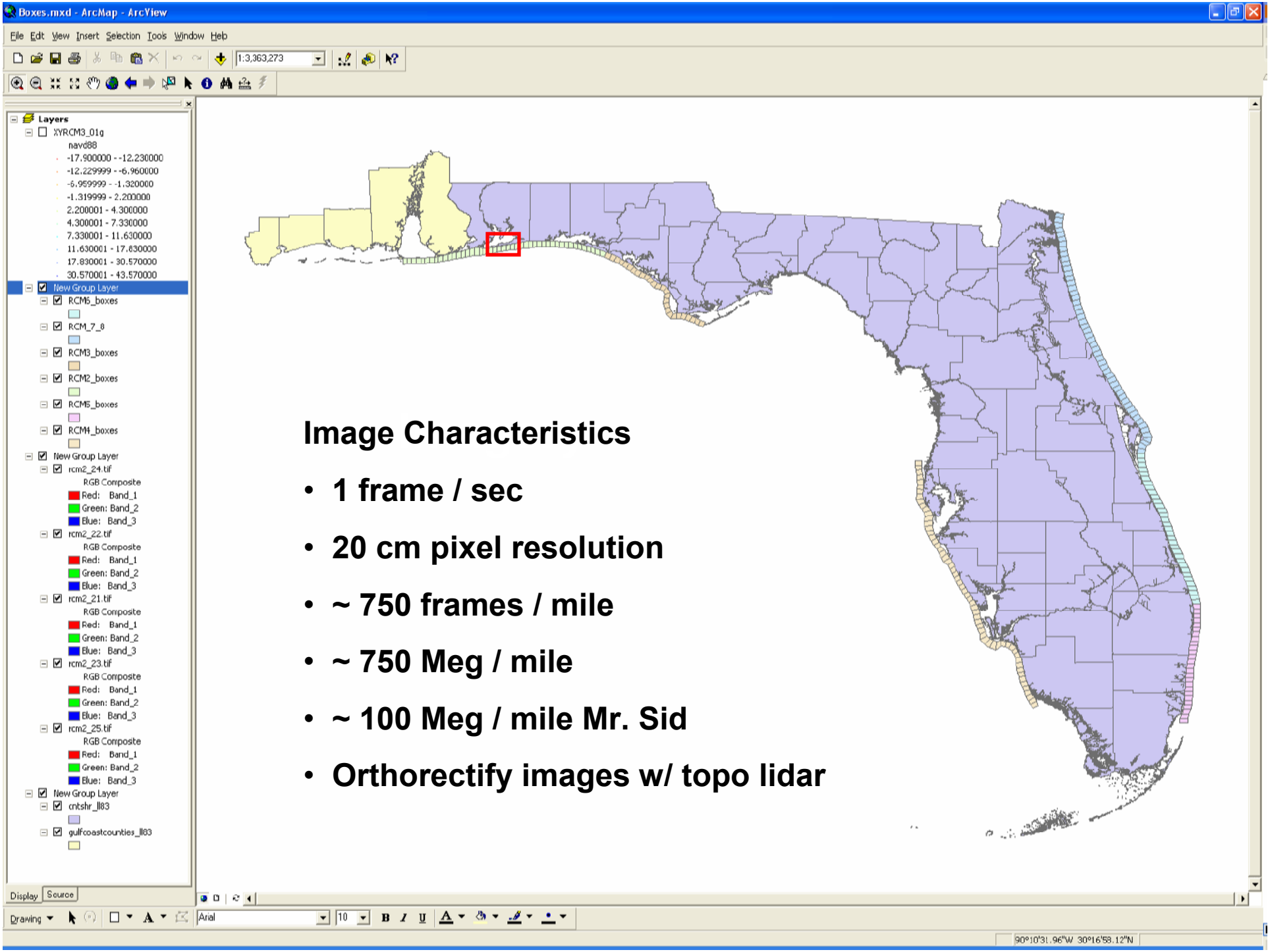
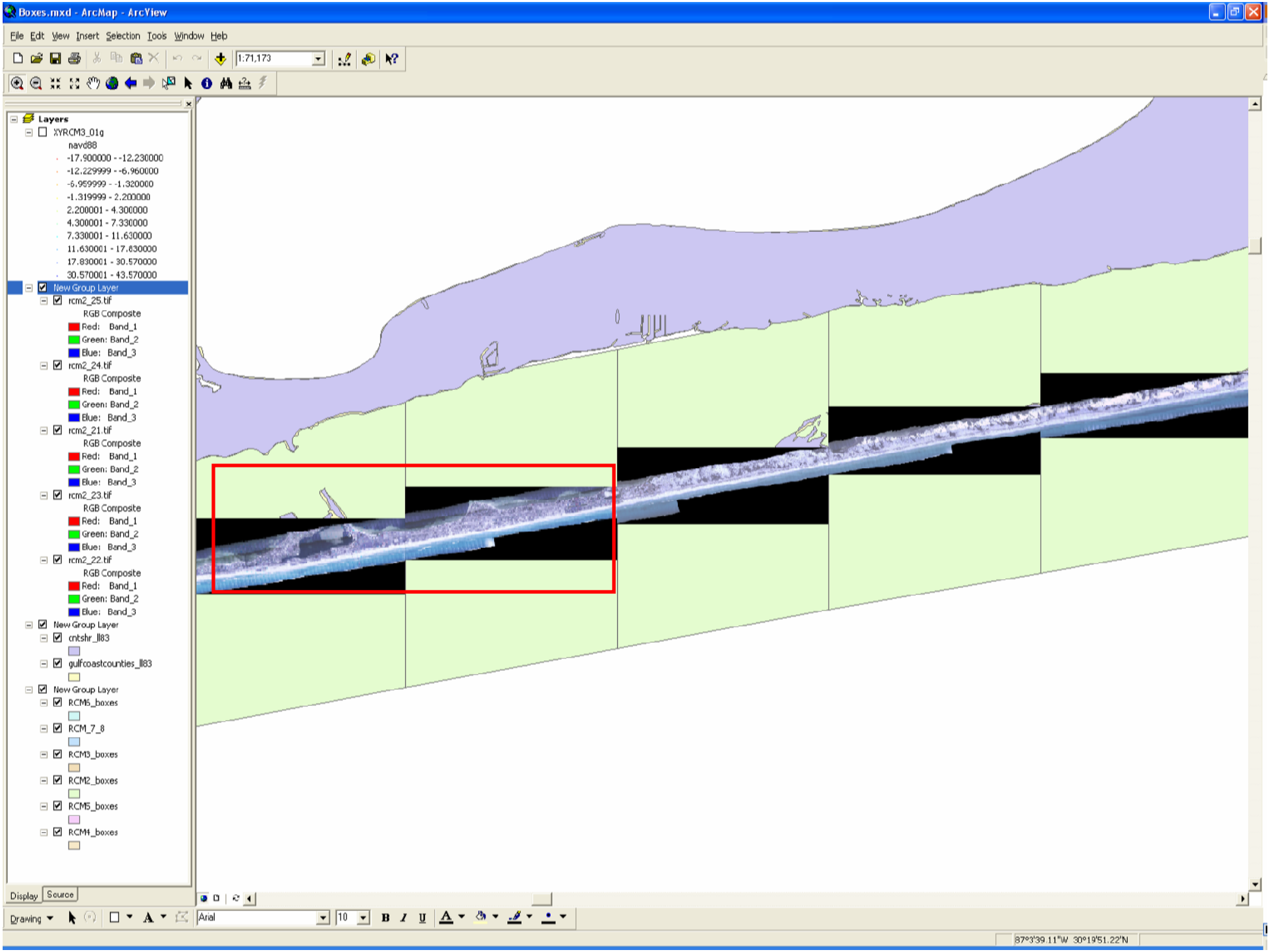


Image Characteristics

- **1 frame / sec**
- **20 cm pixel resolution**
- **~ 750 frames / mile**
- **~ 750 Meg / mile**
- **~ 100 Meg / mile Mr. Sid**
- **Orthorectify images w/ topo lidar**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7.330001 - 11.630000
11.630001 - 17.830000
17.830001 - 30.570000
30.570001 - 43.570000
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Green: Band_2
Blue: Band_3
rcm2_24.tif
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
rcm2_21.tif
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
rcm2_23.tif
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
rcm2_22.tif
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
New Group Layer
cntshr_ll83
gulfcoastcounties_ll83
New Group Layer
RCM5_boxes
RCM_7_8
RCM3_boxes
RCM2_boxes
RCM5_boxes
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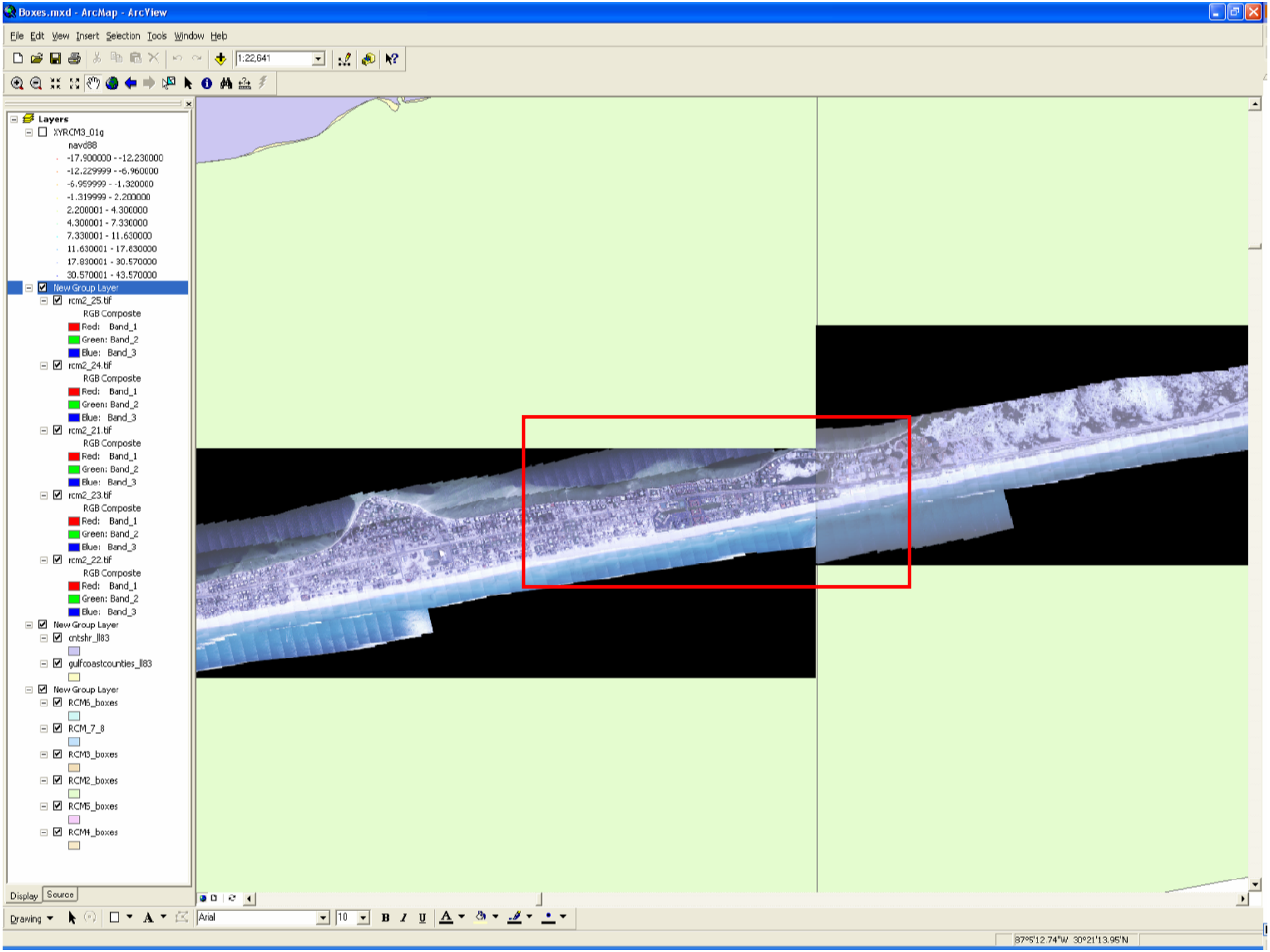
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RGB Composite
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gulfcoastcounties_ll83
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RCM3_boxes
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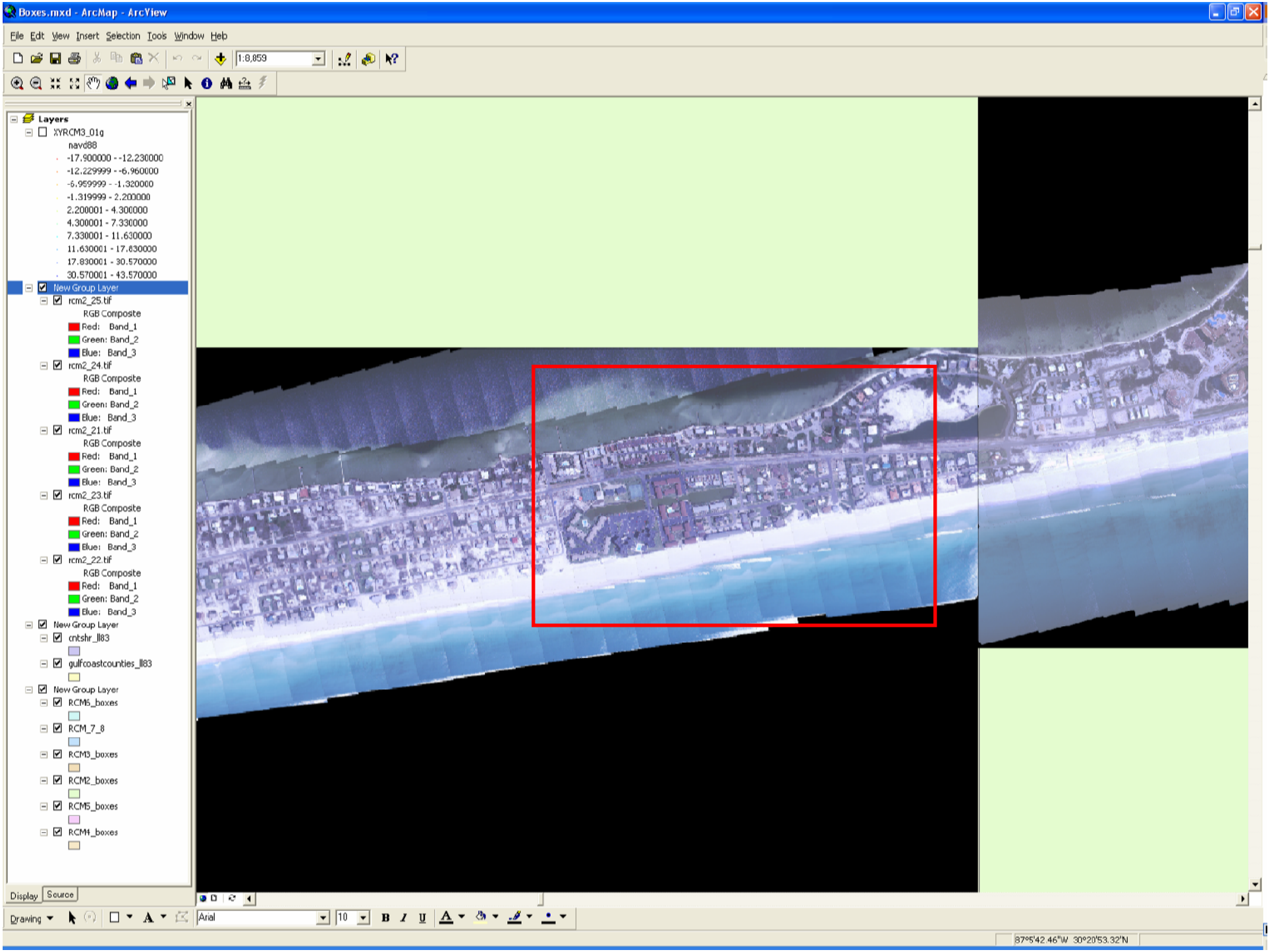
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New Group Layer
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gulfcoastcounties_ll83
New Group Layer
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RCM_7_8
RCM3_boxes
RCM2_boxes
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RCM4_boxes
Display
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Arial
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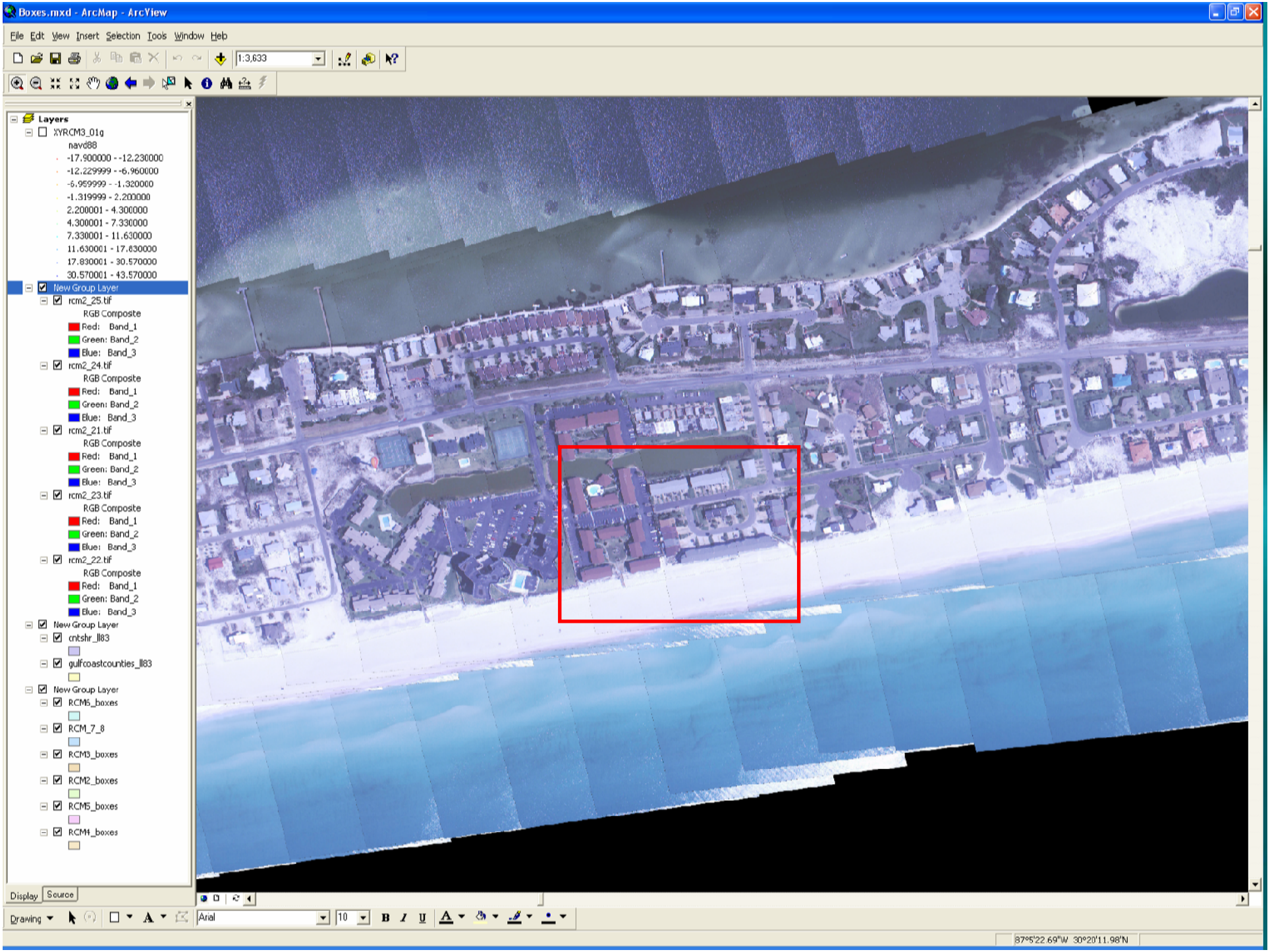
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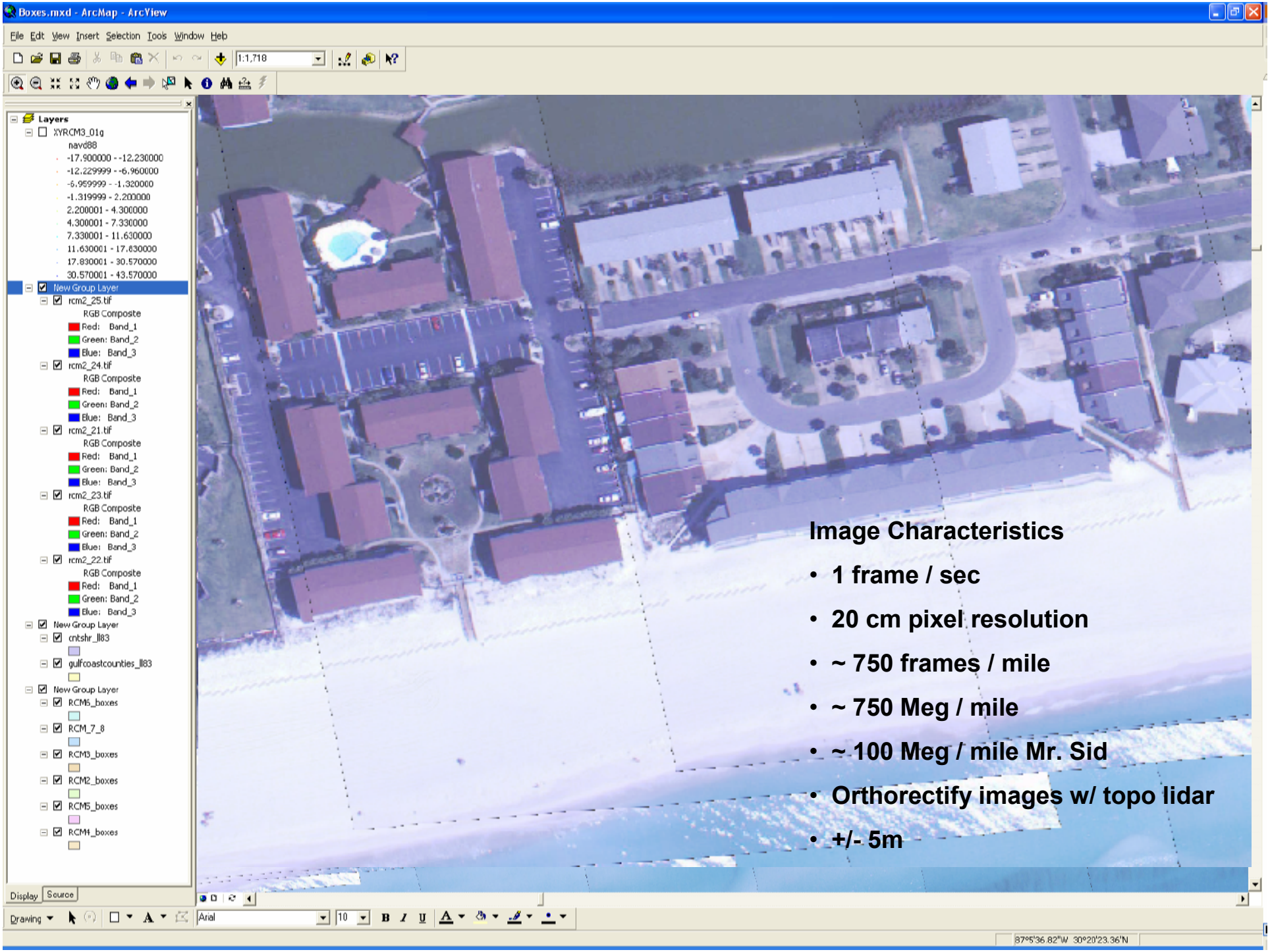
87°5'22.69"W 30°20'11.98"N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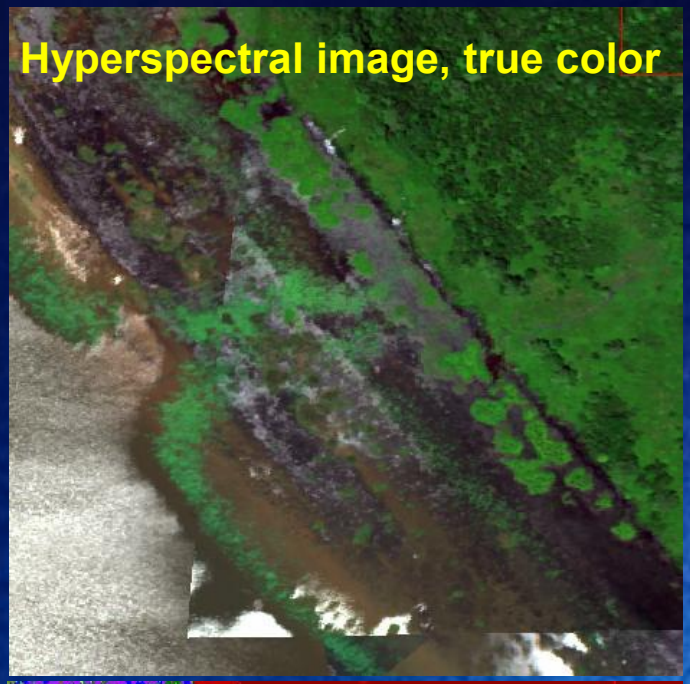
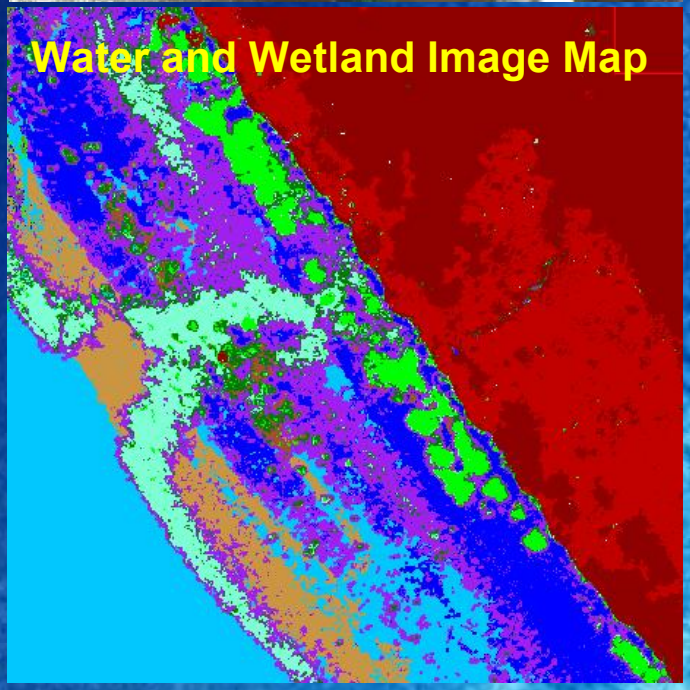
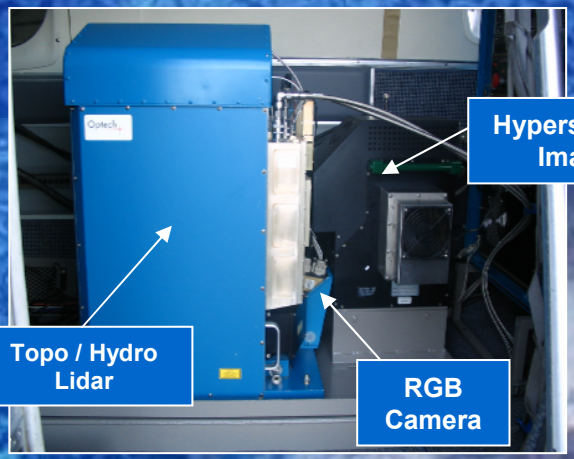
Red: Band_1
Green: Band_2
Blue: Band_3
rcm2_23.tif
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
rcm2_22.tif
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
New Group Layer
cntshr_ll83
gulfcoastcounties_ll83
New Group Layer
RCM5_boxes
RCM_7_8
RCM3_boxes
RCM2_boxes
RCM5_boxes
RCM4_boxes
Display Source
Drawing
Arial
10
87°5'36.82"W 30°20'23.36"N
Image Characteristics
• 1 frame / sec
• 20 cm pixel resolution
• ~ 750 frames / mile
• ~ 750 Meg / mile
• ~ 100 Meg / mile Mr. Sid
• Orthorectify images w/ topo lidar
• +/- 5m

Added Hyperspectral Imager for Environmental Characterization







Classification Key

- Water
- Dense Floating Vascular
- Dense SAV, Emergent
- Apparent Bottom
- Dense SAV
- Emergent Grass (Wild Rice, etc.)
- Forest
- Grasses
- Undetermined Floating Grasses

Advanced Products & Information

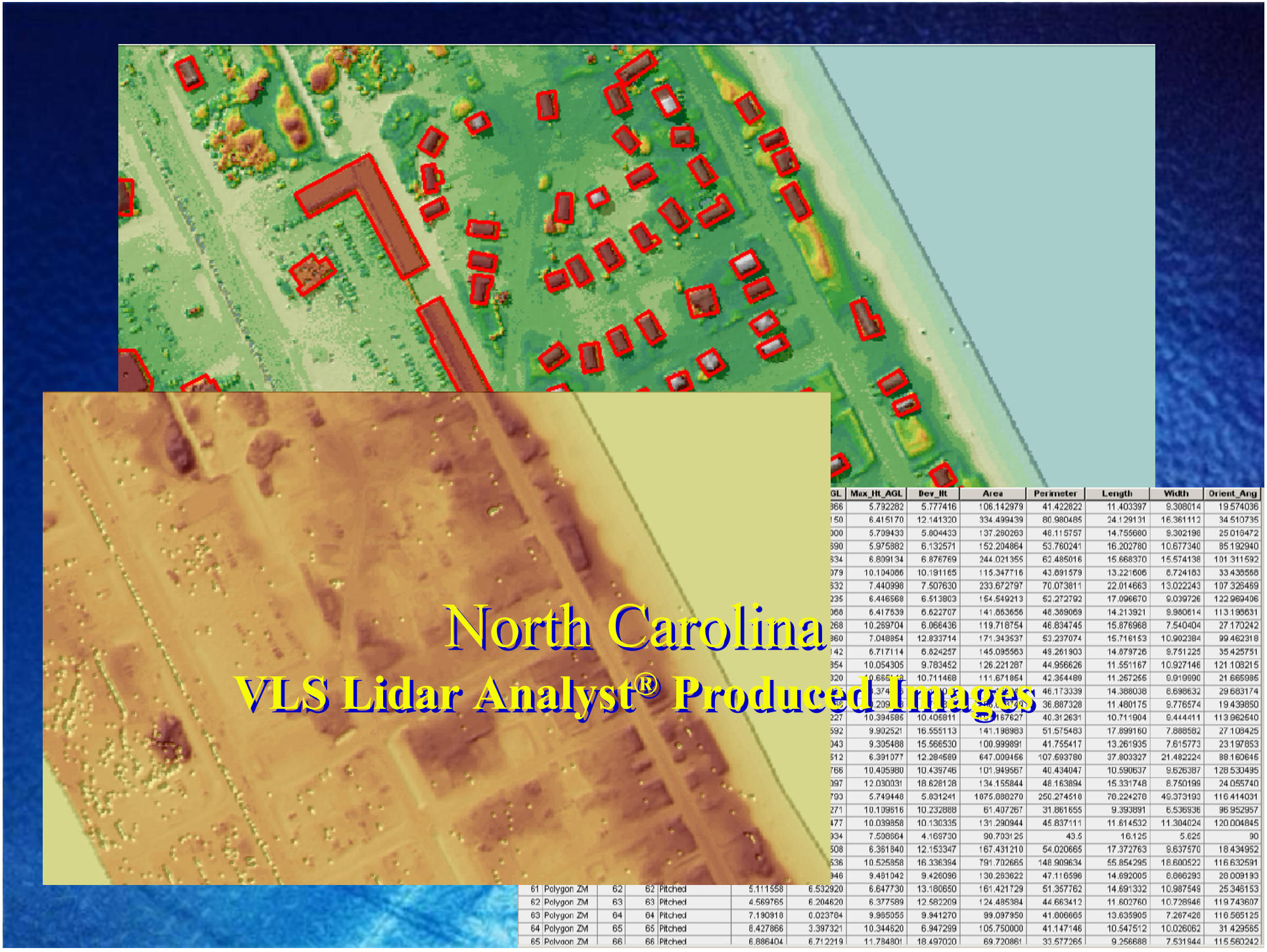
Hyperspectral & Lidar

- SAV
- Wetlands
- Land use
- Bottom type
- Bottom reflectance

Lidar & Imagery

- Economic inputs
- Forestry management
- Shoreline position
- Condition Index Reports

Others in development…

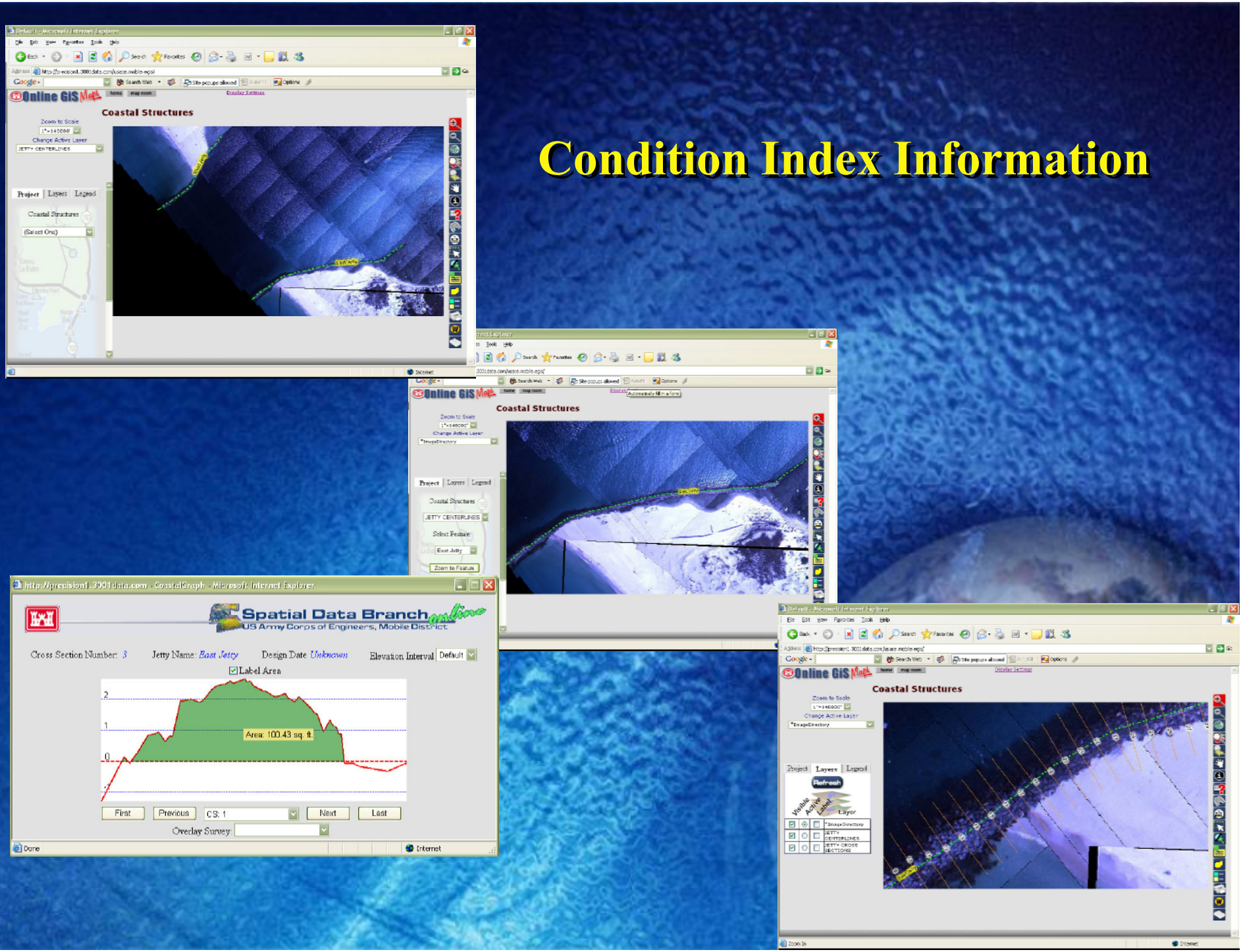


North Carolina

VLS Lidar Analyst® Produced Images

						GL	Max_Ht_AGL	Dev_Ht	Area	Perimeter	Length	Width	Orient_Ang
						866	5.792282	5.777416	106.142979	41.422822	11.403397	9.308014	19.574036
						150	6.415170	12.141320	334.499439	80.980485	24.129131	16.361112	34.510735
						000	5.709433	5.804433	137.280263	46.115757	14.755680	9.302198	25.016472
						690	5.975882	6.132571	152.204864	53.760241	16.202780	10.677340	85.192940
						634	6.809134	6.876769	244.021355	62.485016	15.668370	15.574138	101.311592
						079	10.104066	10.191165	115.347716	43.691579	13.221606	6.724163	33.436566
						532	7.440998	7.507630	233.672797	70.073811	22.014663	13.022243	107.325469
						235	6.446568	6.513803	154.549213	52.272792	17.096670	9.039726	122.969406
						066	6.417539	6.622707	141.853656	46.389069	14.213921	9.960614	113.195631
						268	10.259704	6.066436	119.718754	46.834745	15.876968	7.540404	27.170242
						960	7.048854	12.833714	171.343537	53.237074	15.716153	10.902384	99.462318
						142	6.717114	6.624257	145.095563	49.261903	14.879726	9.751225	35.425751
						854	10.054305	9.783452	126.221287	44.956626	11.551167	10.927146	121.108215
						320	10.665	10.711468	111.671864	42.364489	11.267265	9.919990	21.665986
							6.374			46.173339	14.388038	8.698632	29.683174
							6.209			36.887328	11.480175	9.776574	19.439850
						227	10.394586	10.406811	90.167627	40.312631	10.711904	9.444411	113.962640
						592	9.902521	16.555113	141.196983	51.575483	17.899160	7.888582	27.103425
						043	9.305488	15.566530	100.999891	41.755417	13.261935	7.615773	23.197853
						512	6.391077	12.284589	647.009456	107.693780	37.803327	21.482224	88.160645
						766	10.405980	10.439746	101.949567	40.434047	10.590637	9.626387	128.530495
						097	12.030031	18.628128	134.155844	48.163894	15.331748	8.750199	24.055740
						793	5.749448	5.831241	1875.886270	250.274518	78.224278	49.373193	116.414031
						271	10.109816	10.232888	61.407267	31.861655	9.393891	6.536936	96.952957
						477	10.039858	10.130335	131.290944	45.837111	11.614532	11.304024	120.004845
						934	7.508864	4.169730	90.703125	43.5	16.125	5.625	90
						508	6.361840	12.153347	167.431210	54.020665	17.372763	9.637570	18.434952
						536	10.525858	16.336394	791.702665	148.909634	55.854295	18.600522	116.632591
						946	9.461042	9.426096	130.269622	47.116596	14.692005	6.666293	28.009193
61	Polygon ZM	62	62	Pitched	5.111558	6.532920	6.647730	13.180650	161.421729	51.357762	14.691332	10.987549	25.348153
62	Polygon ZM	63	63	Pitched	4.569765	6.204820	6.377589	12.582209	124.485384	44.663412	11.602760	10.728946	119.743607
63	Polygon ZM	64	64	Pitched	7.190918	0.023784	9.965055	9.941270	99.097950	41.606665	13.635905	7.267426	116.565125
64	Polygon ZM	65	65	Pitched	8.427866	3.397321	10.344520	6.947299	105.750000	41.147146	10.547512	10.026062	31.429585
65	Polygon ZM	66	66	Pitched	6.886404	6.712219	11.784801	18.497020	69.720861	33.577265	9.256688	7.531944	115.560242

Condition Index Information



JALBTCX R&D Initiatives

Department of Marine Science
of The University of Southern Mississippi

Visiting Professor & Post Doc

NOPP Project & NOS Project

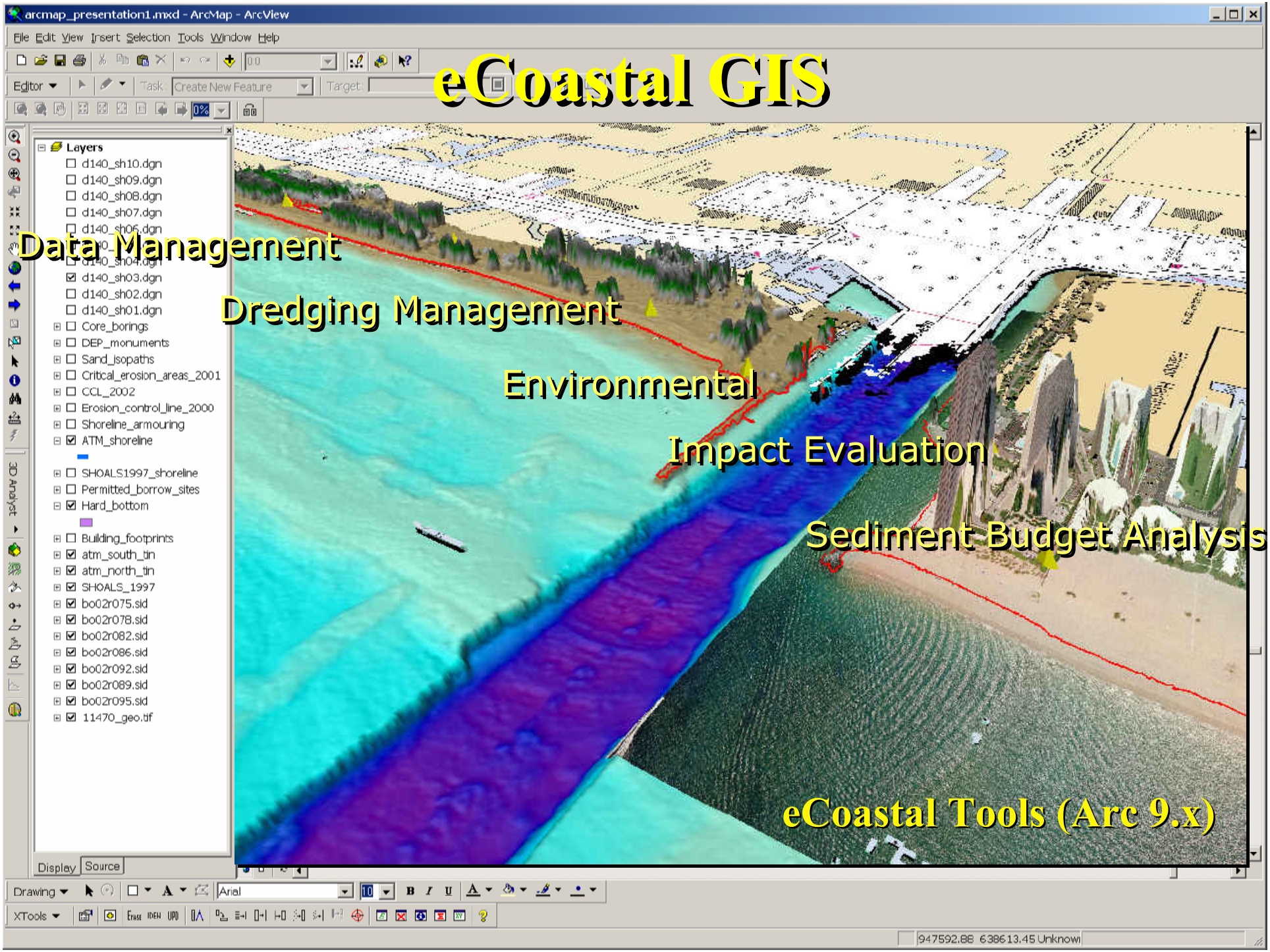
National Coastal & Ocean Mapping Strategy

Department of Marine Science
of The University of Southern Mississippi

1 MS & 2 PhD Students

Automated Feature Extraction

Annual Technical Workshop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Editor
Task: Create New Feature
Target:
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d140_sh01.dgn
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DEP_monuments
Sand_Isopaths
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CCL_2002
Erosion_control_line_2000
Shoreline_armouring
ATM_shoreline
SHOALS1997_shoreline
Permitted_borrow_sites
Hard_bottom
Building_footprints
atm_south_tin
atm_north_tin
SHOALS_1997
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bo02r095.sid
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Display
Source
Drawing
Arial
XTools
947592.88 638613.45 Unknown
eCoastal GIS
Data Management
Dredging Management
Environmental
Impact Evaluation
Sediment Budget Analysis
eCoastal Tools (Arc 9.x)

Agenda

1. Program & Organization
2. 2004, 2005 & 2006 Operations
3. Data & Products
4. Summary

For more information, please contact…..

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Jeff Lillycrop	228-252-1101