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Coastal Situational Awareness via nowCOAST's Web Mapping Services and Map Viewer

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Coastal Situational Awareness via nowCOAST's Web Mapping Services and Map Viewer



Coastal GeoTools 2009 Conference
Session: Data Sharing - Ocean Observations

March 5, 2009

John G.W. Kelley

Micah Wengren, Jason Greenlaw, and Sree Dadisetty

NOAA/National Ocean Service - Coast Survey Development Lab

@NOAA-UNH Joint Hydrographic Center/Center for Coastal & Ocean Mapping

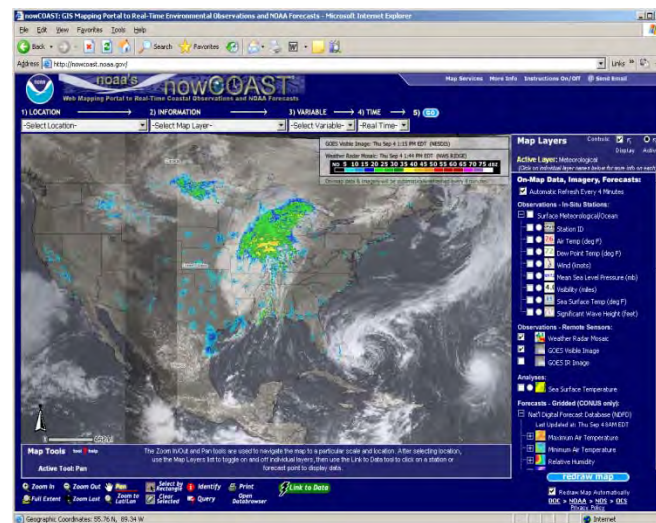
Durham, New Hampshire



What is nowCOAST?



- A GIS-based, interactive web mapping portal to near-real-time observations of
 - weather,
 - oceanographic,
 - river,
 - water quality,
 - air quality conditions, andNOAA forecast products from the top of the watershed to the high seas.
- Integrates data and information from
 - NOAA (NWS, NOS, NESDIS, ESRL/GSD),
 - other federal agencies (e.g. USGS, EPA),
 - state and county agencies,
 - mesonets, and
 - regional ocean observing systems.



T.S. Hanna, Hurricane Ike, Remains of Hurricane Gustav
September 2008

<http://nowcoast.noaa.gov>



nowCOAST in relation to NOAA Goals and Objectives



***nowCOAST* by its integration of near-real-time data & NOAA forecast products supports...**

■ **IOOS' Vision and Goals:**

- "to provide continuous, integrated data on our open oceans, coastal waters, and Great Lakes in the formats and at rates and scales required to support the information needs of government, environmental managers, scientists, business, and public"
- "improve access to high-quality, integrated data"
- "enhance data products and decision-support tools"

■ **Two Objectives of NOAA's IT Strategy under NOAA Mission Support Goal:**

- "Create composite geospatial data products that span NOAA Line & Program office missions"
 - "Remove the physical barriers to geospatial data access within NOAA"
- (NOAA Office of CIO, 2008)



What is the purpose of nowCOAST?

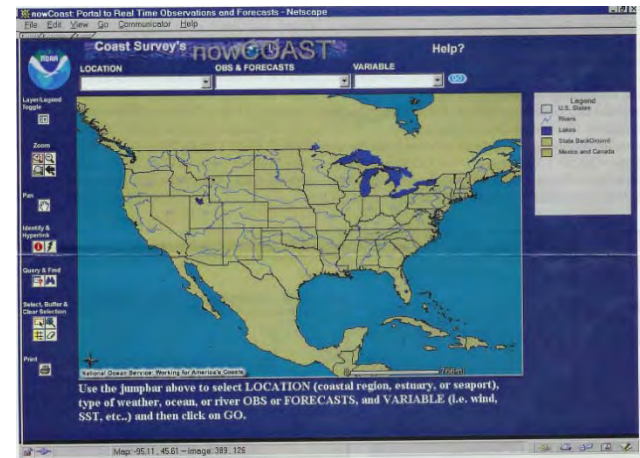


Initial:

- provide a one-stop web site to discover and display coastal environmental observations and NOAA forecast products for coastal U.S.
- response to internal CSDL requirements for coastal forecast model development

Present:

- provide coastal users with **situational awareness** of recent past, present and future (-24 hr to +7 days) environmental conditions in order to plan and respond to threatening coastal hazards for U.S.
- response to external requirements from NOAA and non-NOAA users and partners



nowCOAST Ver. 1

Available to Public - August 2002



nowCOAST Ver. 4.1

September 2008



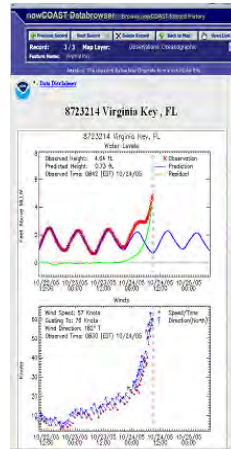
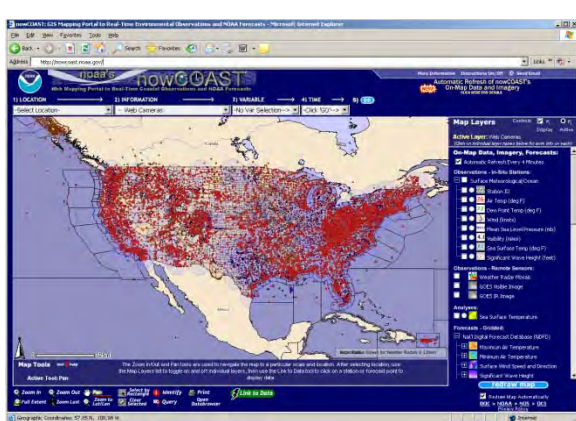
What types of data and information does nowCOAST provide to users?



Two Main Types

- **Geo-Referenced Hyperlinks (+15,000):**
 - Surface & Upper Air Observations
 - ocean, weather, river, air quality, water quality
 - NOAA Model Point Forecast Guidance
 - NOAA Text Forecasts & Discussions
 - NOAA Surface Forecasts

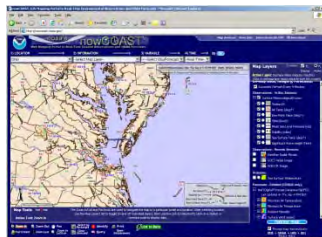
- **On-Map Data/Images/Forecasts**
 - Surface Weather/Ocean Observations
 - Weather Radar Mosaic
 - Analyses (e.g. SST)
 - Weather Warnings
 - Weather & Marine Weather Forecasts
(e.g. NWS' National Digital Forecast Database gridded predictions)



Weather Radar Reflectivity



NCEP Daily Global SST Analysis



Sfc Weather/Ocean Obs (NWS & MADIS)



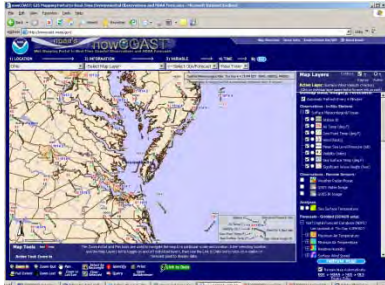
GOES Imagery



NDFD Sfc Wind Forecast



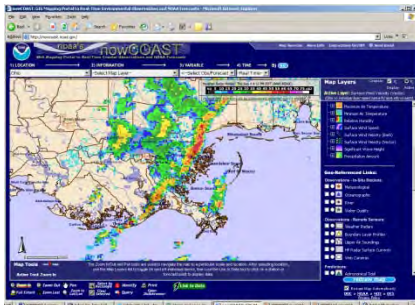
On-Map Observations, Warnings, and Gridded Forecasts



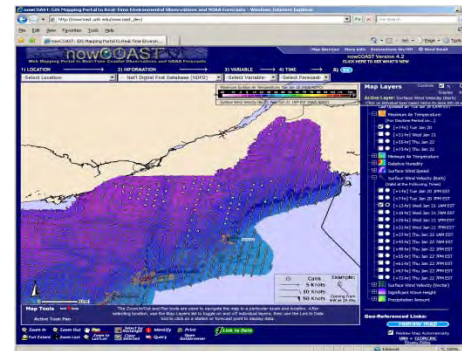
Sfc Weather/Ocean Obs (NWS & MADIS)



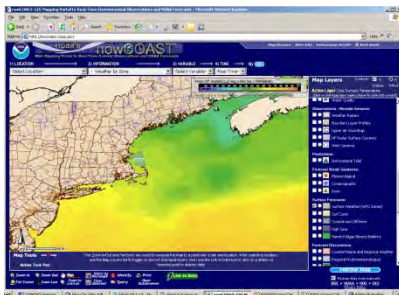
NWS Weather Warnings



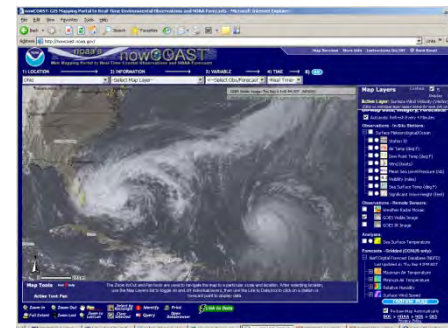
NWS Weather Radar Reflectivity



NDFD Sfc Wind and Temperature Forecast



NCEP Daily Global SST Analysis



NESDIS GOES Imagery



Hyperlinks to *Near Real-Time Observations*



Weather and Ocean Observations:

- National Weather Service:
 - NWS/FAA/DOD Airfield Observations (ASOS/AWOS)
 - RAWS (Remote Automated Weather)
 - COOP Climate Network
- National Climate Data Center
 - US Climate Reference Network (CRN)
- National Data Buoy Center:
 - Data Buoys
 - C-MAN Stations
- National Ocean Service:
 - PORTS
 - NWLON – Water Level
- USGS
 - NWIS River Stations

Many land mesonets & regional ocean observing systems:

- UMD's CBOS
- Texas A&M's TABS
- GoMOOS
- LISShore Network
- Rutger's LEO-15
- CORIE
- Caro-COOPS
- ICON

- LUMCON
- NEOCO
- NCCOOS
- PWSN
- SEAKEYS-CREWS
- USF COMPS
- TCOON
- WAVCIS
- GLERL Network
- SABSOON

River Observations:

- USGS NWIS River Stations
- NWS IFLOWS Stations

Water Quality Observations:

- EPA EMPACT
- USGS NWIS River Stations
- Maryland DNR

Air Quality Observations:

- EPA AirNOW

Weather Radars:

- NWS Doppler Radar Sites



Surface Currents:

- HF Radar networks from several universities

Web Cameras:

- Web camera installations from coastal areas

Upper Air Data:

- Radiosondes
- Wind Profilers

Record 2: Hyperlink (Name: VIRGINIA BEACH 64 NM East of Virginia Beach, VA, Observations) (Data) (Map) (History)

nowCOAST DataBrowser

Record: 2 / 3 Map Layer: Observations Oceanographic

Station ID Search:

Station List

Observations Record

Historical Data Search

NOAA Data

ARPA

CGI

DMIT

Station Status

Maintenance

Platform Status

Ship Observations

VOS Program

Ship Data Report

About NDBC

Important NDBC Web Site Changes

Use & Change is working, but occasionally requires the phone to ring six or seven rings before answering. We on the system to the historical archive. Sorry for the inconvenience.

Station 44014 - VIRGINIA BEACH 64 NM East of Virginia Beach, VA

Owned and maintained by National Data Buoy Center

3 meter Discus Buoy

DMIT payload

36.8° N 74.88° W (0° 30' 40" N 74° 50' 11" W)

Site elevation: 0 m level

Air temp height: 4 m above site elevation

Automotive height: 5 m above site elevation

Radiometer elevation: 0 m level

Sea temp depth: 0.5 m below site elevation

Water depth: 47.5 m

Watch circle radius: 1.25 yards



Hyperlinks to **NOAA Forecast Products**



NWS & NOS Text Forecasts:

- County Forecasts
- Surf Zone Forecasts
- Coastal and Offshore Marine Zone Forecasts
- High Seas Forecasts
- Harmful Algal Blooms Bulletins

NWS & NOS Forecast Model Point Guidance

- WaveWatch III
- Extra-Tropical Storm Surge
- Model Output Statistics (MOS)
- Estuarine/Great Lakes Forecast Models

NWS River Forecast Guidance:

- Advanced Hydrological Prediction Service (AHPS) River Forecasts

NWS Forecast Discussions:

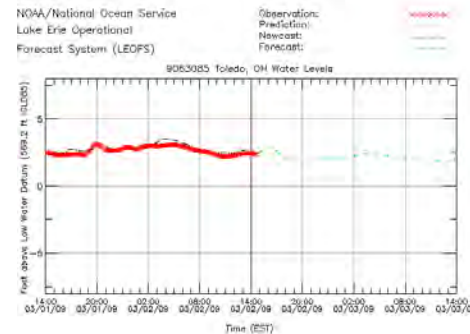
- Regional Coastal and Weather
- Regional Hydrometeorological
- Offshore Marine Weather

Astronomical Tidal Predictions:

- NOS Tidal Predictions



*NWS Text
Weather Forecast*



*NOS
Ocean/Lake
Model-Based
Water Level
Forecast
Guidance*

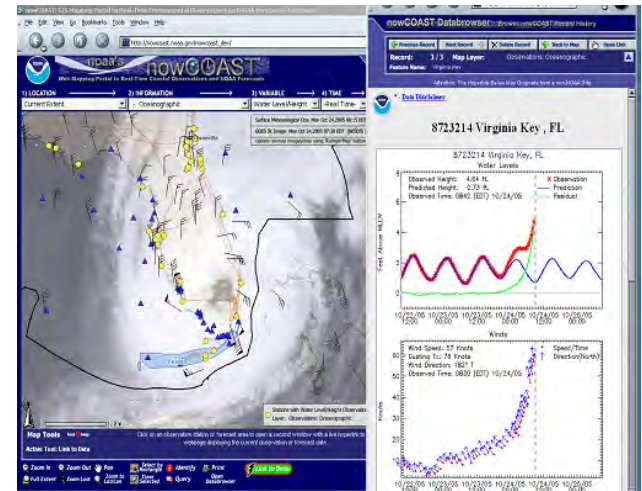


What type of functionality does nowCOAST provide to users?



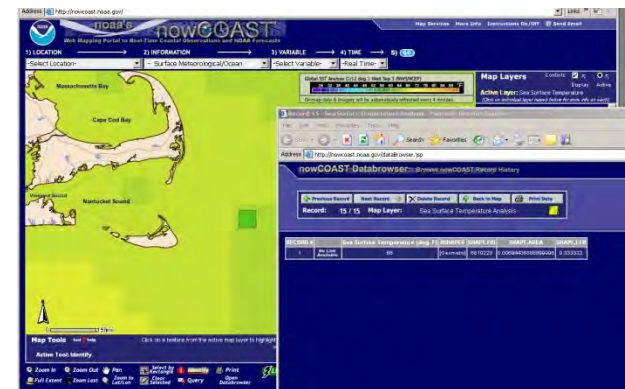
Via Web Browser

- Ability to
 - Control map with pull down menu or data layer list
 - Overlay different data layers
 - View simultaneously a map of present or future weather conditions and web site displaying time series of observations or forecasts for specific location
- Scale dependent rendering of map backgrounds (e.g. roads, urban areas, geographic names, etc..)
- Automatic refresh of web browser every 4 minutes to obtain latest data and images from nowCOAST (i.e. useful for EOCs)
- Ability to obtain numerical values from on-map image using nowCOAST Identify tool



Map Viewer

Databrowser



Obtain SST value at specific location on analysis



nowCOAST and Coastal and Inland Flood Observation and Warning (CI-FLOW) Project



CI-FLOW, a multi-agency project to evaluate and test new technologies to produce accurate and timely identification of inland and coastal floods in the Tar-Pamlico and Neuse river basins of coastal North Carolina.



<http://www.nssl.noaa.gov/projects/ciflow>

nowCOAST displaying NWS weather radar mosaic, GOES imagery, and hyperlink to NWS river forecast guidance in NC.



nowCOAST Demo





What type of functionality does nowCOAST provide to users? (continued)

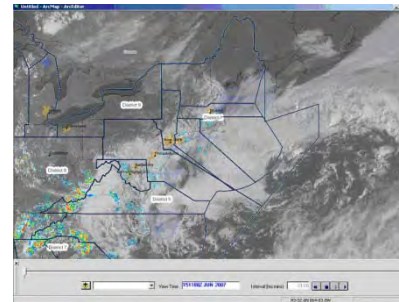


Via Map Services

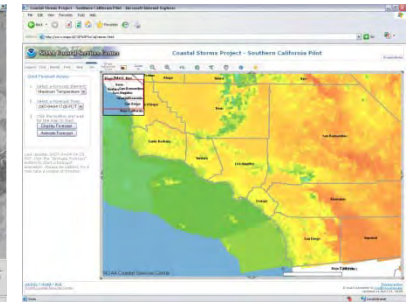
(ArcIMS Image Service, OGC WMS, OGC WFS)

- **Users able to**
 - **View nowCOAST layers in desktop Geographic Information Systems (ArcMAP, ArcExplorer), and other web mapping sites (ArcIMS, ArcGIS Server, MapServer)**
 - **Overlay nowCOAST layers with local data layers (e.g. critical infrastructure, roads, geospatial intelligence, etc..)**

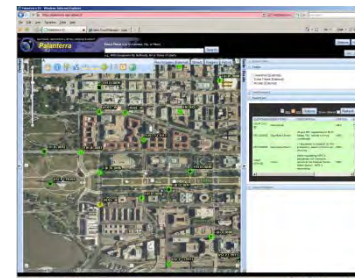
nowCOAST's data layers displayed on



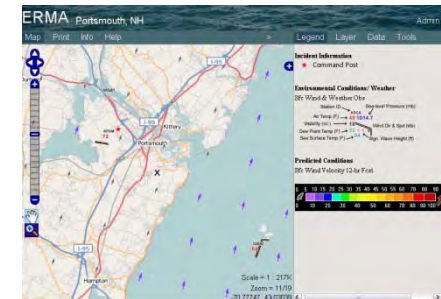
USGS Operational Desktop GIS-Based SAROPS (50 district offices)



NOS/CSC Web Mapping SiteS, Calf. Weather & Hazards Map Viewer



DOD/NGA Palanterra Web Mapping for Homeland Security/Emergency Management



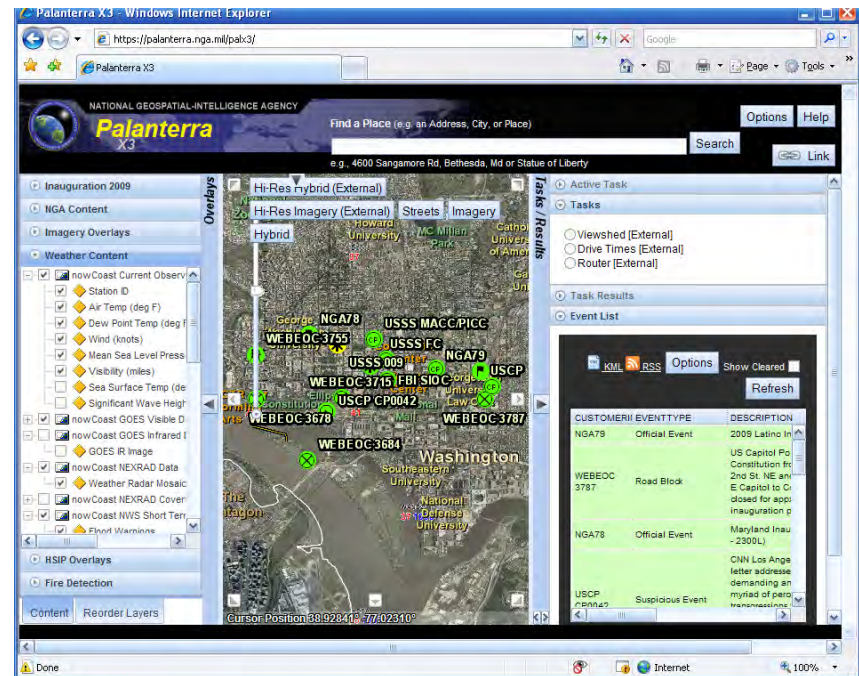
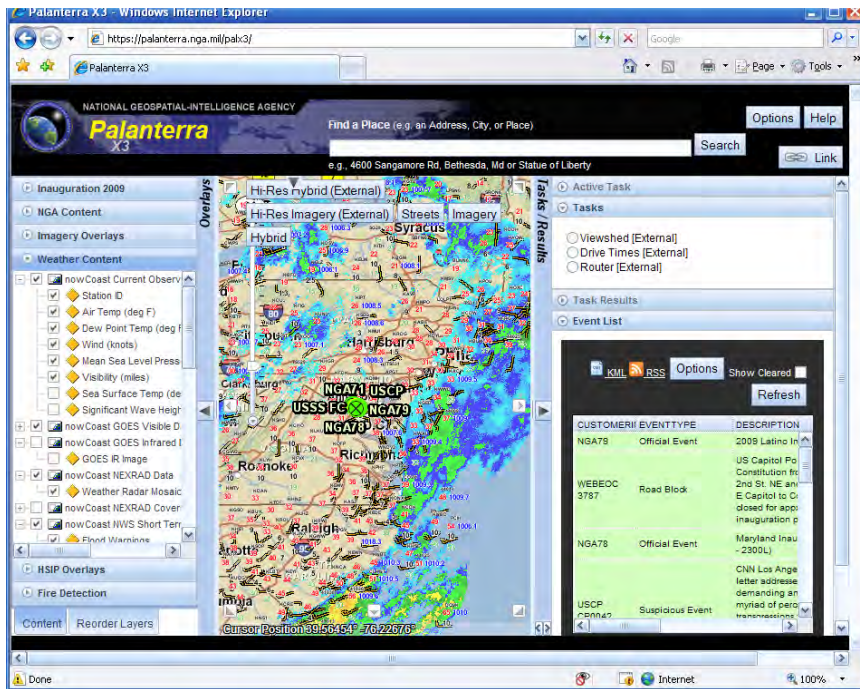
NOAA-UNH CRRC Environmental Response Management Application web mapping site for Portsmouth Harbor (NH/ME)



nowCOAST and Palanterra



- **NowCOAST provides near-real-time surface observations and NOAA gridded forecasts to DOD/National Geospatial-Intelligence Agency's Palanterra Web Mapping Portal**
 - Recent examples...2009 Presidential Inauguration and 2009 Super Bowl



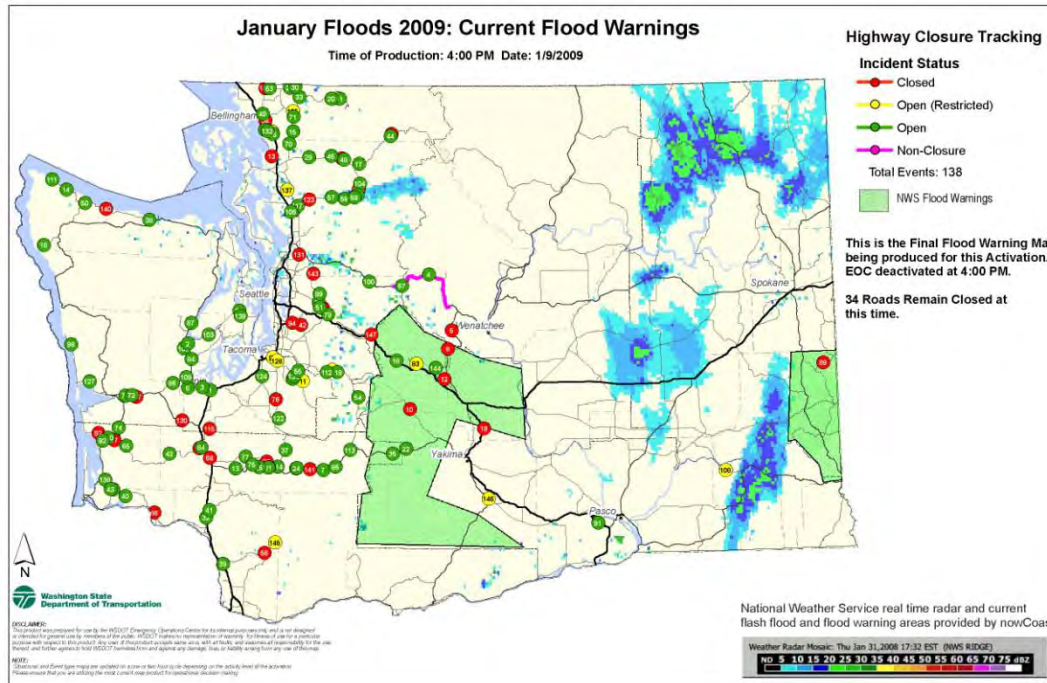
NWS weather radar mosaic and surface weather obs from NOAA's nowCOAST on NGA's Palanterra during Presidential Inauguration



nowCOAST and Washington State DOT



- WSDOT uses nowCOAST map service to display NWS short-duration warnings and weather radar mosaic to create briefing maps (e.g. January floods)



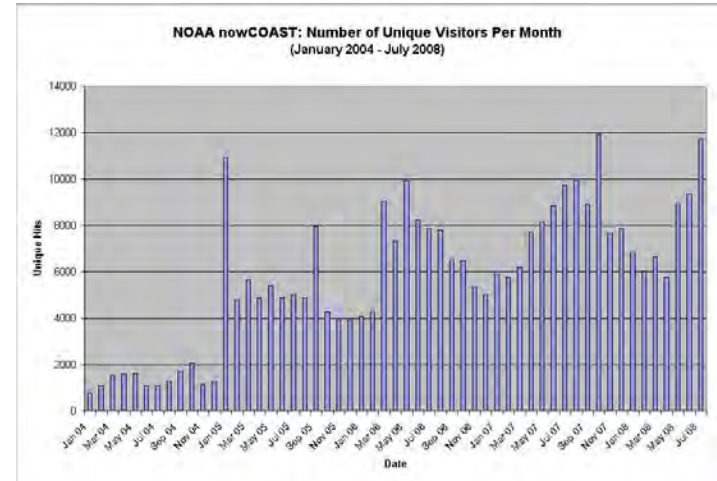
NWS weather radar mosaic and NWS weather warnings from NOAA's nowCOAST overlaid on WSDOT Highway Closures



Usage and User Types



- **Usage**
 - 6K to 12K users/month (unique IP addresses)
 - Greatest use during April – September
 - Used every day of the week (only 17% drop on weekend days)
 - Greatest usage on Wednesday – Friday
 - Accessed at all hours of day with greatest demand occurring between 6AM – 11PM ET



- **Types of Users** (based on emails)
 - Recreational & commercial mariners
 - NOAA
 - NGA, USCG, USGS, USAF, US Navy
 - State Agencies (DES, EMA, State Police)
 - Private sector
 - Public

August 2008:
- 54,509 unique IPs
- 139,924 visits
- Almost 1 million pages
- 7.7 million hits



User Comments



May 2007

The need for the data you provide coupled with the data my Department already has in-house will provide very useful visual information to the public as well as elected officials during and immediately after disastrous events. Any help you can provide will be greatly appreciated.

Tommy D.

Environmental Scientist

Remediation Services Division, Louisiana Dept. of Environmental Quality

August 2008

First off, thank you for making such a great service. I was the only GIS personnel on staff at Houston Transtar during the latest tropical storm event. This was the center attraction for our operations and debris management initiatives. I've been asked to integrate the nowcoast ArcIMS application into our ArcServer based applications and upon doing some test I've come across a few questions about the service.

Kevin C.

Senior GIS Programmer

Houston Transtar (TX)



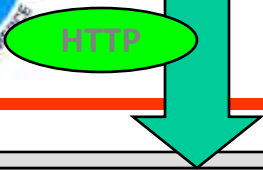
Plans and Requirements



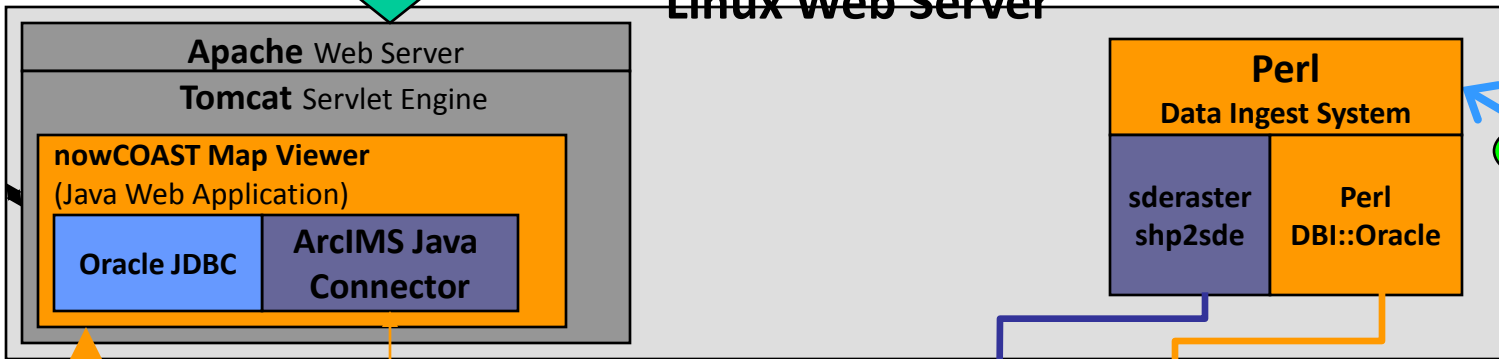
- **Plans**
 - **Transition of nowCOAST to 24 x 7 operational host facility to meet users' requirements for high reliability**
 - **Transition of nowCOAST from ArcIMS/SDE to ArcGIS Server and possibly using PostgreSQL/PostGIS instead of Oracle**



nowCOAST Server Configuration



Linux Web Server



NOAA FTP Servers

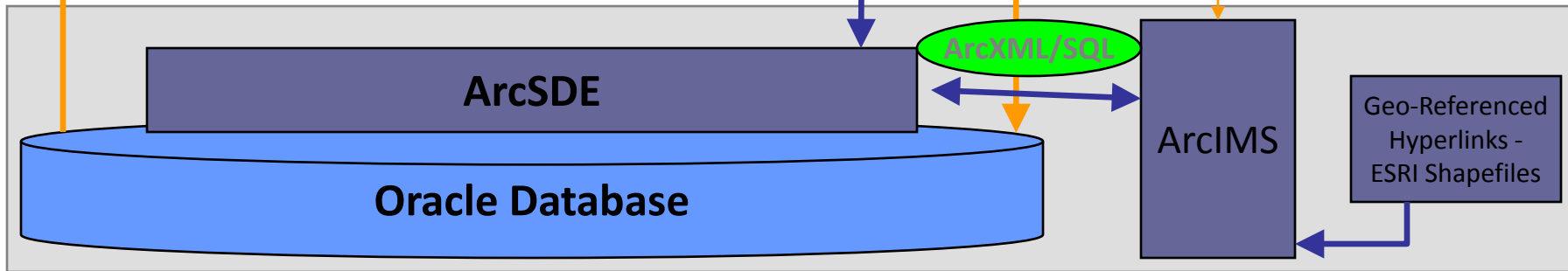
JDBC/SQL

ArcXML

TCP

SQL

Web/Database Server Communication Types:



Linux Database Server



Plans and Requirements



- **Plans**
 - Transition of nowCOAST from ArcIMS/SDE to ArcGIS Server and possibly using PostgreSQL/PostGIS instead of Oracle
 - Transition of nowCOAST to 24 x 7 operational host facility to meet users' requirements for high reliability
 - **Interoperability with other web mapping services (ArcGIS Server, OGC WMS/WFS, KML/KMZ) operated by NOAA, other federal agencies, and ROOAs.**



Plans and Requirements



- **Plans**
 - **Additional products on nowCOAST**
 - to meet requirements of *Coastal and Inland Flooding Observation and Warning Project (CI-FLOW)* and *ERMA* projects
 - to achieve goal of providing coastal users with situational awareness of coastal conditions from -72 hours to +7 days



Plans and Requirements

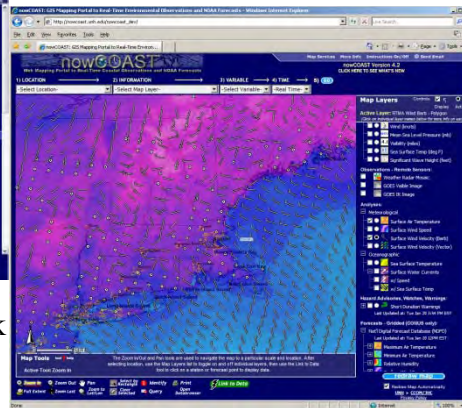


- Plans

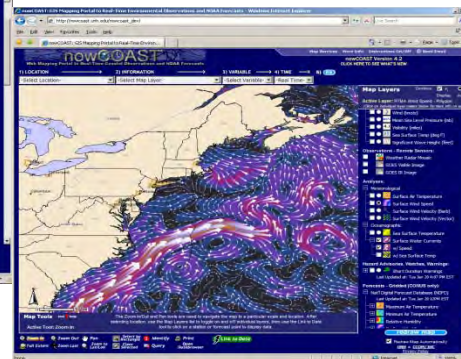
 - New products in next versions of nowCOAST for Spring/Summer



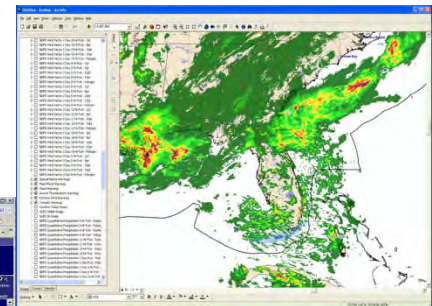
NWS/NHC Tropical Cyclone Track Forecast and Cone of Uncertainty



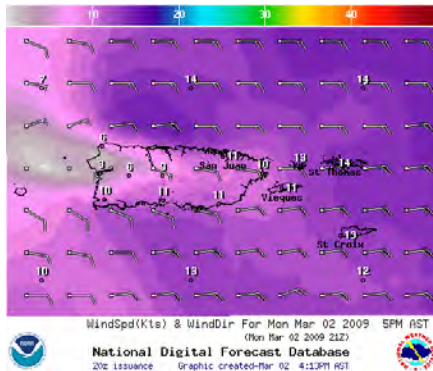
NCEP Real-Time Hourly Surface Weather Analyses (e.g. surface air temperatures, surface wind velocity)



NOS, NCEP, and/or Navy Model Forecast Guidance of Surface Water Currents using UNH CCOM/JHC Flow Visualization Technique



NOAA/NSSL QPE Analysis for CONUS (1hr, 3hr, 6hr, 12hr, & 24hr accumulations – updated hourly)



Display NDFD for PR, Guam, and HI



<http://nowcoast.noaa.gov>

- Acknowledgements:

- Funding

- NOAA ESDIM
 - NOAA HPCC
 - NOAA Coastal Storms Program – Southern California
 - NOAA-UNH Coastal Response Research Center's ERMA Project
 - NOAA/NSSL Coastal and Inland Flooding Observation and Warning (CI-FLOW) Project in NC
 - NOS Coast Survey Development Lab

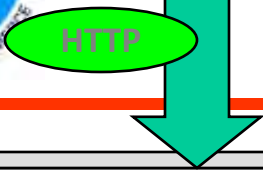
- Developers over the years (2000 to Present)

- Sarah Maxwell, Allison Thomson, Meredith Westington, Matt Kennedy, Micah Wengren, Mike Allard, and Jason Greenlaw, and Sree Dadisetty

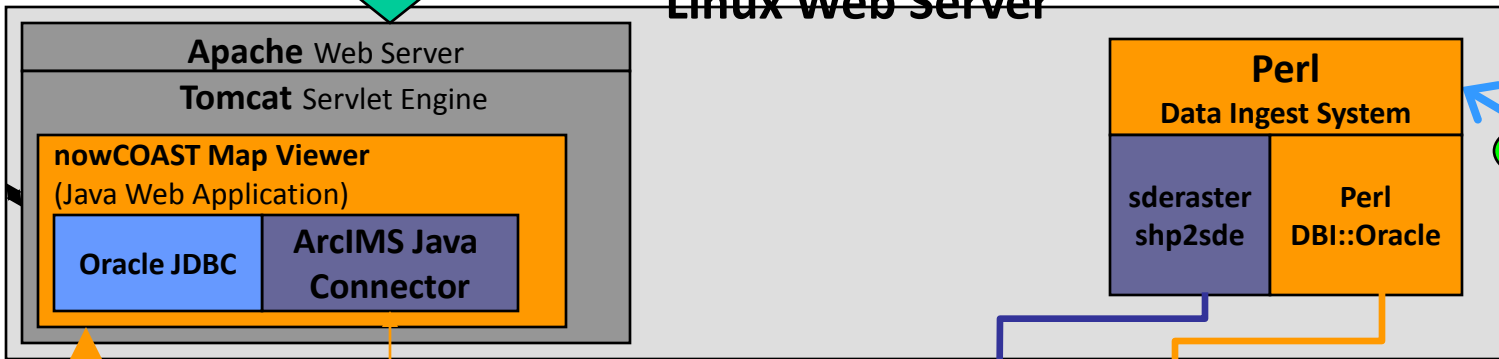
email: nowcoast.team@noaa.gov



nowCOAST Server Configuration



Linux Web Server



NOAA
FTP Servers

JDBC/SQL

ArcXML

TCP

SQL

Web/Database Server
Communication Types:

ArcXML/SQL

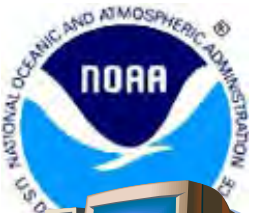
ArcSDE

Oracle Database

ArcIMS

Geo-Referenced
Hyperlinks -
ESRI Shapefiles

Linux Database Server



nowCOAST Proposed Configuration After Migration to ArcGIS Server

