

Monitoring coastal events and changes using satellite data and contextual information: **Towards a CEOS COAST application knowledge hub**

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Purpose: To serve as a web-based knowledge hub employing satellite observations, in situ measurements, and other multidisciplinary data with the vision to contribute to coastal awareness, safety, and restoration efforts.

CESS COAST Application Knowledge Hub

StoryMap About Regions T Links T 🖸 🛍 Album

NOAA Satellites Celebrate Earth Day ©NOAA NESDIS, April 22, 2022 Interactive legends × **Dashboard and Storyboard** 📥 Active layers Points in curated info Cstl Obs App Serv & Tools (COAST amaging Storms Curated information distraction-free map Coastal Events Station Data Legends & Info affir-Simpson Hurricane Wind Scale ? Sort 🔻 coastal events Filter UR GHRSST L4 NRT: NASA JPI Future projection 🔳 🝠 Damaging Storms 🛛 📃 📮 HABs = 32.00 °C Sea Surface Temperature station (RT:realtime, active last 45d; HS:historical) 5 Ivan, 2004 > 🔄 🖕 Water Qual RT 🔄 😤 Tsunameters RT 🔄 🚑 Std Met HS **Committee on Earth Observation Satellites** CEOS of Jeanne, 2004 > KENTUCKSY 互 Dennis, 2005 > **COAST** Coastal Observations, Applications, Services and Tools Contextual information 5 Emily, 2005 > TENNESSEE Hydrology Social + Land Ecology LandSea The CEOS COAST is a team of international satellite agency representatives focusing on high 🝯 Katrina, 2005 > Hydrology



The overall concept



Infographics

1. Satellite data in routine

- Sea Surf. Temp (SST), Ocean Color (OC), Sea Surf. Height (SSH), Sea Surf. Salinity (SSS), Sea Surface Wind (SSW).

- Backbone of moderate resolution data sets that provide high repeat spatial/temporal coverage
- High resolution (HR) data for deep dive; CEOS (L8/9; S2) w. potential for comm. imagery in the future, e.g., Planet

2. Curated information

Events spread (timeline). Associated with story maps and use of HR satellite images. Storms, oil spills, HABs, ecological Station data Standard met, water quality, Tsunameter, currents etc. Active and Historical (source: NOAA DBC, USGS)

7. Economic impact case studies

Contextual i Hydrology Social Land Seabed Ecology LandSea Model	information basin outlines, basin climate atlas, waterways, dams, reservoirs population density, vulnerability indicators (poverty etc.), human base digital elevation, land-use land-classification bathymetry seagrass, mangroves, salt marshes, other flora and fauna ecological coastal units (classification), shoreline NOAA Global Forecast System (GFS)				
Parameter t	rends trend (rate of change/time) maps and trend line-plots of ocean parameters (SST, OC, SSS, SSW)				
Future projections episodic extreme sea level events (scientific studies); mean sea level rise (IPCC/JPL/NOAA report)					
Analytics #	#1 through #5 interaction (data sci, ML). Trans- disciplinary/boundary. Integration of non-/satellite info. Alerts				

Application features

Map-controls and interactions

- zoom, pan

- raster (satellite and base maps)
- vector (events, contextual info) interactive pop-ups for all features - transparency, show value, legend
- coordinate ref sys (EPSG:4326)

export screen display.

session-storage albums permalink, social media share - mobile-screen compatible event story maps for quick review download links for active layers

Station data



Summary

The Satellite Oceanography and Climate Division (SOCD) of NOAA STAR is actively pursuing an effort to provide a knowledge base for coastal events and processes in an easy and less resource consuming webinterface.

We are conceptualizing the CEOS COAST Application Knowledge Hub (AKH) to enable simultaneous displaying of:

Scientific

- global and regional (Rol) focus change visualization

what-if scenario for projections

basic GIS operations

searchable events and deep dive

Technology

- opensource tools (Python, GDAL/OGR, Leaflet, Vector tiling for large data, *e.g.*, hydrobasins) client-side proc. architecture

CESS COAST	Appl	ication Knowled	dge Hub	
NUM CARDINALIS		DEL Model future projections	5 🗙	Off 🐼 👻
EAS TENNESSEE	Extreme Sea Level (ESL)	IPCC scenario Present RCP45 RCP85 Data: Nature	project to	Legends & Info
MISSISSIPPI ALABAMA GEORGIA	events	The projections are for extreme sea l caused buy episodic events. Flood e	levels (not mean) xtent is not shown.	4 +
ISTANA CARACTER AND CARACTER	Mean Sea	IPCC scenario	2050 V	-
R	Level (MSL) IPCC AR6	Total sealevel Glaciers Greenland Antarctica Land water storage	Show	
Gulf Of Mexico	Miami	Stereodynamic sealevel Vertical land motion Total sealevel Total rate (mm/yr)		?

Fig 2: Modeled future prediction component of **CEOS COAST AKH. The** application will leverage from existing scientific studies, and IPCC and NOAA reports to display future predictions for episodic and mean sea level changes in different climate pathways.

[a] satellite-based ocean parameters [b] social data, [c] shoreline characteristics, [d] seabed properties, [e] station measurements, [f] a set of base maps to provide context, [g] waterways, [h] elevation, and [i] a set of curated major coastal events that caused significant damage (storms, HABs, etc.).

Foreseen v1.0 release and demo/presentation: **Q1 2023**

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23rd International Science Team Meeting (GHRSST XXIII), Barcelona 27 June – 1 July 2022 and virtual; contact: prasanjit.dash@noaa.gov (https://orcid.org/0000-0002-8789-0506)