The Global Ocean Observing System

Session 6.2: Opportunities to engage with the satellite community

Dr Steven Ramage

14th GOOS Steering Committee meeting (SC-14)
19-21 February 2025 | Paris, France

GOOS and COAST-VC

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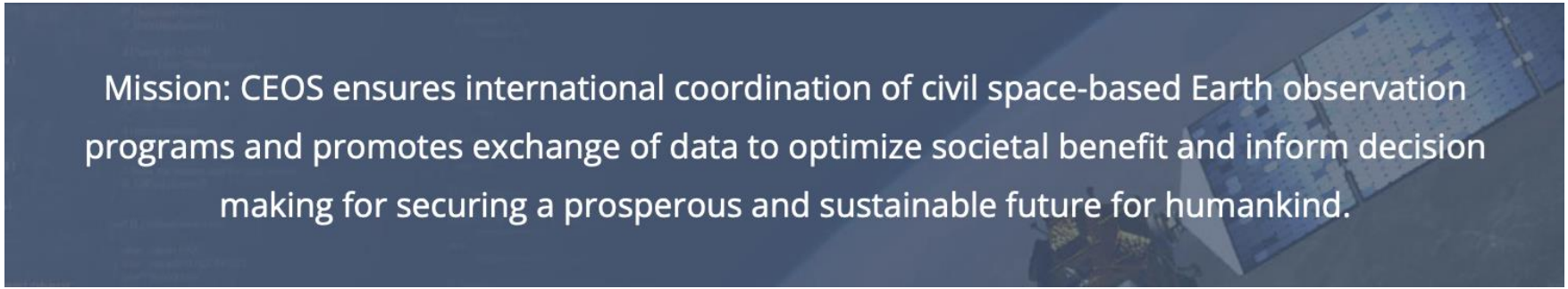
- Satellite data being featured more in the UN Ocean Decade and GOOS beyond references to in situ or buoy data.
  - This is communication and stakeholder engagement topic.
- COAST works on essential ocean variables, however CEOS more broadly works on essential biodiversity and climate variables
- It would also be good to make use of COAST-VC products
  - COAST-VC will run product tutorials - INSPIRE space in the EU Pavilion in Nice (OOSC and UNOC3) – possibly also ESA Living Planet Symposium.

CEOS Mission and Primary Objectives



Primary Objectives:

- To optimise global societal benefit from space-based Earth observation missions
- To serve as the focal point for sustained international coordination among space-based Earth observation programs, remote sensing experts, and activities
- To promote complementarity and compatibility for the benefit of data user communities worldwide

CEOS Long-term Priorities

Ensure that climate observation requirements identified by the Global Climate Observing System (GCOS) – and implications of the Paris Climate Agreement – are addressed.

Ensure, in the context of the Sendai Framework for Disaster Risk Reduction 2015-2030, that CEOS Agency data are made available in support of disaster risk reduction and that CEOS continues engagement with UN agencies and authorities.

Ensure that space-based Earth observation data and products are integral to the success of the next decade of the Group on Earth Observations (GEO), and that CEOS contributions to, and engagement in, GEO governance and leadership are further enhanced.

Systematically engage in and contribute to global efforts on the critical challenges that face humanity in support of the UN 2030 Agenda for Sustainable Development.

CEOS Membership

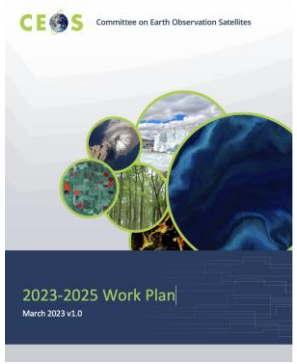
The Committee on Earth Observation Satellites (CEOS) was established in 1984 under aegis of the G7 Economic Summit of Industrial Nations Working Group on Growth, Technology, and Employment

Now in its fourth decade,
CEOS comprises

- **34 Members**
  (*Space Agencies*)
- **30 Associates**
  (*UN Agencies, Phase A programmes or supporting ground facility programmes*)

All of whom contribute to CEOS on a best efforts and voluntary basis.

CEOS Work Plan

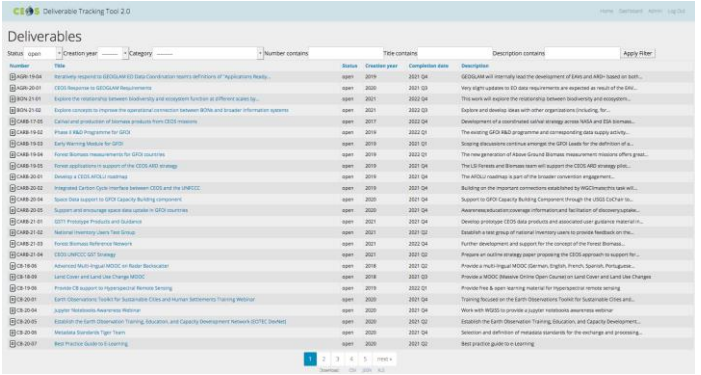


3-year plan re-evaluated and updated annually by all CEOS entities and presented for formal endorsement in Q1 of each calendar year.

CEOS undertakes rigorous work planning, monitoring and implementation of its activities, all of which ensure CEOS internal accountability and external credibility.

The Work Plan informs the spectrum of deliverables that CEOS membership agree to undertake.

CEOS deliverables are reconciled and tracked with a dedicated deliverable tracking tool. The CEOS 2023-2025 Work Plan defines 130 deliverables, e.g. GHG Roadmap, ARD Strategy, ocean activities including COAST-VC and other VCs…



http://deliverables.ceos.org/

CEOS Work Plan: Expected Outcomes

The expected outcomes of the CEOS Work Plan reflect ongoing and emerging priorities as characterised by internal decision making and external commitments (focusing on improved EO systems coordination and enhanced data access for key global programmes and initiatives) in these areas:

- CEOS and the ‘New Space’ agenda
- Climate Monitoring, Research, and Services
- Carbon Observations in support of Climate Science and Policy, plus UNFCCC Global Stocktake
- Data Quality, Data Discovery, Access, Preservation, Usability & Exploitation
- Capacity Building and Data Democracy
- Observations for Disasters, Land, Water, and Oceans
- Observations in support of the UN Sustainable Development Goals
- Advancement of the CEOS Virtual Constellations

CEOS Work Plan: COAST-VC 2024-2025

COAST-VC helps to integrate across multiple CEOS entities and domains, both thematic, e.g., disasters, SDGs, and capacity development, and technical, e.g., ocean, land and atmosphere, biodiversity, information systems and services, and calibration/validation.

COAST-VC is well-positioned to highlight the broader use of Earth observations for greater societal benefit within coastal zones (e.g., Blue Economy; SDG-14), and demonstrates a specific mechanism for CEOS to engage with external stakeholders, such as GOOS.

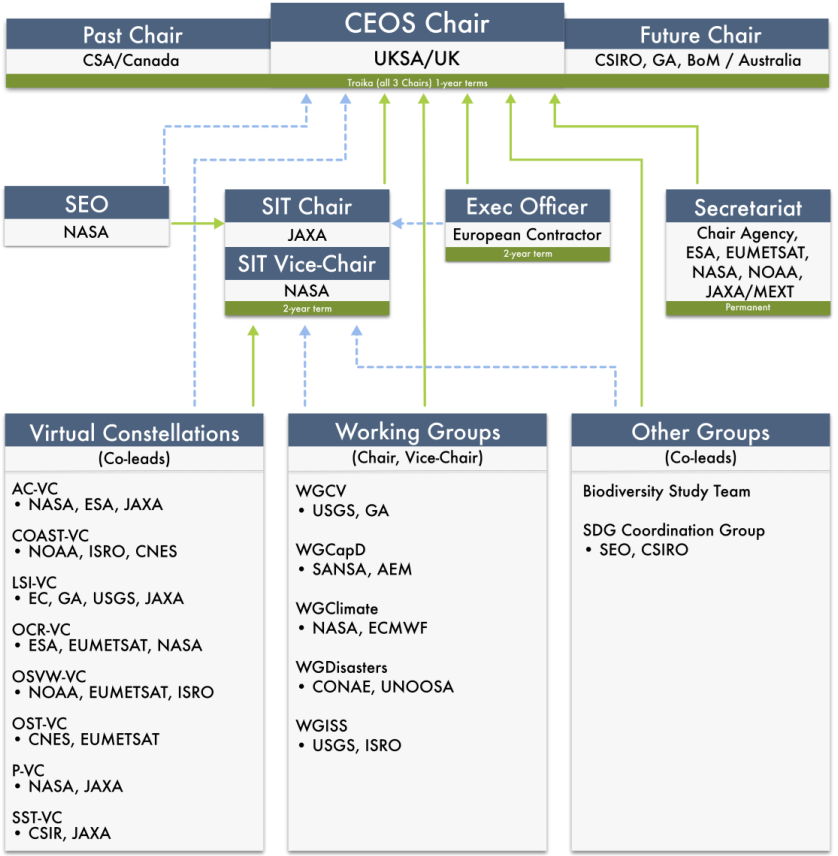
CNES agreed to become the third co-lead for COAST, joining ISRO and NOAA who have committed to serve through 2025.

New Products in the Blue Carbon thematic area and Arctic Pilot regions are expected (contingent on funding availability).

Collaboration with CEOS virtual constellations working on ocean topics.

CEOS Organisational Structure

This organogram depicts the CEOS organisational structure, including the paths by which each CEOS entity reports to leadership.



CEOS Plenaries

Plenary	Year	Venue	Host		Plenary	Year	Venue	Host
1st	1984	Washington DC, USA	NOAA		20th	2006	Buenos Aires, Argentina	CONAE
2nd	1986	Frascati, Italy	ESA		21st	2007	Kona, Hawaii, USA	USGS
3rd	1988	Ottawa, Canada	CSA		22nd	2008	George, South Africa	CSIR
4th	1990	Sao Jose dos Campos, Brazil	INPE		23rd	2009	Phuket, Thailand	GISTDA
5th	1991	Washington DC, USA	NASA/NOAA		24th	2010	Rio de Janeiro, Brazil	INPE
6th	1992	London, UK	BNSC		25th	2011	Lucca, Italy	ASI
7th	1993	Tsukuba, Japan	MEXT/NASDA		26th	2012	Bangalore, India	ISRO
8th	1994	Berlin, Germany	DARA		27th	2013	Montreal, Canada	CSA
9th	1995	Montreal, Canada	CSA		28th	2014	Trömso, Norway	EUMETSAT
10th	1996	Canberra, Australia	CSIRO		29th	2015	Kyoto, Japan	JAXA
11th	1997	Toulouse, France	CNES		30th	2016	Brisbane, Australia	CSIRO
12th	1998	Bangalore, India	ISRO		31st	2017	Rapid City, USA	USGS
13th	1999	Stockholm, Sweden	EUMETSAT		32nd	2018	Brussels, Belgium	EC
14th	2000	Rio de Janeiro, Brazil	INPE		33rd	2019	Hanoi, Vietnam	VAST/VNSC
15th	2001	Kyoto, Japan	MEXT/NASDA		34th	2020	Virtual	ISRO
16th	2002	Frascati, Italy	ESA		35th	2021	Virtual	NASA
17th	2003	Colorado Springs, USA	NOAA		36th	2022	Biarritz, France	CNES
18th	2004	Beijing, China	NRSCC		37th	2023	Chiang Rai, Thailand	GISTDA
19th	2005	London, UK	BNSC		38th	2024	Montreal, Canada	CSA

Introduction to COAST: Coastal Observations, Applications, Services, and Tools

Merrie Beth Neely
Paul Di Giacomo

CEOS
Committee on
Earth Observation Satellites

Coastal Observations, Applications, Services & Tools

What is CEOS? **Committee on Earth Observation Satellites**

What is CEOS COAST-Virtual Constellation? **A Coastal Focused Team**

- **Use Earth observation data (satellite + in situ) to tackle coastal problems affecting society - coverage | frequency | resolution**
- **Engage with regional coastal stakeholders**
  - Endorsed as a Contribution to the UN Ocean Decade

How might CEOS COAST help you?

- **Leverage global satellite data for high impact issues affecting YOUR community.**
- **Co-design coastal information products to solve YOUR information needs.**
- **Advance products and features YOU want and will be easy for you to use**

Partnerships

Satellite data / imaging

Satellite data/imaging processing capabilities

Expertise in satellite algorithm development

Analytical tools/capabilities

Local knowledge/ groundtruthing ability

In situ data, existing models

Understanding of local needs/applications

Analytical tools/capabilities

Image courtesy from Social Zoom Factor

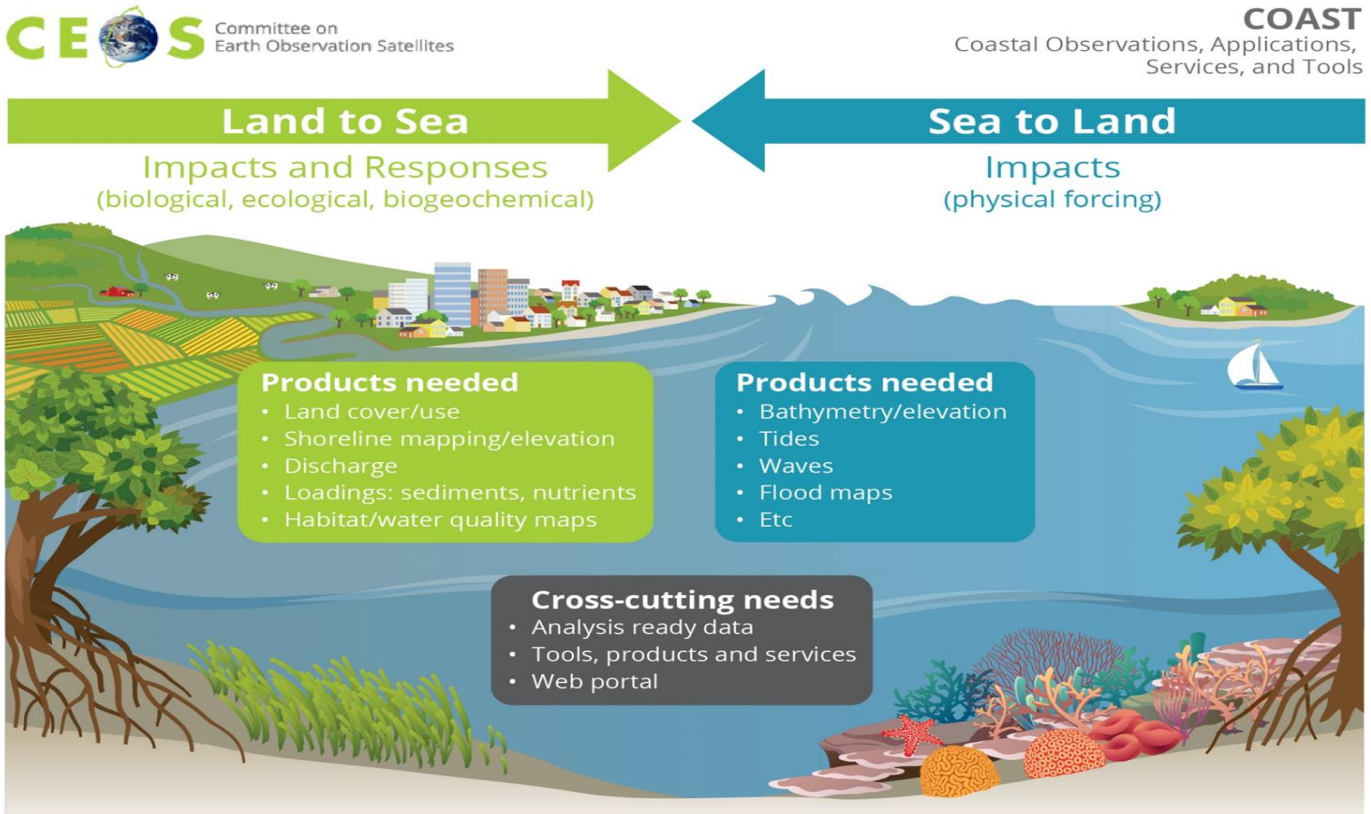
Pilot Projects

Identified two projects to develop coastal products, services and tools

Themes:

- Shoreline mapping
- Bathymetry/
- Flooding

- Turbidity & Sediment Loading
- Coastal Eutrophication
- Coastal Blue Carbon

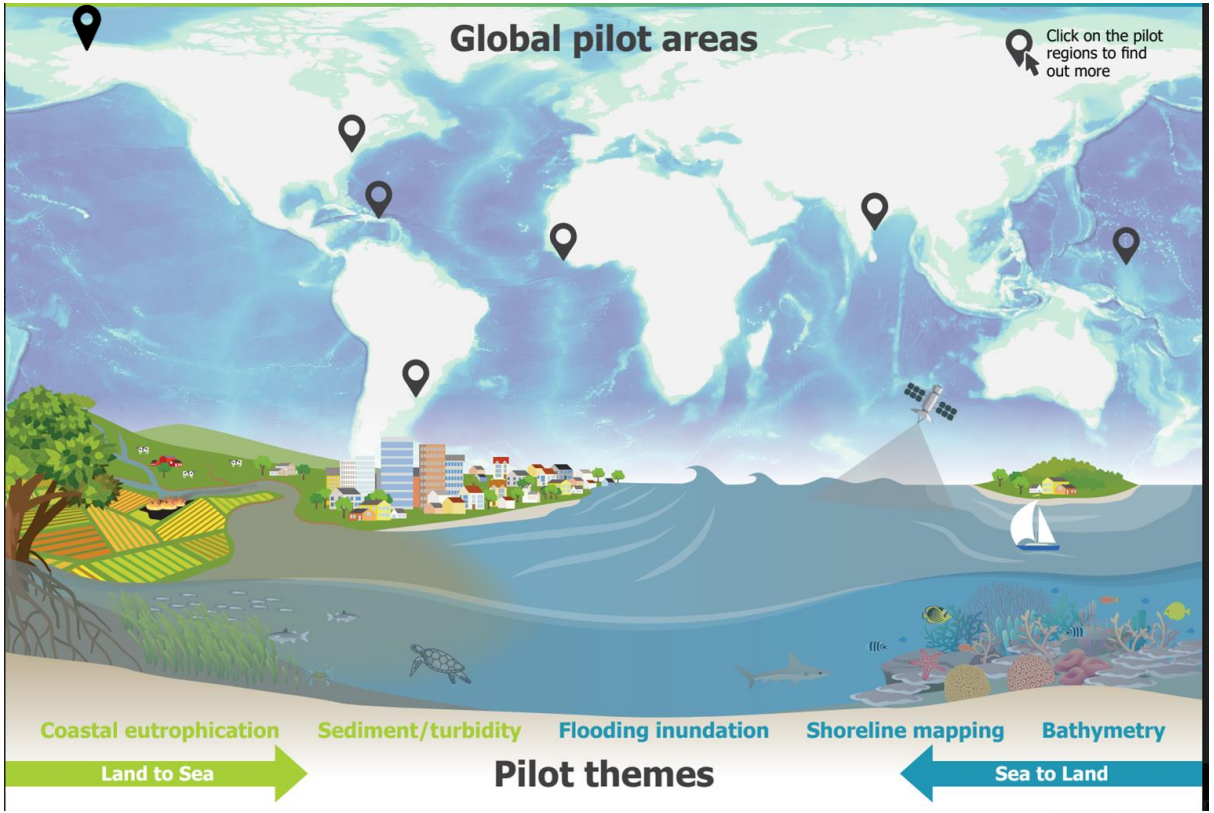


Pilot Project Locations

Continental:
Chesapeake Bay (USA)
Odisha/Bay of Bengal
West Coast of Africa
Rio de la Plata region
(Latin America)

Small Island Nations:
Caribbean & Pacific

Arctic Regions:
Bering Sea & Alaska/Canada



Why Satellite Data?

- With information equity as our lens:
  - How to fill the temporal/spatial gaps of in situ data and leverage models?
  - How do we grow understanding of satellite-based applications?
  - How do we scale up projects and methods that put satellite data & information into the hands of more people?

Why CoDesign?

- **Build something useful and user-friendly**
- Unique coastal satellite data products, **low barrier of entry** skillwise
- **One-stop access to various data** types, including in situ data (cal/val) YOU can supply!
- **Enhanced access to trusted data sources**
- **Free and open source** products enables customization by anyone
- Regional Pilots enable **product testing for scalability**

TRAINING? OOSC and Living Planet Symposium June 2025

CEOS COAST DATA NEEDS

- Shoreline mapping/coastal elevation
  - island elevations
  - Shore line validation data
  - Flood maps/Flood extent data
  - Bathymetry data
  - Coastal elevation & Intertidal Mapping -
    - Optical EO data, validation (GPS, LiDAR, in-situ)
- Precipitation temporal & spatial
  - antecedent moisture conditions (soil moisture)
- Digital Elevation Models
- River Discharge/Dam location & specs
- Land Use /Cover datasets
- Water Temperature
- Salinity - river discharge/mixing models/Density gradients - plume dispersal (i.e. settling velocity)
- Tidal Data - altimetry, winds
- Wave Data - statistics from Altimeters & buoys
  - significant wave height/direction/periodicity
  - wave spectra data
  - Wave refraction nearshore
- Ecosystem Status/Change
  - Habitat maps
  - coral health data
  - SAV classification
  - mangrove classification & health
  - coastal sediment maps - deposition & rate of accumulation
- Eutrophication Indicators (in situ data)
  - Turbidity/Sediment data & loadings datasets
    - Point source discharges (volume & conc.)
  - Nutrient loadings datasets
  - water quality maps
  - Water color maps (airborne or in situ)

NOAA Flood / Coastal Inundation Mapping Development Products

- **VIIRS Flood Detection - US** (3 products)
  - *NWS NRT; NWS daily composite; NWS 5-day composite*
- **VIIRS Flood Detection - Global** (3 products)
  - *Global NRT; Global Daily composite; Global 5-day composite*
- **Synthetic Aperture Radar (SAR)** (1 product)
  - *(Sentinel 1, RadarSat Constellation Mission (RCM), RadarSat 2, ALOS 4 (2023), and NISAR (2023)*
- **ABI US Flood Detection Products** (2 products)
  - *Hourly Composite; Daily Composite*
- **Blended Flood Detection - VIIRS/ABI and VIIRS/SAR** (2 products)
- **Downscaled VIIRS and Blended VIIRS/SAR** (2 Products)

Shoreline Mapping

Australian Government
Geoscience Australia

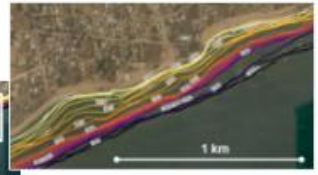
CEOS

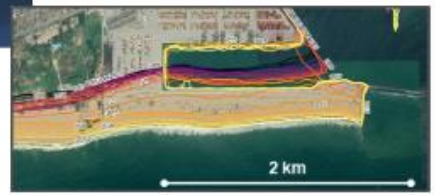
Digital Earth AFRICA

Point of Sangomar, Senegal

Digital Earth Africa Coastlines Launched at the GEO Blue Planet Symposium October 2022

Project commenced as a CEOS COAST initiative to take the learnings from the Digital Earth Australia Coastlines project across to DE Africa





maps.digitalearth.africa

https://www.digitalearthafrica.org/platform-resources/services/coastlines

Intertidal Elevation

Our first product to incorporate Landsat (USGS) and Sentinel-2 (ESA) data into the same derived product

Annual elevation maps of the Intertidal zone at 10m resolution

Annual exposure maps to underpin ecological and migratory species applications

Uncertainty metrics to enable the data to be integrated into other elevation and bathymetry products with confidence

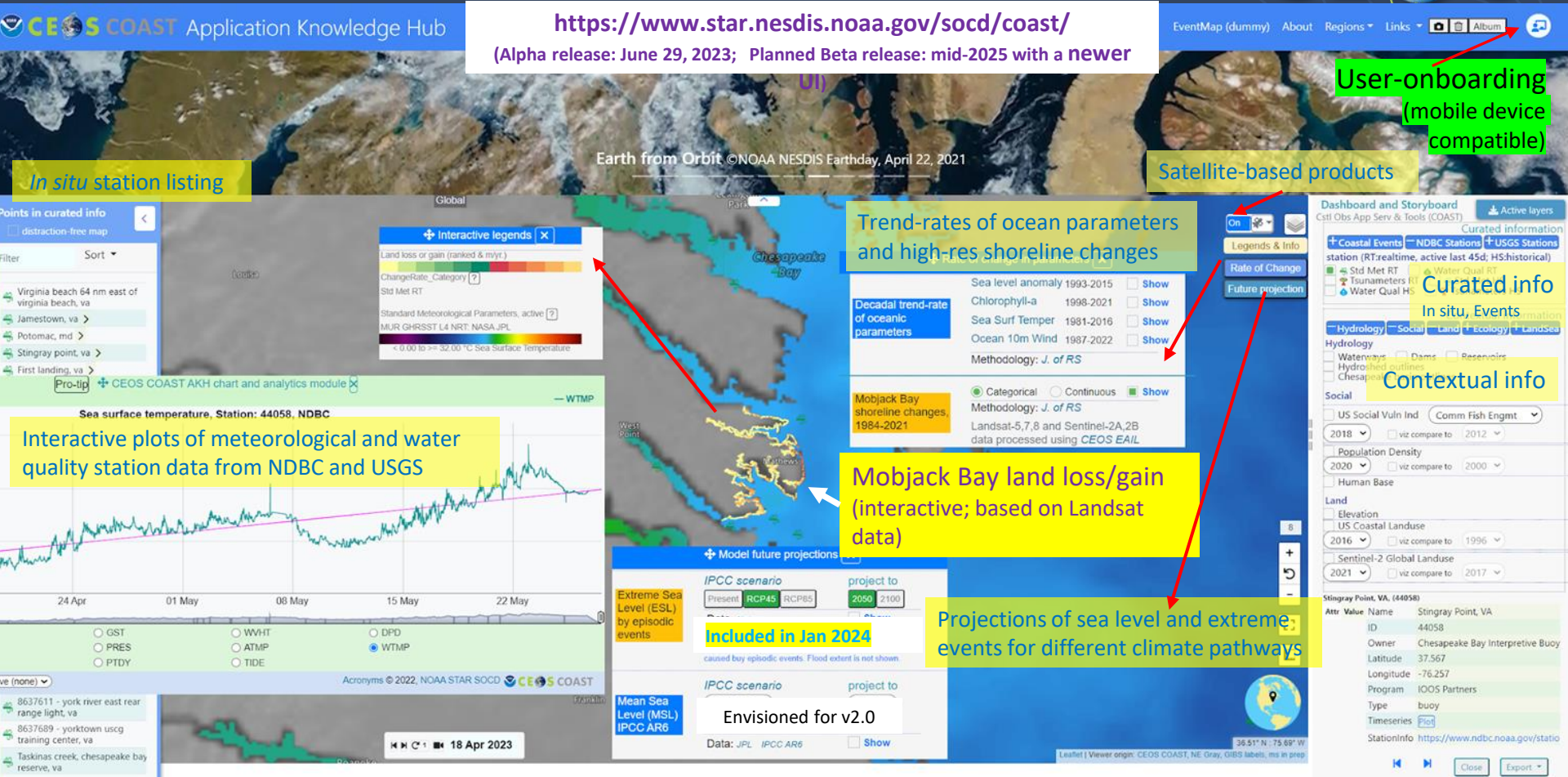
https://knowledge.dea.ga.gov.au/data/product/dea-intertidal/

Knowledge Hub Demo

Data → Information → Knowledge

https://www.star.nesdis.noaa.gov/socd/coast/

(Alpha release: June 29, 2023; Planned Beta release: mid-2025 with a newer UI)



In situ station listing

Satellite-based products

User-onboarding (mobile device compatible)

Trend-rates of ocean parameters and high-res shoreline changes

Curated info

In situ, Events

Contextual info

Interactive plots of meteorological and water quality station data from NDBC and USGS

Mobjack Bay land loss/gain (interactive; based on Landsat data)

Projections of sea level and extreme events for different climate pathways

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The Global Ocean Observing System

Thank you

goosocean.org

unesco Intergovernmental Oceanographic Commission

WORLD METEOROLOGICAL ORGANIZATION

UN environment programme

International Science Council