

# Coastal Observations, Applications, Services and Tools – Virtual Constellation (COAST-VC)

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**Work with CEOS COAST:**  
Using Earth Observation to Investigate Coastal Issues

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Committee on Earth Observation Satellites

**Global pilot areas**

Click on the pilot regions to find out more

**Pilot themes**

- Coastal eutrophication
- Sediment/turbidity
- Flooding inundation
- Shoreline mapping
- Bathymetry

Land to Sea (green arrow pointing right)

Sea to Land (blue arrow pointing left)

The graphic features a world map with several location pins indicating pilot areas. Below the map is a cross-sectional illustration of a coastal environment, showing a river flowing from a rural landscape with fields and trees into a coastal town, and then into the ocean. The ocean side shows a coral reef, a shark, and a sailboat. A satellite is shown orbiting the Earth, with a beam of light directed at the coastal area.

## Glossary/Acronyms

AHT – Ad Hoc Team

AKH – Application Knowledge Hub

ARD – Analysis Ready Data

Cal/Val – Calibration and Validation activities

CARE – CARE (Collective Benefit, Authority to Control, Responsibility, and Ethics) Principles for Indigenous Data Governance

**COAST – Coastal Observations, Applications, Services and Tools**

CEOS – Committee on Earth Observation Satellites

CGMS – Coordination Group for Meteorological Satellites

CNES – Centre National d'Études Spatiales

CSIRO – Commonwealth Scientific and Industrial Research Organisation (Australia)

EAL – Earth Analytics Laboratory

ESA – European Space Agency

EUMETSAT – European Organisation for the Exploitation of Meteorological Satellites

FAIR – Findable, Accessible, Interoperable, and Reusable

GA – Geoscience Australia

GEO – Group on Earth Observation

GEO Blue Planet – GEO Initiative linking coastal and ocean information and society

GEO AquaWatch – GEO's Water Quality Initiative

GOOS – Global Ocean Observing System

IOC – Intergovernmental Oceanographic Commission

ISRO – Indian Space Research Organisation

JAXA – Japan Aerospace Exploration Agency

LSI-VC – Land Surface Imaging Virtual Constellation (CEOS)

NASA – National Aeronautics and Space Administration (United States)

NOAA – National Oceanic and Atmospheric Administration (United States)

OCR-VC – CEOS Ocean Colour Radiometry Virtual Constellation

OST-VC – CEOS Ocean Surface Topography Virtual Constellation

OSVW-VC – CEOS Ocean Surface Vector Wind Virtual Constellation

SDG-CG – CEOS Sustainable Development Goals Coordination Group (SDG CG)

SDG – Sustainable Development Goal

SEO – CEOS Systems Engineering Office

SIT – Strategic Implementation Team

SST-VC – CEOS Sea Surface Temperature Virtual Constellation

USGS – United States Geological Survey

VC – Virtual Constellation (CEOS)

WG – Working Group

WGCapD – CEOS Working Group on Capacity Building and Data Democracy

WGClimate – Joint CEOS-CGMS Working Group on Climate

WGCV – CEOS Working Group on Calibration and Validation

WGDisasters – CEOS Working Group on Disasters

WGISS – CEOS Working Group on Information Systems and Services

WMO – World Meteorological Organization

# Transitioning CEOS COAST into a Virtual Constellation

## What is CEOS COAST?

Timely, accurate, and sustained observations of coastal zones are essential to address existing and emerging societal issues, needs, and concerns. These include but are not limited to coastal resiliency, flood forecasting, sea level rise, disaster recovery to habitat monitoring, eutrophication, water quality, challenges of continued economic and population growth in coastal regions, and assessment of climate change impacts.

The Committee on Earth Observation Satellites (CEOS) formed the COAST (Coastal Observations, Applications, Services and Tools) Ad Hoc Team (AHT) to address these and other challenges and risks in the coastal zone, toward providing new and improved scientific/technical capabilities and building capacity for a more robust end-to-end value chain (observations to data to products to information to actionable knowledge) in support of coastal stakeholders and global sustainable development.

With robust calibration/validation and fit-for-purpose application of data and derived products, space-based remote sensing is an effective tool to help understand, monitor, and forecast changing conditions in coastal zones globally, particularly across the land-sea interface. Focusing on this user-driven value chain, COAST has facilitated targeted work and engagement on priority coastal observations and applications within CEOS, helping to bridge land and aquatic observations within CEOS.

*COAST crosscuts the land-sea boundary and works across other CEOS Virtual Constellations (VCs) and Working Groups (WGs), developing, transitioning, integrating, and delivering diverse data sets and derived products. COAST has steadily and successfully advanced the development of new products and improved the quality and range of existing products in coastal regions.*

## COAST Ad Hoc Team: Brief History

In 2019, CEOS established the COAST effort as a study team. The 2020 CEOS Plenary subsequently approved COAST as an AHT, and the effort continued to develop in 2021. The 2022 CEOS Plenary extended its remit as an AHT until the 2023 Plenary, at which point, COAST will have reached the maximum duration allowed for an AHT in the *CEOS Governance and Processes Document* (ref. page 7).

Since 2020, ISRO and NOAA have maintained the co-lead roles in COAST. The effort has since been augmented by Geoscience Australia (GA) and European Space Agency (ESA) through active product development and Pilot Region capacity building. COAST is further amplified through the remote sensing support and scientific expertise from numerous CEOS agencies and seeks to transition to a VC to continue this unique work.

A more detailed history of the COAST study team and Ad Hoc team is [available](#) on the CEOS COAST website.

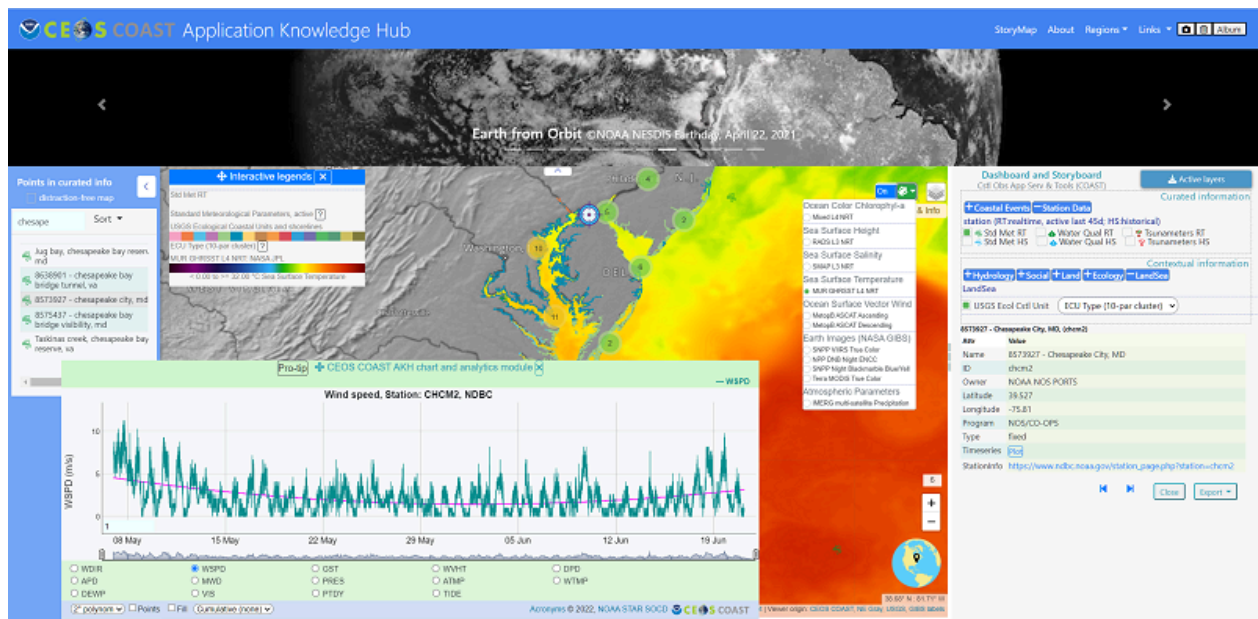
The COAST AHT has prepared this Full Proposal (this section of the document), an Implementation Plan, and associated Terms of Reference in accordance with the approval of the Initial Proposal to transition to a VC made at the 2023 CEOS Plenary.

## COAST Ad Hoc Team: Products and Outcomes

To date, CEOS Members and Associates have coordinated in a synergistic manner to better serve user needs in dynamic, highly productive, and populated coastal regions. As outlined in the [recommended 2022 COAST AHT extension support document](#), COAST has steadily and successfully advanced the development of new products and improved the quality and range of existing products in coastal regions.

COAST leveraged deliverables from the CEOS [Working Group on Capacity Building and Data Democracy](#) (WGCapD) in its pioneering implementation of stakeholder co-design and use of the CEOS Analytics Lab (formerly known as the Earth Analytics Interoperability Laboratory or EAIL) as a product development space. Significantly, in 2023, COAST publicly released an [Application Knowledge Hub](#) where users can readily access COAST products and relevant open-source data and information in COAST Pilot Regions.

Access to COAST open-source products and other curated datasets and information is available through an Application Knowledge Hub (AKH) that debuted in early 2023. This online tool enables simultaneous display of COAST's satellite-based products, available social data and indicators, and in situ measurements on base maps. Major coastal events with significant socio-economic, ecological and physical impacts (storms, harmful algal blooms, etc.) are interactively viewable. Storyboards will provide event maps for selected case studies of coastal events in collaboration with the COAST community.



User's view of the COAST Application Knowledge Hub.

COAST has also selected 5 geographic pilot regions around the world to demonstrate these products, where potential societal impact is high: Bay of Bengal, Chesapeake Bay, Río de La Plata Estuary, the western coast of Africa, and Pacific and Caribbean Small Island Nations. CEOS COAST is engaging identified stakeholders in the co-design and testing of these products to provide the information they need in the ways they want it delivered and with a lowered barrier to data access.

COAST has been consistently praised for its work, including by CEOS Agencies during a [COAST Products Demonstration side meeting](#) at the October 2023 Strategic Implementation Team (SIT) Technical Workshop. A recording of the side meeting and presentations of both the Pilot Regions and other

product demonstrations is [available online](#). In addition, a full list of [current activities](#), and [documents and resources](#) is available on the CEOS COAST website.

## **COAST-VC: Bringing Value to CEOS and the Earth Observation Community**

Since 2020, COAST has engaged CEOS Members and Associates (referred to collectively in this document as CEOS Agencies) on agency priorities and attendant stakeholder needs, likewise partnering with relevant local stakeholder groups as part of extensive co-design and co-development activities led by the COAST team.

Tapping into the wealth of existing and planned Earth observations (likewise complementary socio-economic observations) held by diverse international partners, assembling the supporting technical infrastructure to incorporate diverse data types into development and operations, practicing standard calibration-validation protocols, and adopting GEO Data Sharing Principles and FAIR (Findable, Accessible, Interoperable, and Reusable) data principles, are crucial for the success of COAST-VC activities in possible collaborations with other CEOS VCs and WGs. For example, COAST leveraged deliverables from WGCapD in its pioneering implementation of stakeholder co-design and use of the CEOS Analytics Lab as a product development space.

COAST further recognizes the effort required to collaborate with and complement the work of other CEOS VCs and WGs, especially: Ocean Colour Radiometry (OCR) VC; Sea Surface Temperature (SST) VC; Ocean Surface Topography (OST) VC; Ocean Surface Vector Wind (OSVW) VC; the Working Group on Calibration and Validation (WGCV), the Sustainable Development Goals Coordination Group (SDG CG), particularly with its contributions to SDG 14 (coastal eutrophication), and the joint CEOS-CGMS Working Group on Climate (WGClimate). COAST will help realize “downstream” synergistic benefits from integrating across these parameter focused VCs (i.e., a trans-parameter, ecosystem-based approach) by working trans-boundary across the land-sea interface (i.e., coupling ocean VCs with LSI-VC, etc.), and perhaps most importantly, by facilitating a trans-disciplinary approach, i.e., bridging the environmental and social sciences to realize valuable societal outcomes and benefits for the coastal zone.

COAST leadership has proactively engaged with the VC and WG leads, to avoid overlap in activities and explore opportunities for COAST-VC for collaboration where interests and capacities align. Opportunities from these discussions have been incorporated into the Implementation Plan and potential deliverables through a proposed schedule of activities with other CEOS WGs and VCs.

As a CEOS Virtual Constellation, COAST will leverage and exploit new mission technology and science for prototype development. Forthcoming efforts will focus on high-latitude regions, Blue Carbon, biodiversity, ecosystem and societal impacts (including nature-based solutions for climate change), as well as extending current products to other regions.

Engaging social scientists on a routine basis as part of COAST community interactions and inclusion of social science datasets in the COAST Application Knowledge Hub have emerged as priority needs for successful co-design, development, and production efforts with diverse coastal stakeholders. COAST members will continue to engage and inform new users, especially by expanding Pilot Regions, co-designing with key stakeholders, and introducing innovative products for research and operational applications.

COAST expects to continue internal planning, coordination and execution of technical activities with the four CEOS Ocean VCs, the Land Surface Imaging VC (LSI-VC), the Working Group on Information Systems and Services (WGISS), the WGCapD, WGClimate, WGCV, and with external stakeholders, including the

Group on Earth Observations (GEO) and the Global Ocean Observing System (GOOS), among others.

Engaging other observing system partners and stakeholders to ensure user needs are successfully met by the COAST Pilot Projects is crucial, particularly for other data and information providers such as IOC/GOOS and World Meteorological Organization (WMO). These partners will provide essential field measurements to complement the multi-sensor satellite data.

Likewise, these observations have been complemented by modeling, data assimilation, and the forecasting/prediction capabilities afforded by key partners such as OceanPredict, including the [CoastPredict Initiative](#) that evolved from OceanPredict.

Further, COAST is also an endorsed contribution to the UN Decade of Ocean Science for Sustainable Development (2021-2030). CEOS COAST expects co-design and training with stakeholders to continue throughout the UN Ocean Decade. COAST may find benefit in collaboration with other Ocean Decade activities (e.g., CoastPredict).

## **Confirmed COAST-VC Co-Lead and Member Agencies**

The diverse COAST membership has leveraged observing systems and broader technological capacity that already exist within CEOS, and supported future planning for space-based platforms and new and improved measurement capabilities. To date, COAST has membership from across CEOS Agencies, and existing VCs and WGs. The full list of current COAST leadership and membership is available in the Terms of Reference included in this submission package.

## **Conclusion**

COAST seeks to transition to a Virtual Constellation to continue advancing the successful and robust work conducted as an Ad Hoc Team. Under the VC umbrella, COAST would address the need for developing new products for the Land-Ocean interface using remote sensing observations that are not being addressed in other fora. While its activities complement some of the work of existing VCs and WGs, the COAST-VC can also support user engagement in priority science areas. COAST is CEOS's IOC-endorsed Contribution to the UN Ocean Decade. It is connected to GEO Work Programme activities such as GEO Blue Planet, and it advances CEOS priorities including the 2024 CEOS Chair focus on biodiversity.