



Committee on Earth Observation Satellites

# CEOS Ocean Variables Enabling Research and Applications for GEO (*COVERAGE*):

*An Initiative Proposal to CEOS*

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NASA

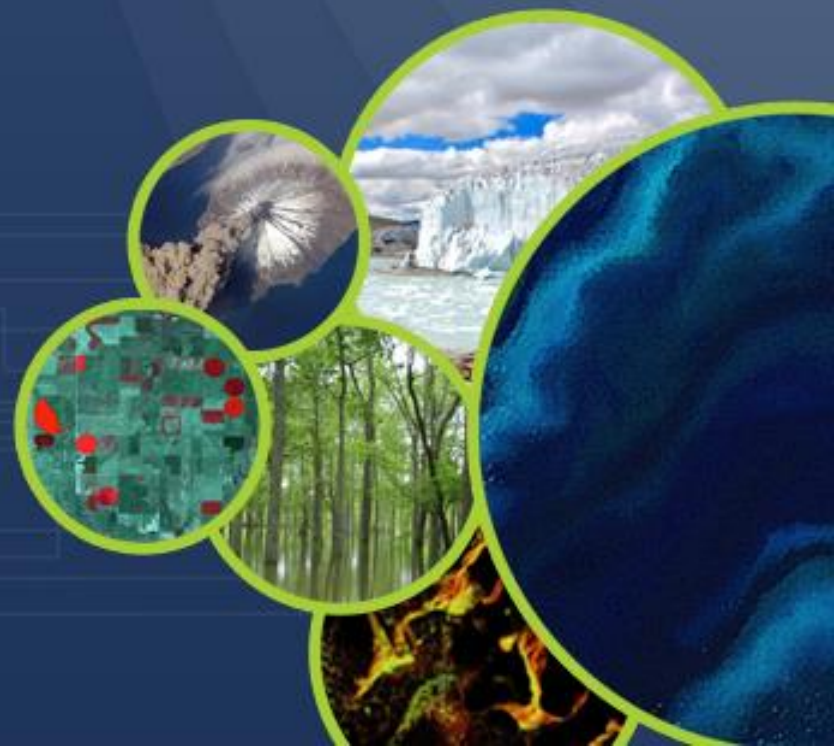
SIT Tech Workshop 2016 Agenda Item # 29

CEOS Strategic Implementation Team Tech

Workshop

Oxford, UK

14<sup>th</sup>-15<sup>th</sup> September 2016





## COVERAGE is a response to:

- Need for improved, unified access to data from the 4 CEOS ocean virtual constellations (VCs) for GEO (SSH, SST, Color, OVW, *but also potentially SSS and Ocean Currents*)
- Importance of improved access/integration of multivariate, multi-platform ocean observations, thematically organized and in a common frame (including those from the Ocean VCs), available in near real-time where possible in support of GEO-Blue Planet initiative in particular.
- Conceived in a CEOS Strategic Implementation Team meeting in Pasadena in 2013.

## Proposed COVERAGE initiative for 2017:

- Provide a coherent, focal point activity and mechanism promoting the advancement of the aforementioned CEOS programmatic objectives.
- We invite the interest and participation of other CEOS agencies in this effort.
- Collaborative Opportunities: data sharing, technical exchange, capacity building

## Stakeholder Beneficiaries:

- Internal: Ocean VCs, WGISS
- External: GEO-Blue Planet, UN/IOC GOOS



## CEOS Goals <sup>1</sup>:

- Achieve better integration across the full range of Earth observations (space-based->in situ)
- Facilitate open & easy access to CEOS agency data for maximal societal benefit CEOS via improved discovery, interoperability, coordinated data access portals in specific topical areas, promoting use of open-source tools

## CEOS 2016-18 Work Plan<sup>2</sup>:

### 3.6. Capacity Building, Data Access, Availability and Quality:

II. Future Data Architectures: Address data access/usage obstacles & “Big Data” challenge

### 3.8 Support to Other Key Stakeholder Initiatives:

Commitment to priority actions identified by GEO Blue Planet Initiative:

- CEOS ocean VCs role in sustainment/continuation/harmonization of essential ocean variables
- develop experimental & operational coordinated, multi-sensor ocean products & services to explore optimal utility of developing a collocated, readily accessible dataset package with fit-for-purpose latency for applied, industrial, and research uses.

**GEO-Blue Planet goals<sup>3</sup>:** advance/exploit synergies among observational programs for sustained development & use of ocean and coastal observations for the benefit of society via:

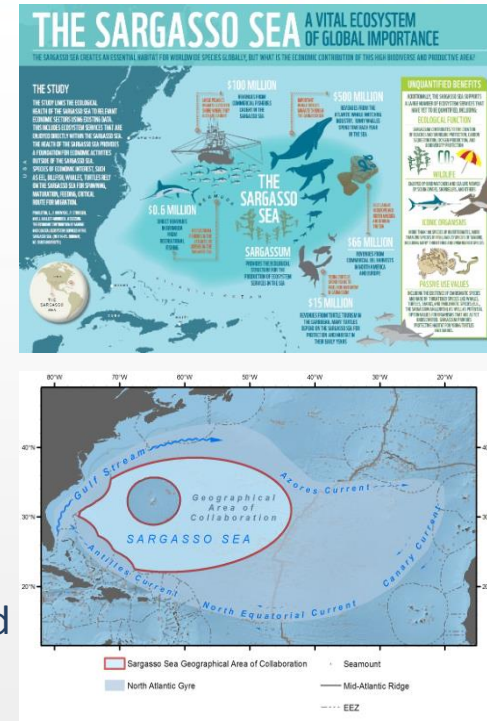
- 1) increased integration of and access to *in situ* and remote sensing ocean observation data
- 2) the conception, promotion and end-to-end ocean information services



## CEOS Ocean Variables Enabling Research and Applications for GEO

- Build a project to bring together 4 CEOS Ocean Constellations, enable broad international participation, enable broad use of ocean satellite data, and utilize emerging data management and cloud capabilities.
- COVERAGE aims to assemble and present satellite and *in situ* ocean data in a compelling web-based format to demonstrate the value added of multivariate ocean data integration is support of science, applications, and public engagement.
- Develop a data rich platform (utilizing both established standards/protocols but also emerging data management and cloud technologies where necessary) for integrated ocean data delivery and access:
  - multi-parameter observations, easily discoverable and usable, thematically organized, available in near real-time, collocated to a common grid and including climatologies.
  - complemented by a set of value-added data services available via the COVERAGE portal including: an advanced Web-based visualization interface, subsetting/extraction, data collocation/matchup and other relevant on demand processing capabilities (eg. trend analysis, anomaly detection, dynamic processing/regridding).
  - establish technical interfaces and data delivery and aggregation pipelines.
- Vision: International collaboration via CEOS and GEO-Blue Planet engagement for global extension of COVERAGE involving implementation based on a priority-set of use cases. Spinoff is the a global product with near-real-time capabilities.

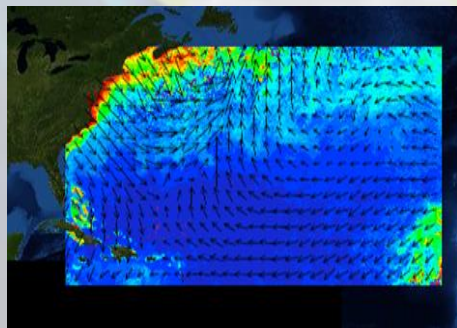




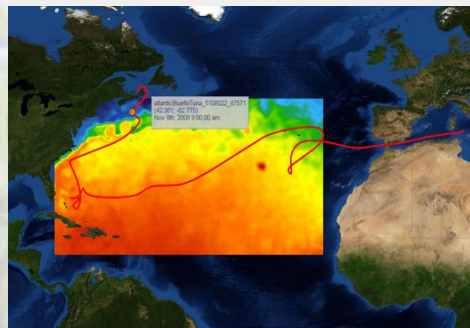
- Use the Sargasso Sea and NASA as a regional pilot application for Sargasso Sea Commission to ensure that the development is user-driven and effective.
- Collaboration with the Sargasso Sea Commission ([SSC](#))
  - SSC: Network of international partners led by the Government of Bermuda, including UK, USA and intergovernmental agencies (IUCN, ISA) aiming to advance the recognition of the importance of the Sargasso Sea and promote its protection in accordance with the Law of the Sea Convention
  - Periodic interactions with SSC over a 1.5 year period to define the scope and contents of a pilot COVERAGE application for the Sargasso region and undertake a joint workshop to present the prototype to stakeholders
- Value of COVERAGE for SSC
  - Provide access to data for **data poor** high seas area
  - Illuminate the relationship between oceanographic conditions and uses of the Sargasso Sea
  - Identify ocean use by marine species and humans & highlight areas of conflicting usage
  - Tool supporting future instruments resulting from ongoing UN negotiation of a [new marine biodiversity treaty for areas beyond national jurisdiction](#) (ABNJ) as an extension to [UNCLOS](#).



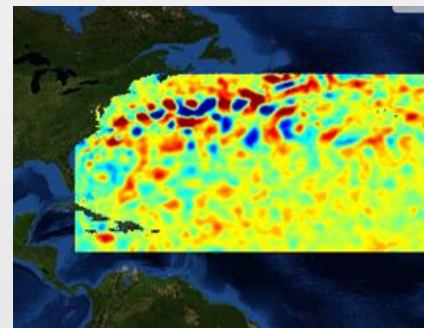
- Leverages JPL web-based data visualization platform and cloud data integration technologies
- Incorporates range of co-located satellite ocean products on ~25km daily grids including: SST, SST anomaly & gradients, CHL-A, SSS, Surface Currents & Wind Speed, Sea level anomaly, SST gradients
- Diverse *in situ* datasets including: SPURS1 field campaign data, AIS vessel tracking data, fish telemetry data (Bluefin tunas, Mako & Tiger sharks, Eels)
- Spatial domain: Sargasso Sea defined as 15N to 45N and 80W to 20W
- Enables overlay of all parameters and the visual exploration of inter-relationships between layers
- Animation allows examination of dynamic evolution of structure and relationships between variables



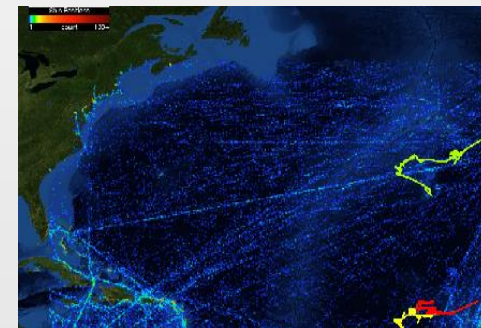
MODIS CHL-A +  
ASCAT Ocean Surface Winds



Bluefin tuna archival tag  
track + Reynolds SST



AVISO Sea level  
anomaly



AIS Vessel Positions  
Heat map + Tracks

# COVERAGE-Sargasso Workshop & UN Presentation

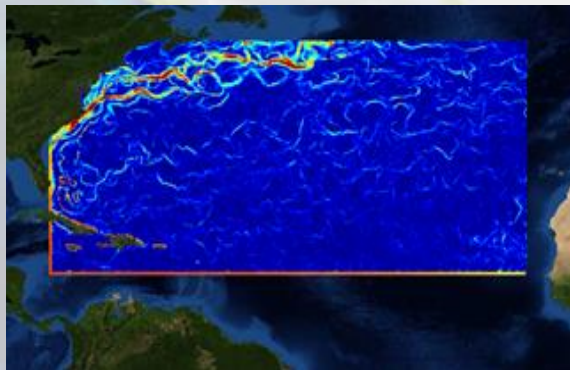


- NASA-funded workshop hosted by SSC, Key West, FL., March 20-22, 2016  
<http://www.sargassoseacommission.org/about-our-work/workshops/nasa-sargasso-sea-workshop>
- 36 participants including SSC Secretariat, Commissioners & scientists from agencies including NASA, NOAA, academia, industry with expertise in the Sargasso region
- Objectives:
  - Expose the COVERAGE pilot project to peer review and comment.
  - Examine utility of COVERAGE for resolving relationships between ocean conditions and uses of the Sargasso Sea.
  - Identify high-priority applications for COVERAGE to enable “use cases” for future implementation
- Key Outcomes:
  - Workshop [report/recommendations](#) and presentation materials
  - ***Overwhelming consensus on usefulness of COVERAGE as an accessible data integration platform***
  - Priority thematic areas for the Sargasso region: “Ships & Sargassum”, “Fisheries, Organisms & their Environment”, “Regional early warning system for Sargassum inundation events”
  - Inclusion of additional datasets & strategic partnerships (UN-IOC/OBIS)
  - Need for automated data pipelines for (near real-time) data delivery
  - Detailed feedback from participants on tool functionality
- COVERAGE-SS presented at an event at UN-HQ on 31 Aug.2016 in the margins of the [Preparatory Committee meeting](#) (PREPCOM2) for ABNJ treaty negotiations

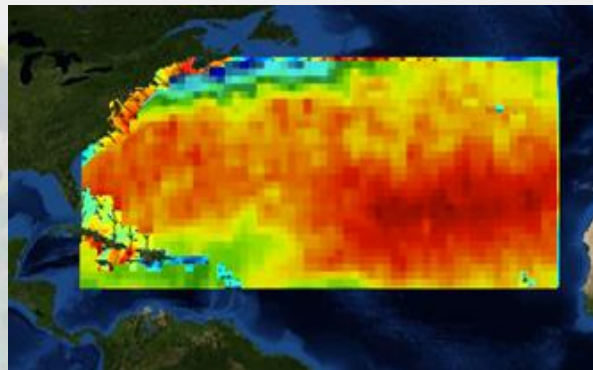




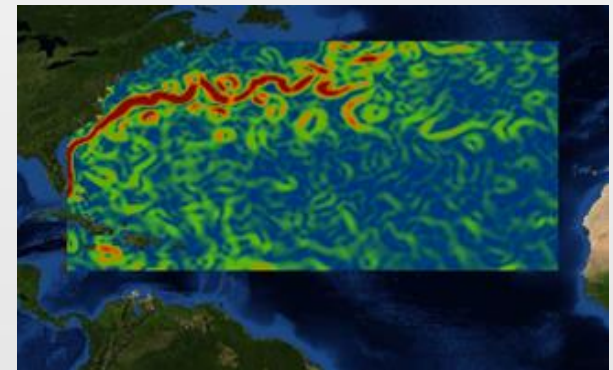
- COVERAGE Initiative Paper submission & presentation CEOS-SIT Oxford meeting (*completed*)
- Circulation of paper within CEOS WGs and VCs to confirm support and in-principle agency contributions to the proposed activity.
- Possible updated proposal paper incorporating broader CEOS agency feedback and contributions circulated to Principals at least 2 weeks prior to Plenary (mid-Oct. 2016)
- Presentation and discussion at 30<sup>th</sup> CEOS Plenary, Brisbane, Oct-Nov, 2016
- COVERAGE envisaged as a 3-year R&D commitment within CEOS towards an “operational” capability by the end of 2020.



MUR-SST Gradients



Aquarius Sea Surface Salinity



OSCAR Surface Currents





## COVERAGE Demonstration Prototype for the Sargasso Sea

