COVERAGE
CEOS Ocean Variables Enabling Research and Applications for GEO

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3rd Blue Planet Symposium
College Park, MD 5/31-6/2/2017

CEOS Ocean Variables Enabling Research and Applications for GEO

- Initiated in a CEOS – SIT meeting in Pasadena in 2013.

- 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.

- Tech. Platform for integrated ocean data access: "fusion environment" for multi-parameter observations, available in near-real-time, collocated to a common grid, thematically organized, including climatologies, and allow for inclusion of emerging *in situ* data sets (e.g. AIS ship tracking, animal tagging, etc.).

- Build a project to bring together 4 CEOS Ocean Constellations (SST, Ocean Color, Ocean Vector Winds, Ocean Surface Topography), enable broad international participation, enable widespread use of ocean satellite data, and utilize emerging data management and cloud capabilities.

- Proven Application Value: International collaboration via Sargasso Sea Commission over last couple years provided a useful pilot of COVERAGE involving non-real-time implementation and a regional use case.

COVERAGE Overview (2/2)

CEOS Ocean Variables Enabling Research and Applications for GEO

Develop a data rich platform for delivery and access to integrated, analysis ready ocean data:

- Multi-parameter observations, easily discoverable and usable, thematically organized, available in near real-time (where possible), 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
  - data discovery
  - subsetting/extraction
  - data collocation/matchup
  - other potentially relevant on demand processing capabilities (eg. trend analysis, anomaly detection, dynamic regridding).

- Establish technical interfaces and data delivery and aggregation pipelines

- Community & Use-Case Driven

Leverage relevant existing/emerging technologies (several open source) and a successful project implementation model (eg. NASA Sea Level Change Portal)

Sargasso Sea Pilot Activity
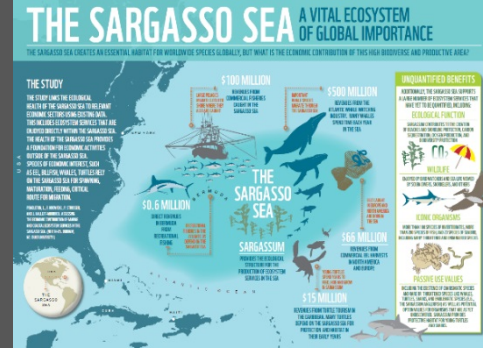
- Used the Sargasso Sea and NASA as a regional pilot application for Sargasso Sea Commission to ensure that the development is user-driven and effective.

- 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 2 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 usages by marine species and humans
  - Highlight areas of possible conflicting usage
  - Tool supporting future measures resulting from ongoing UN negotiation of a new marine biodiversity treaty for areas beyond national jurisdiction (ABNJ) as an extension to UNCLOS.

COVERAGE-Sargasso Workshop

- 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 and 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

- Format:
  - Demonstration of COVERAGE prototype followed by presentations on Sargasso research activities
  - Breakout & Plenary sessions identifying priority development areas and set of technical recommendations

- 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: "Fisheries, Organisms & Environmental Interactions", "Ships & *Sargassum*", "Regional early warning system for *Sargassum* inundation events"
  - Inclusion of additional datasets from sources such as NOAA/WOA and UN-IOC/OBIS
  - Need for automated data pipelines for near real-time data delivery
  - Detailed feedback from participants on tool functionality

COVERAGE - Sargasso Web Application

- 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
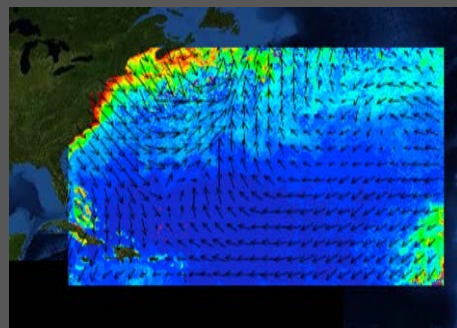
MODIS CHL-A + ASCAT Ocean Surface Winds
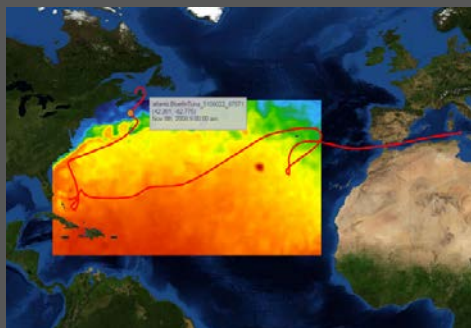
*Bluefin tuna archival tag track + Reynolds SST*
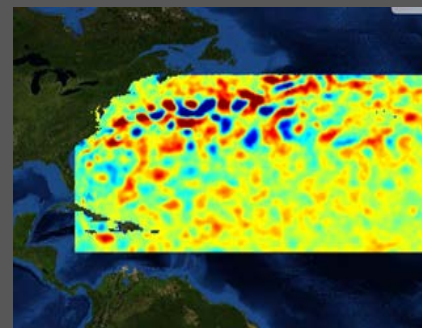
AVISO Sea level anomaly

AIS Vessel Positions Heat map + Tracks
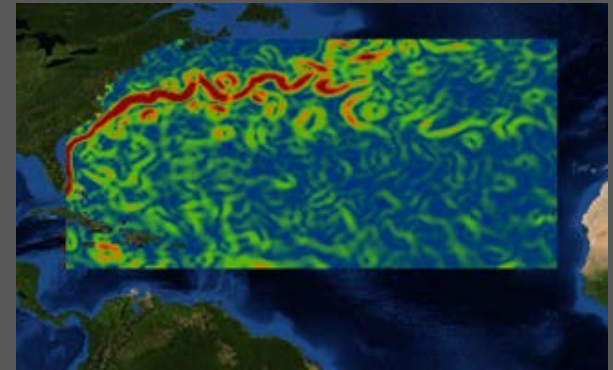
COVERAGE Status & Next Steps

- Approved as a new CEOS initiative at international meeting of the Committee on Earth Observing Satellites (Paris, 25-27 April, 2017)

- Contributing to CEOS Virtual Constellations, GEO-Blue Planet, and MBON.

- Develop national & international partnerships

- Identify priority set of Use Cases & Requirements

- Improve portal functionality (visualization, analytics)

- Develop near real time capability via automated data pipelines/interfaces to distributed data providers

- NASA JPL leading the CEOS effort
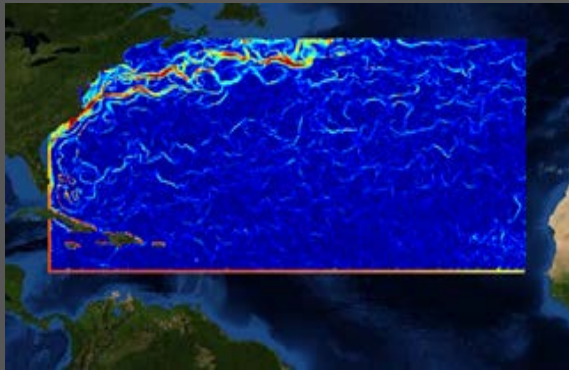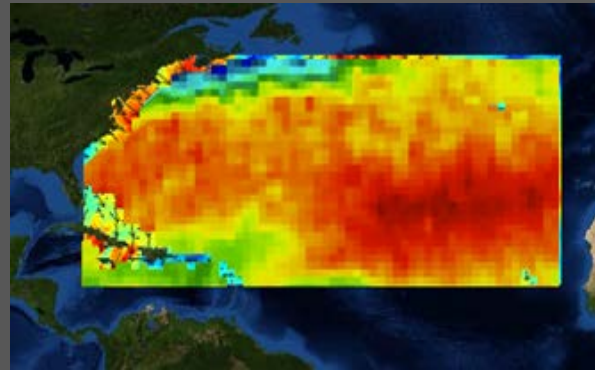
MUR-SST Gradients   *Aquarius Sea Surface Salinity*   *OSCAR Surface Currents*

COVERAGE Draft Implementation Plan

4 part development concept for COVERAGE:

- Preliminary arrangements & detailed scoping (6 months)
- Phase 1 implementation for limited COVERAGE prototype system (1 year)
- Phase 2 development of full COVERAGE system (1 year)
- Integration & testing, deployment and evaluation of finalized COVERAGE system (6 months).

Advancement of the CEOS Virtual Constellations: 2017-2019			
Objective/Deliverable	**Projected Completion Date**	**Background Information**	**Responsible CEOS Entity**
COV-1: Collaborative agreements for COVERAGE	Q3 2017	Establish collaborative agreements with agency and stakeholder groups (VCs, GEO-MBON, GEO-Blue Planet) partnering in COVERAGE	COVERAGE group
COV-2: COVERAGE use cases & focal pilot application	Q4 2017	Determine priority application for COVERAGE via stakeholders engagement and compile use cases/requirements	COVERAGE group
COV-3: COVERAGE Project Implementation Plan	Q1 2018	Develop detailed project implementation plan and schedule	COVERAGE group
COV-4: COVERAGE Phase I prototype system	Q1 2019	Development of prototype COVERAGE system demonstrating core functionality for limited datasets	COVERAGE group
COV-5: COVERAGE Phase II system	Q1 2020	Develop COVERAGE system demonstrating full functionality for suite of datasets	COVERAGE group
COV-5: Operational COVERAGE portal & system	Q3 2020	Tested and operationally deployed COVERAGE thematic data portal & associated data services	COVERAGE group

Questions / Discussion

COVERAGE DEMO: *A Prototype Application for the Sargasso Sea*