Next Generation Data Service infrastructure for a Digitally Integrated Ocean Observing System in Support of Marine Science & Ecosystem Management

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COVERAGE
CEOS Ocean Variables Enabling Research & Applications for GEO

CEOS The Committee on Earth Observation Satellites

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Motivation

- Imperative to better marshal available observations of different types for societal benefit.
- Need for improved data infrastructures providing more seamless access to diverse, distributed observations proliferating rapidly in extent and type.
- Maximize impact of Earth observations & ocean observing system data investments by enabling their integrated and efficient utilization.
- Address the needs of emerging data user communities and a nascent value-added service sector.
- Decade Challenges 7, 8, 2 relating to fit-for-purpose information system capabilities enabling ecosystem science & decision support applications.

Vision

- Coordinated international, multi-agency effort seeking to implement the next generation value-added data service infrastructure necessary to power a digitally integrated ocean observing system.
- Address key constraints to access and synergistic use of multi-sensor/platform Earth Observations and ocean observing system data, particularly amongst currently underserved user communities with a need for such environmental information.
- Enable more widespread, integrated use of ocean satellite, in-situ and model data products in support of science & applications for societal benefit to more fully realize their potential.
- Support UN Sustainability Goals 13 (Climate Action) & 14 (Life Below Water) and help catalyze the data-driven Blue Economy of the future.

Initiative

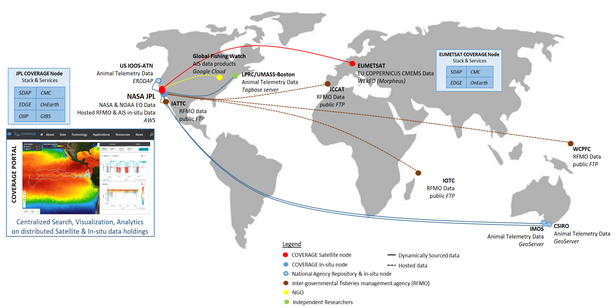
- Leverage COVERAGE: existing cross-cutting, collaborative initiative with CEOS and NASA project
- Build upon an advanced technology platform being implemented providing access to complementary satellite & in-situ datasets via value-added data services
- Improves access to a coherent, curated set of global, interagency data products from the 4 Ocean Virtual Constellations (SST, Ocean Color, Ocean Winds, Ocean Surface Topography) at common resolution as a baseline dataset.
- Exercises emerging cloud technologies for Earth Observation applications across heterogeneous cloud environments (NASA-AWS, EUMETSAT WEkEO)
- Demonstrates utility of the generalized technical capability in the context of an example thematic Ecosystem application relating to: “Pelagic fisheries & Biodiversity in relation to the environment”

Results

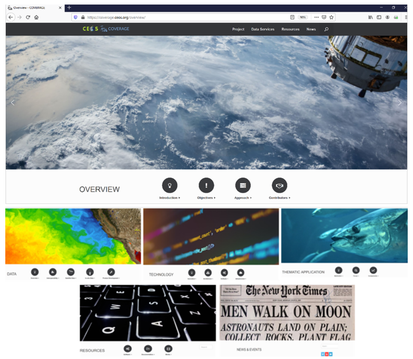
Click figures to enlarge

Outcomes from the recently concluded Phase-B (prototype implementation) COVERAGE project activity.

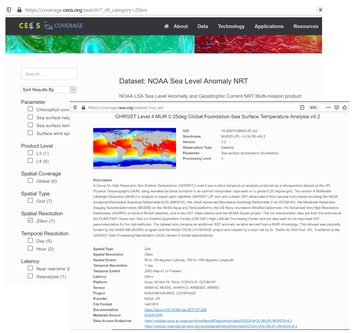
Distributed Data Architecture



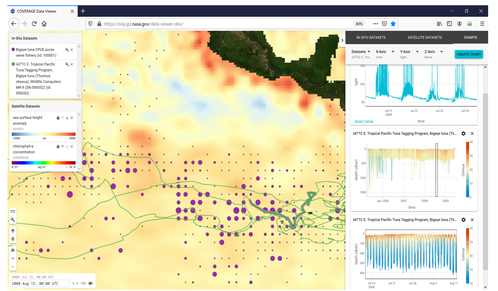
Web Portal https://coverage.ceos.org



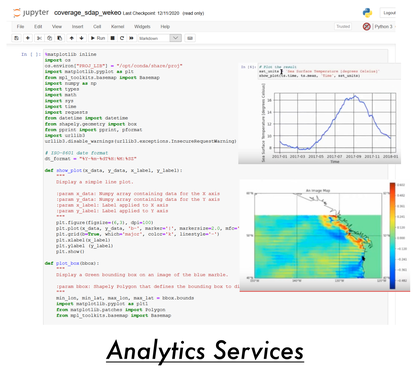
Prototype Data Services



Integrated Search



Web-based Data Visualization



Analytics Services

Approach

- User community driven, Stakeholder focused, Open Source, data FAIR
- Emphasis on data interoperability standards and thematically-based data access via distributed data architecture
- Phased Development (current project):
- Governance: Advisory Board (stakeholder agencies)

Next Steps

Planned Phase-C Activity

- Hardening/refining technical capabilities & Expansion of thematic application use cases
- Continued engagement of NASA & CEOS stakeholders, external partners, broader community
- Operationalization concept and Sustainability strategy development
- Engagement of Decade US and partner organizations to advance COVERAGE concept for the UN Decade of the Oceans

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Prototype Data Services

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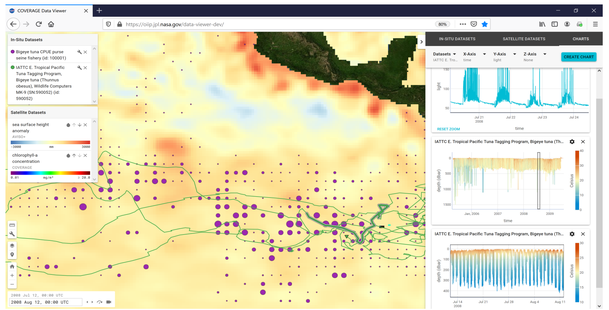
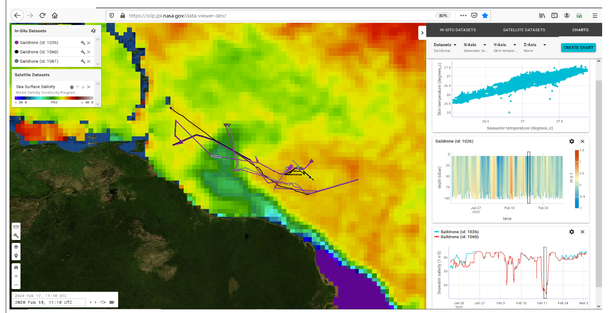
Web-based Data Visualization

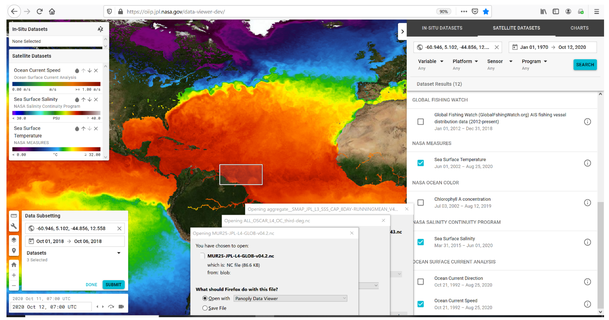


IATTC Bigeye Tuna archival tag & spatial catch distribution data relative to AVISO-SSHA and animal telemetry environmental measurements

- Integrated visualization of satellite & in-situ data
- Synchronized horizontal and vertical views of data and their evolution over time
- Integrated dataset Search
- "One-stop" Data Subsetting capability (both satellite & in-situ)
- Open Source: JPL Common Mapping Client
- What's Next: Analytics API integration

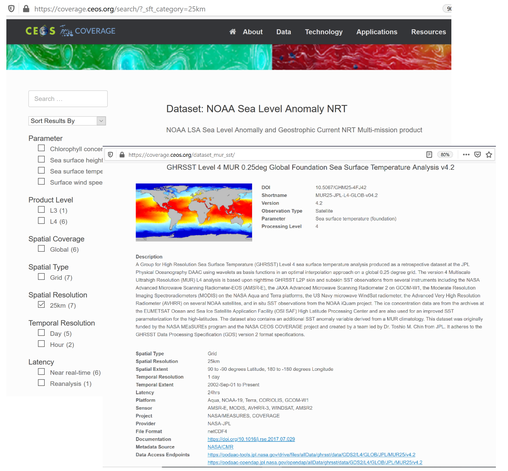


Saildrone ATOMIC cruise ADCP and CTD data overlaid on Sea Surface Salinity data from SMAP



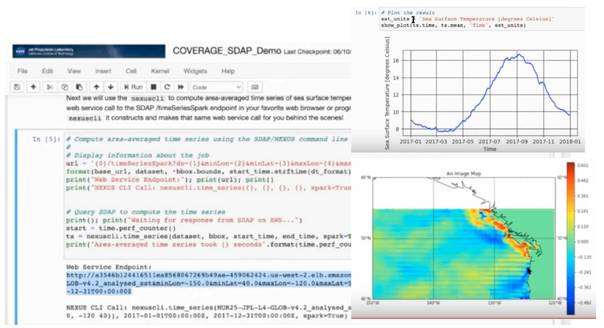
Integrated Data Search & Subsetting

Data Search

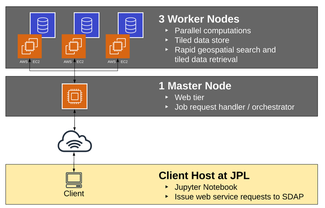


- Integrates Dataset Metadata from multiple repositories: e.g.
  - NASA/CMR
  - FedEO (CMEMS)
  - IMOS
  - CSIRO "Marlin"
- Features
  - Keyword search
  - Facetted search filters
- Returns dataset descriptive & access point information

Analytics Cloud Services



SDAP WEkEO Deployment Instance



- Science Data Analytics Platform (SDAP)
- Open Source : http://sdap.apache.org
- *"Enabling Big Data Science Without Download"*
- Cloud Deployments: AWS (JPL) & WEkEO (EUMETSAT)
- Interfaces: Jupyter notebooks & APIs

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Community Engagement & Web-Portal

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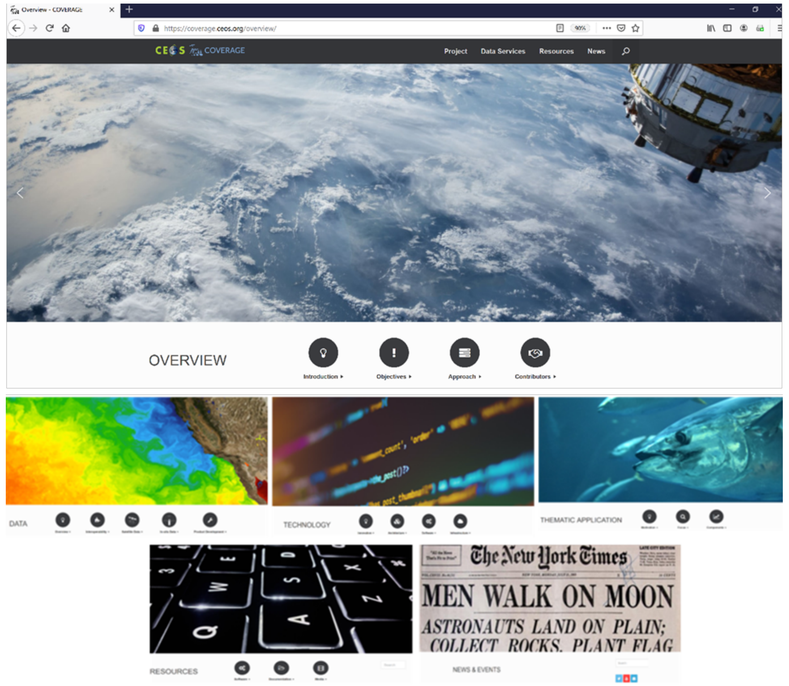
Web-Portal

https://coverage.ceos.org



- Descriptive information on COVERAGE Initiative & Project
- Integrates Data services/tools
- Resources Area: project technical documentation, tutorial videos
- News Area: events & announcements
- Integrated COVERAGE you-tube channel & Twitter feed

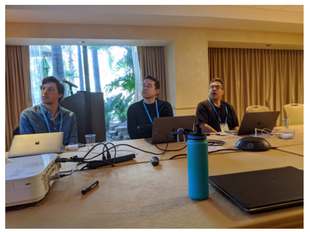
Community & Stakeholder Engagement

Workshop Events:

OCEAN SCIENCES MEETING — Feb. 2020

ESIP MAKING DATA MATTER — Jul. 2020

EUMETSAT — Aug. 2020



Conference presentations
ESIP-Summer 2020, GEO-BON2020, Ocean Sciences 2020, Fall AGU2019

Stakeholder consultations: Advisory Board Meetings, CEOS, Agency partners: EUMETSAT, Sargasso Sea Commission (SSC), Inter-American Tropical Tuna Commission (IATTC), CSIRO, IMOS, US IOOS-ATN

https://twitter.com/coverage_ceos
Project announcements

https://tinyurl.com/coverage-channel
Demonstration/tutorial Materials