ME33B-06
Ocean Sciences 2020

Implementation of a Prototype Big Data Platform Providing Enhanced Access to Inter-agency Satellite Data Products in Support of MBON

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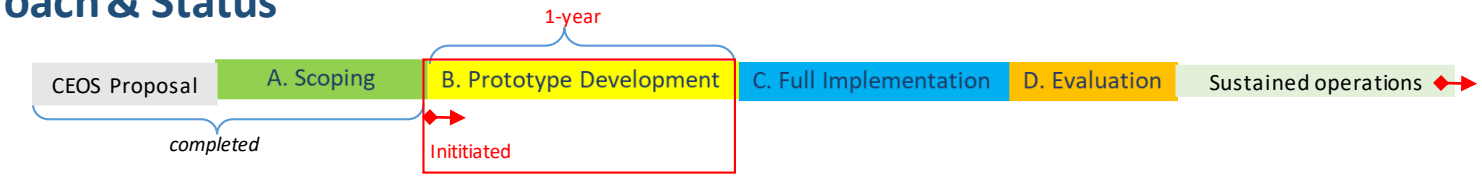
URS #

Overview

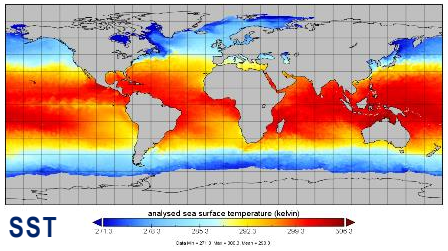
- **International initiative** led by NASA under the Committee on Earth Observation Satellites (CEOS) and endorsed as a 3 year pilot project
- **Cross-cutting, collaborative effort** within CEOS
  - Enable more widespread use of ocean satellite products in support of science & applications for societal benefit
  - Implementation of an advanced technology platform providing improved access to value added data & services
  - Demonstrate utility in the context of a thematic application relating to "the environment and high seas tuna fisheries"
- **Response to known needs of the ocean community** for improved, more integrated access to analysis ready data for societal benefit in support also of the United Nations Sustainable Development Goals (UN-SDGs) (#14 in particular) relating to marine biodiversity & sustainable/ecosystem-based resource management
- **Stakeholders & Partners**
- **Reporting:** NASA-HQ, CEOS, Advisory board (*Agency, CEOS-VCs, and MBON representatives)*
- **Development Approach & Status**

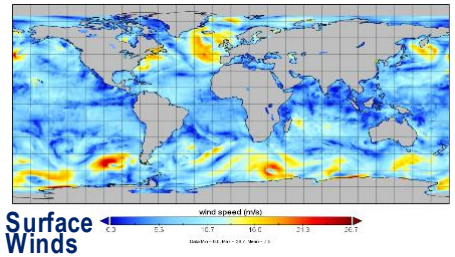


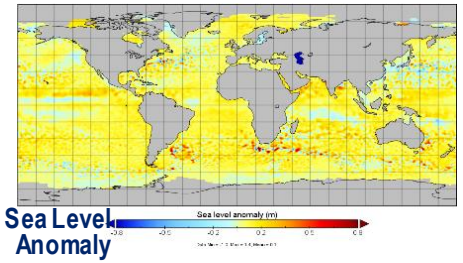
Goals

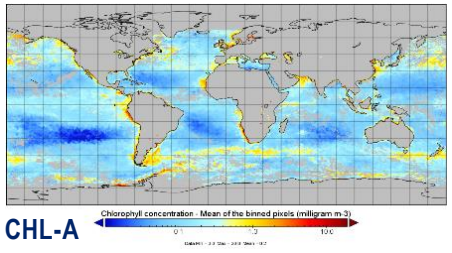
COVERAGE aims to develop a data rich Tech. platform for more seamless delivery of analysis ready ocean data to demonstrate the value added of multivariate ocean data integration in support of science & applications for societal benefit

- "Fusion environment" leveraging emerging cloud-based infrastructure, largely existing software capabilities available as open source
- Curated aggregation of high quality, interagency multi-parameter observations (Sea Surface Temperature, Surface Winds, Sea Level Anomaly and Ocean Color)
- Global, Collocated to a common 0.25 deg. resolution grid, Near real-time (where possible), Gap-free
- Complemented by set of select in-situ datasets supporting target applications
- Access via value-added data services available via a COVERAGE Thematic Portal, interactive tools and associated Web service APIs
- Illustrated in the context of demonstration GEO-MBON applications
- User focused & Community driven









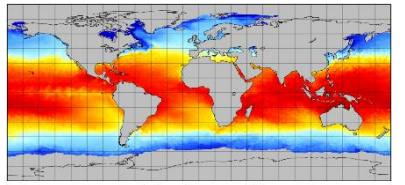
Dataset Inventory

During Phase A (scoping), completed a review of candidate interagency satellite data products across the 4 CEOS ocean VC parameters (SST, Winds, SSH, Ocean Color) for inclusion as a coherent set of 0.25 degree, global <u>baseline</u> products for COVERAGE

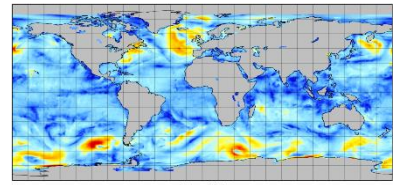
- Selection considerations:
  - Highly curated, high quality, add-value to each other
  - In consultation with CEOS-VCs and COVERAGE board
- COVERAGE satellite data profile: 0.25', global, NRT, multi-year, gap free/L4, interoperable formats
- Documentation of data search/access mechanisms, formats, volumes
- Shared for comment with Board, VCs, agency experts

<u>Conclusions</u>

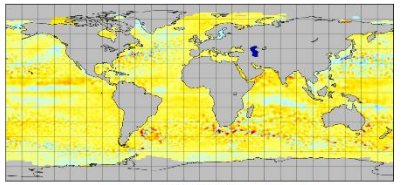
- Manageable number of good options for all parameters for inclusion
- Some heterogeneity in Data Search/Access mechanisms across agencies (NASA, Copernicus-CMEMS, NOAA)
- Ocean Color: apparent paucity of L4 gap-free products
- Future consideration of higher resolution & value added products: eg. gradients



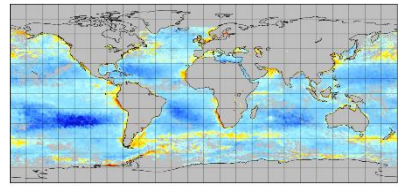
SST



Surface Winds



SLA



CHL-A


Product temporal coverage comparisons

Phase-B Tasks & Deliverables

- Phase B: 1 year activity, kicked off Oct. 2019
- Implement prototype COVERAGE system:
  - Leverage existing JPL open source technologies and adapt as necessary
  - Integrate prioritized Baseline interagency satellite data products and select in-situ datasets
  - Establishment of 2 distributed COVERAGE Science Data Analytics Platform (SDAP) nodes for US & European remote sensing data (JPL-AWS, EUMETSAT-WEKEO)
  - Dynamic Data Interfaces to partnering agency Animal Telemetry and in-situ data repositories (eg. CSIRO, IMOS, IOOS-ATN)
  - Provide core set of value added services: search, data subsetting-extraction, visualization
  - Implement integrated data search capability leveraging CEOS-CDA system
- Illustrate the prototype in the context of a demonstration application: "HMS fisheries in relation to the environment"
- L4 CHL-A MUR product development/validation in coordination with Ocean Color Radiometry Virtual Constellation (OCR-VC) and NASA ocean color program. Working in parallel with NOAA development of gapless Ocean Color product.
- Project Website/Portal Development
- Emphasis on collaborating stakeholder engagement to ensure system usability:
  understand use cases, data product needs, desired functionality & analysis capability needs
- Approach: development milestones linked to periodic demonstration & workshop activities
  eg. Ocean Sciences 2020, Tuna Camp, GHRSST, CEOS-SIT-TW meetings

Collaborators & Contributors

Collaborators

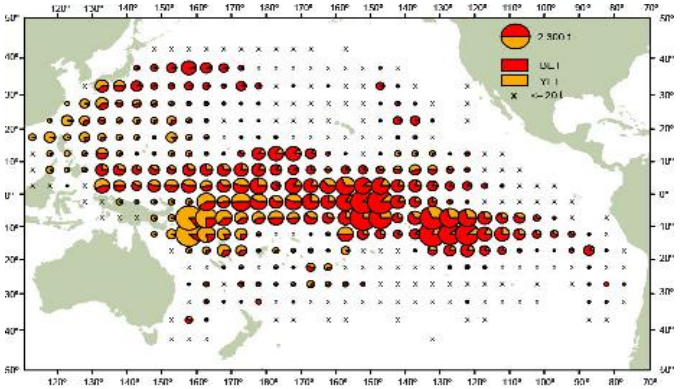
- SDAP satellite data nodes
  - JPL/AWS (satellite data)
  - EUMETSAT/WEKEO (satellite data)
- SDAP in-situ data nodes
  - JPL/AWS (hosted in-situ data)
  - IFREMER/CMEMS (ARGO data)
  - Australian IMOS/ADON & CSIRO (tagging data)
  - IOOS-ATN (tagging data)
- Possible non-institutional/researcher nodes
  - UW – Fisheries (tagging data)
  - UMASS- LPRC (tagging data)

Phase B Target Thematic Application:
High Seas Tuna Fisheries Focus

"Satellite Data in Support of Ecosystem-based Fisheries Analyses"

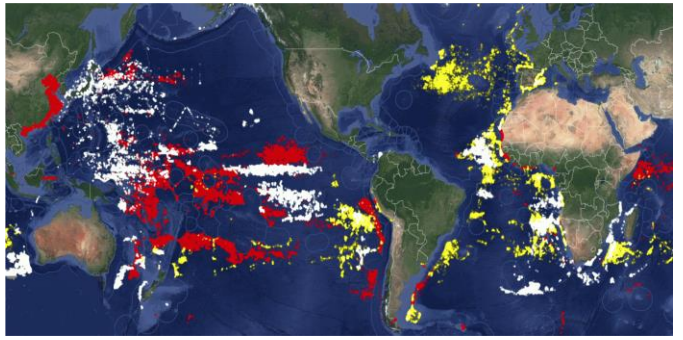
Biological & Resource Management Communities:

- Increasing interest in use of EO data but limited expertise/capacity & currently under-served



High Seas & Regional Fisheries Applications involving integration of ocean remote sensing, physical model and in-situ datasets enabling decision support and research investigations

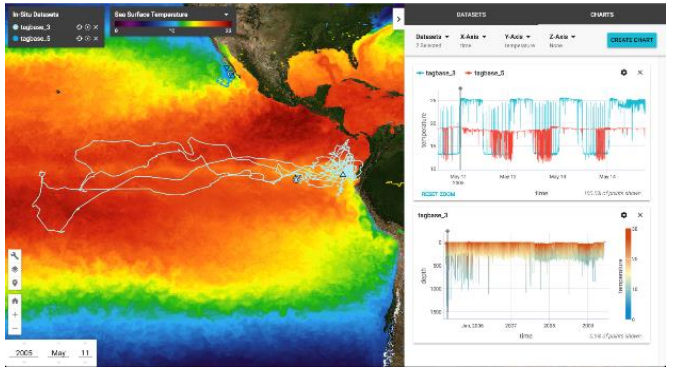
- Habitat analysis for Highly Migratory Species (HMS)
- Tuna Spatial catch forecasting
- By-catch mitigation



Stakeholder agencies: eg. RFMOs, NOAA/NMFS, GEO-MBON (Marine Biodiversity Observation Network), GEO-Blue Planet

Supporting Data *(publicly available)*

- RFMO monthly spatial catch/effort time series by species, aggregated spatially at 1 & 5 deg. spatial resolution, 1952-2018
- Electronic tagging datasets: high resol. trajectory-profile series
- AIS fishing vessel movement data products by category (daily, since 2012 from *Global Fishing Watch*)



Future Evolution: A Nested/Multi-scale Application Concept

Macro-scale open ocean application during Phase-B complemented potentially by select regional view(s) in future

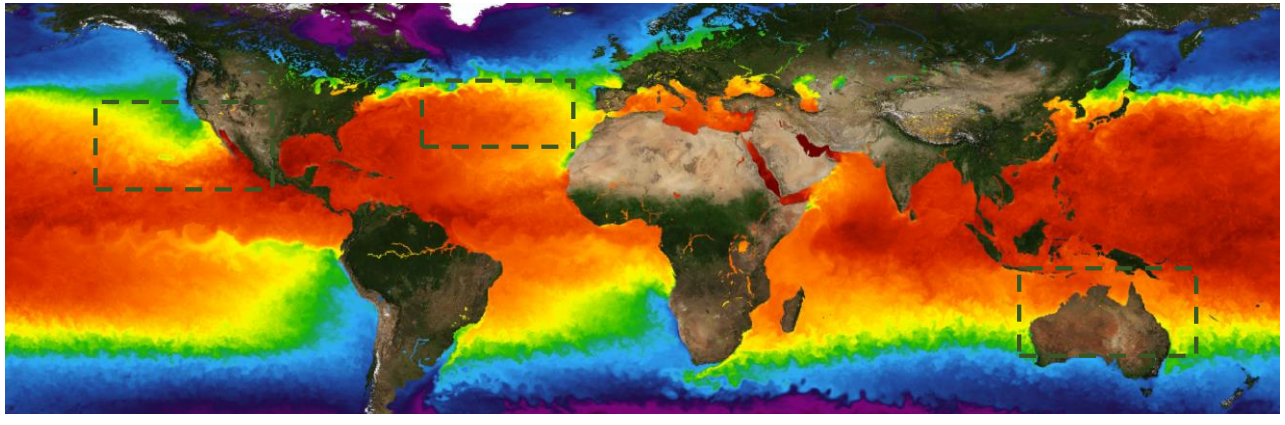
Rationale:

- Richness of In-situ data in support of our target applications is limited for open ocean regions
- Regional approach will facilitate integration of select high-resolution satellite and potentially model data into our applications
- Facilitate broader agency participation in COVERAGE & contributions
- Provides an option/pathway for future COVERAGE expansion & sustainability/operationalization

Sargasso Sea Commission (SSC) & the International Commission for the Conservation of Atlantic Tunas (ICCAT) proposal for regional ecosystem pilot involving COVERAGE as data platform

Candidate Areas

- ETP
- Sargasso Sea
- AUS (IMOS)



OCEAN SCIENCES MEETING | 16–21 FEBRUARY 2020 SAN DIEGO, CA, USA

COVERAGE @ AGU 2020 Ocean Sciences in San Diego

- Workshop Event: Tuesday, 18 February 2020: 09:00 - 12:00

  "COVERAGE Consultative Workshop: A Distributed Data Platform Providing Enhanced Access to Inter-agency Data Products in Support of Marine Biodiversity Applications"

COVERAGE

Questions