The COVERAGE Project & Thematic Demonstration Application: High Seas Tuna Fisheries In Relation to the Environment

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Overview

- **International initiative** led by NASA under the Committee on Earth Observation Satellites (CEOS) and endorsed as a 3 year pilot project, currently in its 2nd year of technical implementation

- **Cross-cutting, collaborative effort**
  - Enable more widespread use of ocean satellite products in support of science & applications for societal benefit
  - Improved access to a coherent set of global, interagency data products from the 4 Ocean VCs at common resolution
  - Implementation of an advanced technology platform providing access to complementary satellite & in-situ datasets via value-added data services
  - Demonstrate utility in the context of an example thematic application relating to: “the environment and high seas biodiversity & pelagic fisheries”
  - Gap free L4 ocean color product development

- **Response to known needs of the ocean community** for improved, more integrated access to analysis ready data (ARD) in support also of the United Nations Sustainable Development Goals (UN-SDGs) (#14 in particular) relating to marine biodiversity & sustainable/ecosystem-based resource management

- **Advisory Board & Contributors**

- **Approach & Status**
  - **CEOS Proposal**
    - completed
  - **A. Scoping**
  - **B. Prototype Development**
  - **C. Full Implementation**
  - **D. Evaluation**
  - **Possible Operations**

  1-year through Oct.2020
“Satellite Data in Support of Ecosystem-based Fisheries Analyses”

Biological & Resource Management Communities:
• Increasing interest in use of Earth Observation 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)
Distributed System Architecture
Website Portal
https://coverage.ceos.org

- Descriptive information on COVERAGE Initiative
- Data services/tool integration coming soon

https://twitter.com/coverage_ceos
Project announcements

https://tinyurl.com/coverage-channel
Demonstration/tutorial Materials
Leverages CEOS-WGISS IDN and CDA

Integrates Dataset Metadata from multiple repositories:
- NASA/CMR
- FedEO (CMEMS)
- IMOS
- CSIRO “Marlin”

Features:
- Keyword search
- Facetted search filters

Returns dataset descriptive & access point information
• 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

RFMO monthly aggregate longline and purse seine spatial effort distribution data from IATTC in relation to daily AIS data from Global Fishing Watch

Saildrone ATOMIC cruise ADCP and CTD data overlaid on Sea Surface Salinity data from SMAP
IATTC Bigeye Tuna archival tag & spatial catch distribution data in relation to AVISO-SSHA and animal telemetry environmental measurements
• Science Data Analytics Platform (SDAP)  
  http://sdap.apache.org

• “Enabling Big Data science without download”

• Cloud Deployments: AWS & WEkEO

• Interfaces: Jupyter notebooks & APIs
Community & Stakeholder Engagement

3 Workshop Events:
- Feb. 2020
- Jul. 2020
- 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
https://tinyurl.com/coverage-channel
Conclusions

• Growing Imperative to better marshal available Earth observations of different types in support of ocean science and marine resource management applications for societal benefit

• COVERAGE is about:
  - Development of improved data infrastructures to enable this
  - Better realizing the potential of EO data in supporting new and under-served user communities by addressing key constraints (product selection, access & usage mechanics)
  - Doing so collaboratively via stakeholder engagement within CEOS and externally

• At the conclusion of this 1-year Phase B activity, we have a range of useful outcomes:
  - A prototype system, collection of integrated, interagency data products, and a reusable set of technical capabilities that show considerable promise
  - Illustrated in the context of a thematic application that in itself has generated community interest with considerable potential for further development
  - Validated L4 gap-free ocean color CHLA product with potential to take to 1km resolution (see backup slide)

• Solid foundation for a follow-on Phase C activity:
  - involving refinement and hardening of technical capabilities
  - further development of HMS pelagic fisheries ecosystem pilot: regional focus, more detailed/hi-res. datasets
  - expanded network of collaborators
Backup
L4 CHL-A MRVA Product

- L4 CHLA MRVA product implemented
- Based on L3 MODIS and VIIRS inputs (4km)
- Complete 0.25 degree series processed and integrated into COVERAGE services

- Validation Analyses Completed: excellent results

L4 CHLA MRVA - in situ Comparisons

- Saildrone Baja Campaign
- SEABASS/NOMAD/MERMAIDS Matchup Database Comparisons

L4 CHLA Product Inter-comparisons

- MRVA, Globcolour, NOAA-MSL12

NEXT STEPS

- Write Technical Report (ATBD, Validation, Product format specification)
- Extend to use L2 MODIS, VIIRS, Sentinel 3 inputs -> can get down to 1km gap free