Distributed Oceanographic Match-up Service (DOMS) Use Cases

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A. Purpose

This document outlines a series of use cases that have been developed through interactions with stakeholders of the DOMS project. The cases go well beyond the scope of the DOMS prototype, but provide a host of options and opportunities for future DOMS development and extension.

B. Use Cases

1. **Decision support:** Planning for a future field campaign using data from a previous campaign (e.g., planning for SPURS 2):
   - 1.1. A user wants to see what historical in-situ datasets exists for a given geospatial domain in a specific time period.
   - 1.2. A user wants to see what satellite datasets (e.g., Aquarius, ASCAT, AVHRR) exists for a given geospatial domain in a specific time period to understand the satellite swath locations relative to a proposed sampling area to maximize coverage/overpasses.
   - 1.3. A user wants to extract collocated satellite and in-situ for the proposed study area that are available for specific time period to understand the structure of parameters to be observed (e.g., salinity) during the proposed campaign. This assessment of the past will support optimal deployment of in-situ sampling assets for the planned field project.
   - 1.4. A user wants to submit his own dataset into DOMS and then match to satellite or in-situ data.
   - 1.5. User wants to input just a geospatial domain and ask what satellite or in-situ data exist in that region (and possibly get back the data in the domain).
     - 1.5.1. E.g., Upload a cruise track and find matching satellite/in situ data along the track, in preparation for real-time operations during an upcoming field program.

2. **Satellite Algorithm Calibration/Validation:** With every iterative improvement of a retrieval algorithm for a parameter (e.g., SSS from Aquarius), science teams and researchers want to:
   - 2.1. Undertake matchups between a selected satellite dataset (e.g., Aquarius L2 data) for the entire mission and coincident surface (<=10m) observations (e.g., ARGO, shipboard SSS) within specified tolerance thresholds (location, time, and search radius limits) automatically and via a webservice call. Standard reports on satellite retrieval biases relative to in-situ observations (e.g., RMS statistics) would be produced regionally/globally and for specific time periods (e.g., seasonally).
   - 2.2. Undertake more detailed screening in the a region where a variety of platforms were deployed to provide truly near-surface measurements (e.g., SPURS observing region). Use

the matchup service to provide a list of available in-situ datasets intersecting with select satellite passes/swaths and then for a subset of “optimal” in-situ data types, extract the collocated data values to estimate more accurate bias statistics.

2.3. Undertake matchups based using data values themselves as a criterion. For example, return available in-situ datasets/values for Aquarius SSS values at the extremes of the distribution to understand whether the extreme retrievals are outliers and potentially identify why the retrieval is failing (e.g., rain event or high winds shown in collocated in-situ data).

2.4. Some users may also be interested in Triple point collocation for mission CalVal assessments -as opposed to pairwise dataset matchups (e.g., Aquarius – ARGO – glider; Aquarius – ARGO - HYCOM)

3. **Science Investigations:** Supporting process studies, data synthesis, etc.

3.1. Return detailed data value listings of collocated in-situ and satellite data for more careful analysis of underlying processes. Include necessary ancillary data (e.g., multiple parameters from in-situ platforms not measured by satellite, but essential to conduct process study) and metadata for each collocated record.

3.2. Support development processes and continuous extension of blended satellite-in situ surface analysis products, by providing large-scale, automatic, and ease to use matchup services. Further, this supports product regeneration when either the satellite or the in situ data sources are improved to a new version.

3.3. Support modeling data assimilation services by jointly supporting data acquisition, approaching near-real time, for both satellite and in situ data within specified domains.

3.4. Provide a user-friendly, interactive interface for students and researchers to extract collocated data.

4. **Satellite to Satellite match-up**

4.1. Improve rain contamination flagging in sea surface salinity data products, E.g., combine the strengths of Aquarius – TRMM L2 data.

4.2. Extend the two-way satellite match-up to also include in situ observations for further quality check and a three-way analysis.

5. **Satellite or in-situ to model match-up**

5.1. OGC Web processing service is an example.

5.2. E.g., HYCOM model salinity comparisons with Samos RV data (note that this use case is effectively covered by the gridded satellite L3/L4 product <->in situ matchup case that will be entertained as part of the DOMS project).

5.3. E.g., HYCOM, NCEP and Aquarius L2 Salinity, Winds. ROMS-Aquarius

5.4. Use satellite and in situ measurements in near-future with projection model run to assess model stability and trends.

6. **Real-time satellite vs. in situ matching to support operational activities (e.g., situational awareness during field experiments).**

6.1. Data access (latency) and security would be a real challenge here.