



Introduction

There has been a steady progression of improved computing ability, distributed processing architectures, new ways of storing satellite data, and online tools and web services over the last 15 years that the oceanographic community increasingly utilizes for research and investigation. With the advent of even higher data volumes from next generation space sensors the ability to employ tools, services and computing resources will be even more necessary for successful research. In this presentation we present a suite of emerging technologies developed at the NASA Jet Propulsion in collaboration with various partners that address some of these concerns. The **Virtual Quality Screening Service (VQSS)** described at a previous meeting, is now operationally deployed and represents a web service paradigm to apply quality screening information (quality, uncertainty, and ancillary variables) to GHRSSST granules and extract out subsetted SST values. Another technology project is the **Distributed Oceanographic Matchup Service (DOMS)**, a service to provide satellite to *in situ* matchup capability across a wide range satellite products and *in situ* sensors from ships, ROVS, gliders and drifters. The third project called **OceanXtremes** aims to provide a new database derived storage architecture for satellite data such that distributed computing resources can be leveraged to quickly process and perform analytics on long time series data in the form of SST climatologies, feature detection and EOFs as a few examples. Each of these projects taken individually and together represent important technology components that can assist users in extracting, processing, contextualizing and analyzing satellite (and *in situ*) data.

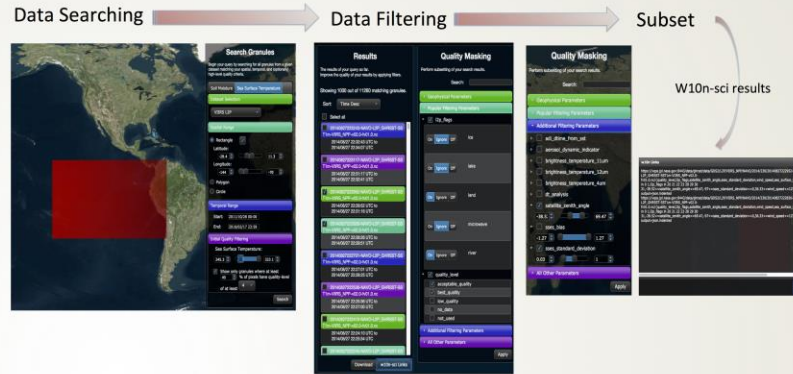
Virtual Quality Screening Service (Armstrong)

Objective: Implement web services and related infrastructure for quality screening of GHRSSST and SMAP L2/L3/L4 data.

- Expose data granules from GHRSSST/SMAP mission through **Webification (w10n-sci)**
- Harvest and expose data statistics (e.g., cloud free pixels)
- Provide a **portal** for the public exposure of VirtualQSS that will allows users to:
 - Search, Select** quality and ancillary variables, **Apply** flag or threshold filtering, **Subset** and **Return** data, and **Store** queries

Sample GHRSSST Use Case scenario for quality information screening

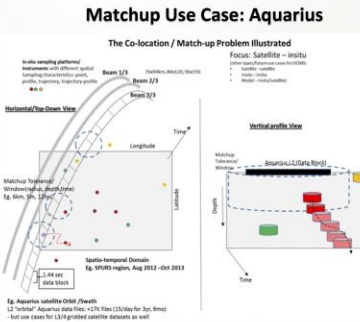
- User wants a time series of high quality SST data over a well defined region including data that have:
 - A defined minimum wind speed threshold - An acceptable level of data uncertainty and satellite viewing orientation. Only ocean pixels are to be selected.
- User first selects a region (and time) and filters for granules that contain at least 40% "reasonable data"
- Once the search request is submitted and a granule list returned further filters are applied:
 - Under "Geophysical Parameters" menu
 - A **wind_speed** threshold of at least 6 m/s is set
 - Under "Popular Filtering Parameters" menu
 - A **quality_level** of "best quality" is selected
 - l2p_flags** bit for land is not set
 - Under "Additional Filtering Parameters" menu
 - Variables **sses_bias** and **sses_standard_deviation** are selected within reasonable ranges
 - An appropriate **satellite_zenith_angle** range is selected
- After hitting "apply" w10n-sci links to subsetted and filtered data are exposed and can be executed
- All filtering steps can be saved for later reuse and modification



Distributed Oceanographic Matchup Service (Tsontos)

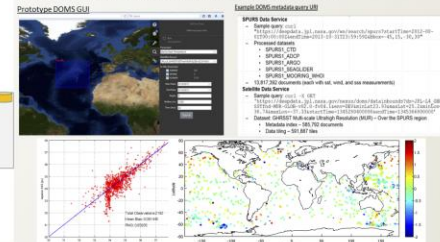
Objective: Develop generalized, scalable, distributed and publically accessible matchup service in support of NASA science & mission Cal/Val

- Distributed data providers:**
 - NCAR: ICOADS/ARGO
 - FSU COAPS: SAMOS US Research Cruises
 - PO.DAAC: SPURS, Satellite SST, SSS, Winds (L2/3/4)
- Architecture:**
 - Common software stack (e.g., w10n-sci)
 - Supports heterogeneous, remote back-end repositories (RBD, file archive/THREDDS, NoSQL)
 - Computationally demanding matchup operations close to high volume PODAAC satellite data
 - Service hosted on the cloud & accessible via PODAAC portal in future

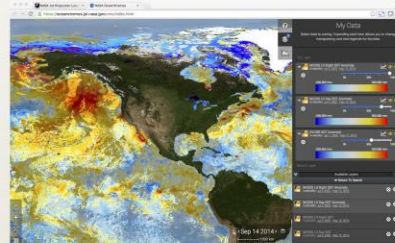


DOMS User Interfaces & Outputs

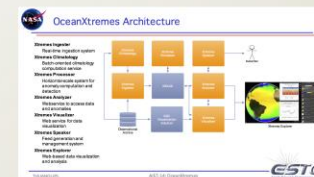
Web-service & Form-based querying with flexible filtering
- by instrument, sensor, parameter
- spatio-temporal domain & matchup window criteria (x,y,z,t)
Tabular output files (.nc/.csv) & Graphical summaries



SST Anomaly Use Case: US West Coast "Blob"



OceanXtremes Design



OceanXtremes (Huang)

- Objective:**
- Develop an anomaly detection system which identifies items, events or observations which do not conform to an expected pattern
 - Mature and test domain-specific, multi-scale anomaly and feature detection algorithms.
 - Identify unexpected correlations between key measured variables.
 - Demonstrate value of technologies in this service:
 - Adapted Map-Reduce data mining.
 - Algorithm profiling service.
 - Shared discovery and exploration search tools.
 - Automatic notification of events of interest.