



Using the STOQS Web Application for Access to *in situ* Oceanographic Data

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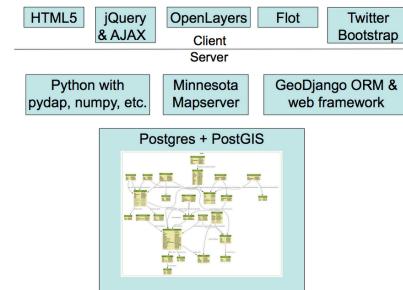
Abstract

With increasing measurement and sampling capabilities of autonomous oceanographic platforms (e.g. Gliders, Autonomous Underwater Vehicles, Wavegliders), the need to efficiently access and visualize the data they collect is growing. The Monterey Bay Aquarium Research Institute has designed and built the Spatial Temporal Oceanographic Query System (STOQS) specifically to address this issue. The need for STOQS arises from inefficiencies discovered from using CF-NetCDF point observation conventions for these data. The problem is that access efficiency decreases with decreasing dimension of CF-NetCDF data. For example, the Trajectory Common Data Model feature type has only one coordinate dimension, usually Time – positions of the trajectory (Depth, Latitude, Longitude) are stored as non-indexed record variables within the NetCDF file. If client software needs to access data between two depth values or from a bounded geographic area, then the whole data set must be read and the selection made within the client software. This is very inefficient. What is needed is a way to easily select data of interest from an archive given any number of spatial, temporal, or other constraints.

Geospatial relational database technology provides this capability. The full STOQS application consists of a PostgreSQL/PostGIS database, Memcached, and Python/Django running on a server and Web 2.0 technology (jQuery, OpenLayers, Twitter Bootstrap) running in a modern web browser. The web application provides faceted search capabilities allowing a user to quickly drill into the data of interest. Data selection can be constrained by spatial, temporal, and depth selections as well as by parameter value and platform name. The web application layer also provides a REST (Representational State Transfer) Application Programming Interface allowing tools such as the Matlab stoqstoolbox to retrieve data directly from the database. STOQS is an open source software project built upon a framework of free and open source software and is available for anyone to use for making their data more accessible and usable.

For more information please see: <http://code.google.com/p/stoqs/>.

Architecture



User Interface

The STOQS user interface displays a map of the vehicle tracks and a time series of depth profiles of the vehicles. Any of items on the right may be selected, which initiates instant update of the other items that may be selected. With this faceted search capability the user can quickly narrow a selection for data of interest.

In this screen grab a user has selected the standard_name "sea_water_temperature" and a time depth range that includes 10 days of the upper 500 meters. The user interface's dynamic query of the database indicates that all 8 platforms measure the selected parameter.

The interface is reactive to browser screen size and behaves appropriately when viewed on tablets and smart phones.

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Operation

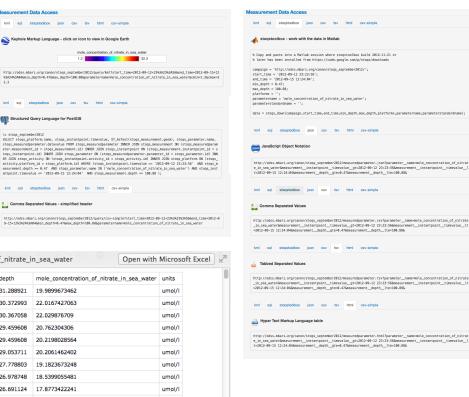
1. Install the STOQS software on a CentOS or Red Hat Linux server
2. Vehicles conduct their missions, collecting data
3. Create NetCDF files of the instrument data using CF Conventions for Point Observations
4. Copy NetCDF files to a location where a THREDDS Data Server can serve them
5. Construct a STOQS load script and execute it to populate a database for the campaign
6. Data are accessed from the STOQS User Interface and the REST API to the database

The STOQS User Interface allows selection by time and depth, by parameter name, by parameter value, and by platform name. Data are retrieved directly from the database for faster visualization and analysis. A typical campaign produces dozens of NetCDF files containing millions of measurement values. Performing the kind of data access demonstrated in this poster without STOQS would require reading all of NetCDF files, sub-selecting the data and creating the products within the client tool.

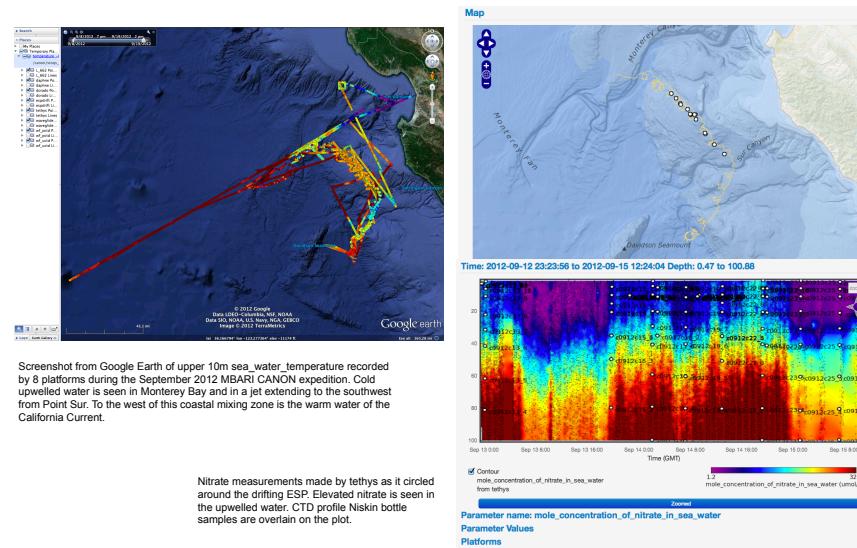
Data Access

The STOQS user interface is responsive because it displays metadata and sub-sampled summarized data. The tool is designed to help the user narrow down a specific request for data which can then be retrieved in the Measurement Data Access section. The summarized data are linked to the full-resolution data in the database.

Once the constraint expressions are determined, specific requests for data can be made. A REST-style mechanism is used to retrieve data and STOQS formats the data according to the format that the user requests. Supported formats include KML, SQL, Matlab code (for use with stoqstoolbox), JSON, Comma Separated Values, Tabbed Separated Values, and HTML. Direct access via PostgreSQL and the Django data model are also supported.



Data Visualization



Acknowledgements

STOQS is licensed under GPL3 and is built upon other free and open source software. For more information please see the project web site at <http://code.google.com/p/stoqs/>. Development of STOQS is supported by the David and Lucile Packard Foundation at the Monterey Bay Aquarium Research Institute.