

JIMAR – PFRP ANNUAL REPORT FOR FY 2005

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Project Proposal Title: Development of oceanographic atlases for pelagic and insular fisheries and resource management of the Pacific basin

Funding Agency: NOAA, Pelagic Fisheries Research Program

NOAA Goal (Check those that apply):

- To protect, restore, and manage the use of coastal and ocean resources through ecosystem-base management
- To understand climate variability and change to enhance society's ability to plan and respond
- To serve society's needs for weather and water information
- To support the nation's commerce with information for safe, efficient, and environmentally sound transportation

1. Purpose of the Project (one paragraph)

Marine ecosystems and fisheries are influenced by a broad range of oceanographic and environmental conditions and processes. The development of broad-based ecosystem approaches to fisheries management is hindered by the bewildering array of unsynthesized oceanographic information currently available. Additionally, there is no consistent coding or formatting standards, and each data source may require different software for access. The Oceanographic Atlas of the Pacific is designed to provide a single point of access to environmental data from a variety of platforms (satellite, shipboard, moorings, and numerical models) in forms that are useful and accessible to both non-expert and expert users. This will be accomplished through a series of oceanographic atlases for all of the U.S. Pacific Island exclusive economic zones (EEZ) and regions of the Pacific basin important for pelagic and highly migratory species fisheries management. Data coverage will be provided at basin-wide and regional scales as well as for various biogeophysical sub-regions and, contingent upon data availability, individual islands, banks, or reefs. Distribution of the full data sets will be conducted primarily over the Internet using an interactive web interface that allows users to customize various aspects of data selection and display. Both CD-ROM and limited print versions will also be made available for resource managers and researchers in those areas lacking the resources for large Internet transfers.

2. Progress during FY 2005 (One-two paragraphs, including a comparison of the actual accomplishments to the objectives established for the period, and the reasons for slippage if established objectives were not met):

Web Site:

As in FY04, current work has focused mostly on the development of the Atlas data delivery mechanism rather than research into and development of novel and highly derived data products. As the flagship Atlas product, the website is designed to be a sophisticated yet easy to use interface to in situ, satellite, and model data. The strength of this system is its ability to let users combine and compare any data available through the Atlas by selecting combinations of basemaps and overlays in a manner similar to many GIS applications. In FY05, a homepage for the Atlas was created, collecting email addresses for an Atlas-update mailing list and providing a place for future Atlas tools to reside. For the interactive mapping interface, the structure of the interface has been implemented with a set of GIS-like tools and features, including map zooming and panning, region selection, and query definition. This HTML/Javascript interface relies upon a suite of backend tools that handle metadata management, data processing, data aggregation, and visualization. An application written in Python acts as a web-service for the browser client. When the user requests a map visualization, the web-service runs assorted code modules that find the necessary source data, reprocess it, slice the dataset along the appropriate dimensions, and create plots of multiple overlaid datasets that are returned to the client as images with associated metadata. Raw data queries are handled similarly but result in the return of data values as either ASCII or netCDF files rather than images.

Work is currently being done to make the Atlas compatible with OPeNDAP enabled distributed archives of oceanographic data. An OPeNDAP server and Live-Access-Server (LAS) have also been installed on the Atlas webserver to help facilitate interoperability. The OPeNDAP server will allow the Atlas to share its local data holdings with partners elsewhere on the Internet. As the adopted standard for the Integrated Observing System efforts around the world, OPeNDAP will allow the Atlas to integrate emerging oceanographic data streams.

Data Sets:

Remote Sensing Data and Model Output

The development of science-quality historical time series and climatologies is one of the fundamental goals of the project. The Atlas project has been working with the National Oceanographic Data Center (NODC) Satellite Oceanography Group to derive climatologies from the best available remote sensing and other wide-coverage gridded oceanographic datasets. Pathfinder 5.0 4km sea-surface temperature, ocean color (SeaWiFS/MODIS chlorophyll a, PAR), wind speed and stress, salinity, and dissolved oxygen at 100m climatologies have been produced for the Atlas so far, and the original time series data is also available. Other data sets in the Atlas holdings include variables such as sea surface height and currents.

Many datasets needed for the Atlas are provided in near real time on an operational basis by the Hawaii CoastWatch node. Many others are available from other sources and are being archived separate from the CoastWatch data.

Model output from OGCMs provides an important component of the Atlas. Due to the limitation of satellite measurements to surface waters and the extremely sparse spatial and temporal distribution of *in situ* and shipboard measurements, models must provide many estimates of subsurface dynamics. Several model outputs are available via OPeNDAP through the International Pacific Research Center (IPRC) Asia Pacific Data Research Center (APDRC), including surface level data from NRL's Navy Layered Ocean Model (NLOM).

In Situ Data

While large *in situ* oceanographic data sets, such as COADS and Levitus/World Ocean Atlas, provide "highly refined" products that can adequately provide the larger scale context within which finer scale information, when available, can be more effectively analyzed. The Atlas has acquired several collections of publicly available *in situ* measurements, including the World Ocean Database, as well as near real time data from NMFS Coral Reef Ecosystem Division moorings and drifters in the northwest Hawaiian archipelago and other US Pacific Island EEZs. Through a geographical query process on the Atlas web interface, users can see locations where in-situ measurements are available and then access profiles and time series as graphs and raw data. Currently, only the CRED instruments are queryable, though work is being done to convert the thousands of WOD profiles into a relational database format.

3. Plans for the next fiscal year (one paragraph):

The Atlas Coordinator will continue building the web interface and back end web-services, aiming for a public release early in the year. When the software is stable, the Atlas data holdings will be rounded out with data sets deemed desirable by various PFPR PI's and other potential users. Work will also need to be done with the project Principal Investigators to produce regional "hard copy" atlases at a level appropriate for scientific publications as well as documentation for the web interface and data holdings.

Numerous tools and add-ons will be developed for the atlas, enabling a higher level of control over data dimensioning, querying, and visualization. The ability to upload custom data sets to the Atlas may also be a useful tool for researchers wishing to compare their own data with the oceanographic parameters available through the Atlas, but enabling users to download subsets of Atlas data to their own computer is a higher priority.

There has been further discussion with NODC/CORIS about hosting the Atlas on their operational web servers while maintaining a development machine in Hawaii. This possibility will be more rigorously assessed now that most of the Atlas software is coming online.

4. List of papers published in refereed journals during FY 2005.

5. Other papers, technical reports, meeting presentations, etc.

Moffitt, R.A., R.E. Brainard, W. Skirving, and J. Sibert. Progress of the Oceanographic Atlas of the Pacific project. PFRP PI meeting. Nov/Dec, 2004, Honolulu, HI.

Moffitt, R.A., R.E. Brainard, A.E. Strong, W. Skirving, J. Sibert, and D. Foley. Oceanographic Atlas of the Hawaiian Archipelago: A Tool for Marine Resource Management. Presentation at the Northwestern Hawaiian Islands 3rd Scientific Symposium, Honolulu, HI, Nov 2-4, 2004.

Moffitt, R.A. The Oceanographic Atlas and Integrated Observing System Data Management. Presentation at the 2nd Coral Reef Ecosystem Integrated Observing System meeting, Honolulu, HI, Feb 15-17, 2005.

6. Graduates (Names of students graduating with MS or PhD degrees during FY 2005. Provide titles of their thesis or dissertation):

Thus far, there have been no students directly associated with this project.

7. Awards (List awards given to JIMAR employees or to the project itself during the period):

8. Publication Count (Total count of publications for the reporting period and previous periods categorized by NOAA lead author and Institute (or subgrantee) lead author and whether it was peer-reviewed or non peer-reviewed (not including presentations):

	JL Lead Author			NOAA Lead Author			Other Lead Author		
	FY03	FY04	FY05	FY03	FY04	FY05	FY03	FY04	FY05
Peer-reviewed									
Non-peer reviewed									

9. Students and Post-docs (Number of students and post-docs that were associated with NOAA funded research. Please indicate if they received any NOAA funding. For institutes that award subcontracts, please include information from your subgrantees):

Thus far, there have been no students directly associated with this project.

10. Personnel:

(i) Number of employees by job title and terminal degree that received more than 50% support from NOAA, including visiting scientists (this information is not required from subgrantees):

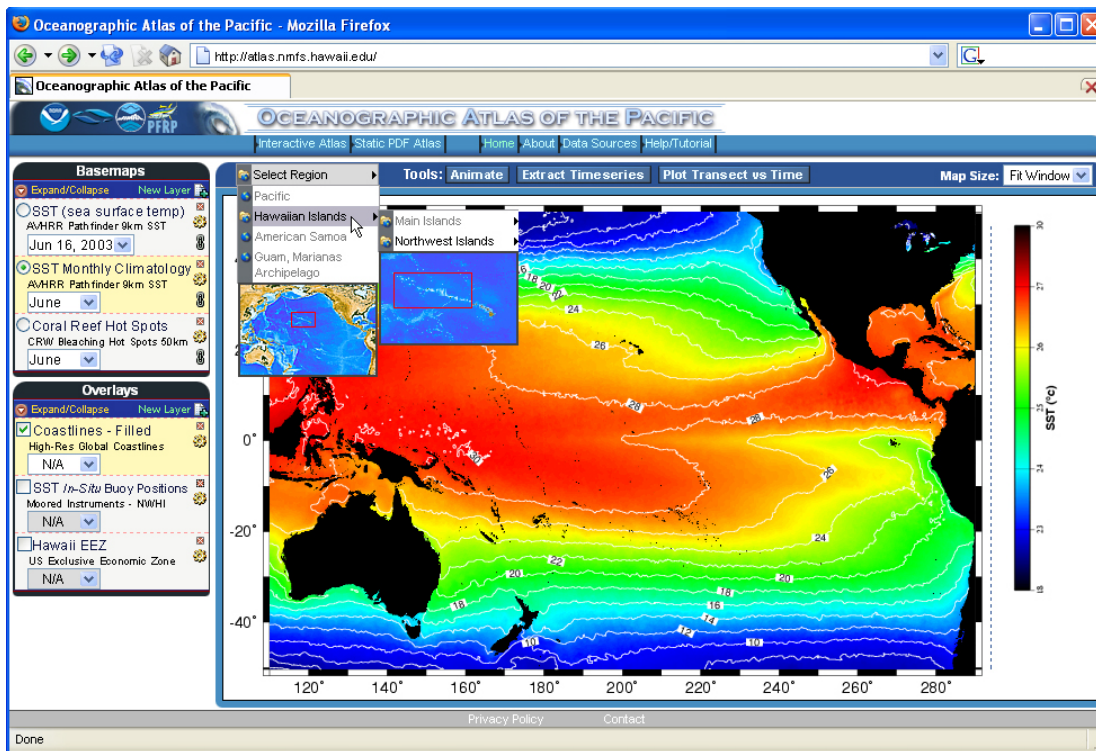
(ii) Number of employees/students that received 100% of their funding from an OAR laboratory and/or are located within that laboratory.

(iii) Number of employees/students that were hired by NOAA during the past year:



OCEANOGRAPHIC ATLAS OF THE PACIFIC

Caption 1: The Oceanographic Atlas of the Pacific, making marine environmental data accessible on the web and in print.



● Caption 2: A snapshot of the interactive Atlas website in action. The web interface allows users to visualize combinations of numerous oceanographic data collections. (June monthly climatology of Pathfinder satellite sea-surface temperature shown).