

**Progress Report for
Enhancing Northwest Association of Networked Ocean Observing Systems (NANOOS):
The Pacific Northwest IOOS Regional Association**

#NA08NOS4730290

1 December 2010 – 30 May, 2011

This progress report describes activities carried out in support of enhancing the Northwest Association of Networked Ocean Observing Systems (NANOOS). This report was compiled by Jan Newton, NANOOS Executive Director and David Martin, NANOOS Governing Council Board Chair; the co-PIs for this grant. Newton and Martin, in consultation with the NANOOS Governing Council and Executive Committee, execute the activities of this award. Per NOAA the imminent combining of RA Planning and RCOOS awards, NANOOS has begun to implement this NOAA-instituted end-state by submitting progress reports for this grant while noting outcomes from the NANOOS RCOOS grant that were enabled and accelerated by collaborative resource allocations from these complimentary Planning Grant efforts.

1) Project Summary

The goal of this project remains the same: to foster and enhance Pacific Northwest (PNW) regional partnerships in order to grow constituencies and to implement a governance structure and business plan that permit official federal certification of NANOOS as the PNW Integrated Ocean Observing System (IOOS) Regional Association and allow for the installation and long-term maintenance of a PNW Regional Coastal Ocean Observing System (RCOOS).

Stated NANOOS objectives of the project are to:

- 1) **Continue to identify and engage the full and expanding spectrum of stakeholders** having significant interests in the waters of the Pacific Northwest to ensure their views and opinions are fully recognized and taken into account in all aspects of planning, science and governance, and that this partnership building effort takes advantage of their scientific, economic, social, cultural and operational expertise.
- 2) **Proactively engage the regional ocean science community** in this partnership-building project to ensure their expertise helps guide the eventual design and evaluation of the system. This approach will ensure that PNW Regional IOOS evolves to take advantage of new knowledge and technology as they are developed.
- 3) **Obtain input about sub-regional scale oceanographic concerns** by engaging with local stakeholders to ensure these factors are addressed at the Regional level. NANOOS will work within these smaller groups to build a sense of community and partnerships at the sub-regional scale and then translate this into strong regional partnerships through larger gatherings and workshops.
- 4) **Implement the results of the consensus agreement on the overall Governance structure for NANOOS.**
- 5) **Develop and implement a Business Plan** to guide NANOOS budget formulation, involvement of users, all aspects of linkages between observations and products, research and development decisions, training, and alternate funding opportunities.
- 6) **Strengthen international and inter-Regional partnerships** by engaging with Canadian colleagues and other western Regional Association efforts to build bridges to these efforts and ensure seamless integration of these efforts.

- 7) **Continue to engage at the national level** to ensure the PNW activities of NANOOS are fully supportive of the national effort to implement and maintain an IOOS.

2) Progress and accomplishments

To achieve the above seven NANOOS Objectives, NANOOS Leadership interacts with the NANOOS Governing Council, the NANOOS Executive Committee (elected Governing Council sector representatives and Standing Committee Chairs), and three Standing Committees (Data Management and Communication = DMAC; User Products = UPC; Education and Outreach = E&O). Key highlights of NANOOS progress and accomplishments for this period that cumulatively address the objectives are listed below, with reports from each of the three standing committees and the requested additional programmatic updates following. This report encompasses efforts funded by this RA grant as well as our RCOOS grant, since all of these NANOOS activities are necessarily highly integrated.

Major activities:

- **NOPP recommends NANOOS 5-y proposal for IOOS funding** – The proposal NANOOS submitted on behalf of its Governing Council, “Sustaining NANOOS, the Pacific Northwest component of the US IOOS,” was reviewed in a merit-based process and was found to meet or exceed the minimum requirements to warrant a recommendation for funding as part of the Fiscal Year 2011 National Oceanographic Partnership Program (NOPP) Broad Agency Announcement titled “FY 2011 Implementation of the U.S. Integrated Ocean Observing System (IOOS®).”
- **NANOOS submits Y5 de-scope to NOAA** – In May 2011, NANOOS submitted a de-scoped budget and work plan commensurate with an anticipated award amount of \$2,087,500 for NANOOS in the first year of its award. NANOOS distributed the 6% reduction over its lowest modular budget submitted (\$2.2M) evenly over all activities. This represents a slight reduction from NANOOS’ current funding level of \$2.1M.
- **NANOOS attends NFRA Board and IOOS meetings** – Newton and Martin attended these semi-annual meetings on 9-11 February in Washington, DC. Martin and Newton participated in meetings with PNW congressional staff dealing with IOOS matters, accompanied by NANOOS members Norge Larson (Sea Bird Electronics, Inc.) and Penny Dalton (Washington Sea Grant).
- **NANOOS Tri-Com meeting** – NANOOS held its annual “Tri-Committee” meeting on 12-13 May in Beaverton, OR at OHSU. Each year NANOOS assembles its DMAC, User Products, and Education/Outreach Committees to update each other on accomplishments and strategically prioritize activities for the coming year. This year over 20 members participated in the 1.5-day meeting.

Other activities:

- **NANOOS and Renewable Energy** – In February, Martin attended the Regional Navy Energy Roundup at Naval Station Everett and participated in discussions in the role of renewable energy technologies (particularly wind and tidal) in reducing the Navy’s carbon footprint. In this regard, the topic of how environmental conditions monitored and provided by NANOOS could inform Navy energy management decision makers was covered.

- **NANOOS and CMSP** – Newton was invited to present NANOOS’ work and regional perspective on Coastal and Marine Spatial Planning (CMSP) at the ASLO conference 14-18 February in San Juan, Puerto Rico, in a session “Coastal and Marine Spatial Planning: current need and future challenges,” co-chaired by Zdenka Willis, IOOS Program Manager. Newton’s talk “IOOS’ role in contributing to national and regional capability for Coastal Marine Spatial Planning: A view from the NANOOS Regional Association” was one of several from the IOOS Regional Associations (RAs). This panel brought together many working in CMSP who were not as aware of the active role the RAs are providing in this arena.
- **NANOOS and animal telemetry** – Newton was invited but participated remotely to the IOOS Animal Telemetry Observations Workshop in Santa Cruz, CA on 2-3 March. She contributed, along with Heather Kekering (CeNCOOS), regarding the benefits and challenges of expanding this effort in concert within the IOOS RAs.
- **NANOOS, ACT, and International Coordination on Ocean Acidification** – Newton was invited by Venice Water Authority (Magistrato alle Acque di Venezia) and Alliance for Coastal Technologies (ACT, with support from US IOOS) to be a speaker/presenter at a workshop on “Technologies for Coast Observations” in Venice, Italy, on April 21-22, 2011 as well as to give a presentation at Ca’Foscari University in a symposium on “Marine Acidification” and to participate in ACT demonstration measurements of pCO₂ in Venice Lagoon 19-20, 2011, representing ACT Advisory Council. Newton’s talk at Ca Foscari was “Regional observing system and ocean acidification in Puget Sound” and emphasized the variability in pCO₂ measurements in estuarine systems like Puget Sound as well as how NANOOS is presenting the information. Newton’s talk “The Pacific Northwest US Regional Observing System: NANOOS” at the workshop emphasized how the IOOS / RA structure addresses both national and regional needs and issues. She was in a session with a talk from JERICO (Joint European Research Infrastructure Network for Coastal Observations) of 27 institutions from 17 nations. Newton has subsequently been invited to be on the Scientific Advisory Committee for JERICO.
- **Real-time Ocean Acidification data back on-line** – NANOOS, in collaboration with NOAA PMEL, announces availability of pCO₂ as a variable in near-real time through the NANOOS Visualization System (NVS). Begun in summer 2010, pCO₂ from NOAA sensors is live again following winter maintenance.
- **NANOOS input to UW coordination on Ocean Acidification** – Dean Graumlich of the University of Washington’s College of the Environment requested a briefing on activities at UW involving ocean acidification. Newton responded with a presentation on NANOOS observing, data servicing, and outreach/education activities.
- **NANOOS input to future Navy computing** – In May, Martin attended the CNO Strategic Studies Group (SSG) forum in Newport, RI which dealt with the U.S. Navy’s future computing and information environment. This followed an earlier visit by the SSG to UW where the concepts, philosophy, and distributed infrastructure concepts of the IOOS DMAC were presented. Depending on the final report’s release restrictions, Martin will provide the SSG’s next generation future computing needs report to the IOOS national office.

➤ **IOOS and acoustics** – Newton was invited to give a presentation at the Acoustical Society of America 161st Meeting in Seattle, WA on 23 May. Newton’s invited talk was a collaboration between APL-UW, POST, and SeaGlider authors highlighting NANOOS’ recent work with acoustics on gliders and tracking fish, as well as the broader context of opportunities for collaborations between the acoustical community and IOOS.

Newton, Alford, Mickett, Martin, Payne, and Stahr, F. 2011. *NANOOS and Opportunities for Acoustical Application in IOOS*. J. Acoust. Soc. Am. V 129(4): 2371.

➤ **NANOOS responds to requests from IOOS to support ICE, etc.** – NANOOS has supported IOOS program office requests for NANOOS input on the Blueprint Assessment, CARD, Asset Inventory, Gaps Analysis, and Milestones throughout the reporting period.

NANOOS Standing Committee updates:

➤ **NANOOS DMAC** – Co-chaired by Steve Uczekaj (The Boeing Company) and Emilio Mayorga (APL-UW) this committee, composed of members from Boeing, OHSU, UW, OSU, and DOGAMI, has weekly “tag-up” calls to achieve consistent work efforts for NANOOS DMAC. Activities for this period included: 1) weekly NANOOS DMAC and User Products Committee (UPC) joint telecon; 2) bi-weekly IOOS Regional DMAC Implementation (RDI) telecon; 3) IOOS DMAC Steering Committee weekly telecon; 4) Planning Committee for April 2011 IOOS DMAC Workshop, as one of 3 regions represented in creating the agenda and direction for the workshop; 5) annual IOOS DMAC workshop, April 26-28, Silver Spring, MD; 6) IOOS Non-Federal Asset Inventory Tiger Team; 7) participation in the annual Tri-committee meeting. Co-chairs Uczekaj and Mayorga provided a dedicated DMAC update at the May 2011 NANOOS Tri-Committee meeting and provided input to update and further develop task prioritization and tracking following the Nov. 2010 NANOOS DMAC-UPC meeting. The NANOOS DMAC and UPC teams continue to work in an effective, integrated fashion towards the prioritization, development and evaluation of data services and user products.

The NANOOS Visualization System (NVS) was enhanced through a major new release (vers. 2.5, March 30; see UPC section) and continuous asset additions and updates reflecting platform, sensor and telemetry reconfigurations, strengthening its role as a regional data aggregation, discovery and access tool. New assets include two entities providing data to NANOOS for the first time (29 USGS river gages and 2 new mooring from the Pacific Shellfish Institute), a NANOOS ocean model (OSU ROMS), and new deployments, new offerings and re-deployments from existing NVS providers (UW, OSU, CMOP, NOAA NERRS, CDIP, ICM-Mobilisa, King County, CO2 sensor data from NOAA PMEL leveraging NANOOS buoys, and new forecast model overlays and site time series extractions). NVS support for web-service-based asset data redistribution to external applications continues to be enhanced. The NVS system architecture was substantially improved via: 1) development of web and mobile services to monitor status of NVS hardware and applications; 2) strengthening NVS data-access web services for use by external applications; 3) enhancement to the backend handling of measurement metadata; 4) enhancements to the APL EIS tile server; 5) progress towards automatic detection and loading of new and updated assets from providers; and 6) support for a greater range of data services, including the NSF-sponsored CUAHSI Hydrological Information System cyberinfrastructure supported by USGS and EPA, relying on SOAP web services and WaterML encoding.

The DMAC Team continued maturing the system architecture and implementation of IOOS DMAC data services and standards through regular participation in IOOS RDI telecons and software and system enhancements. CMOP upgraded THREDDS and is now distributing historical in situ observations and irregular-grid model output for the Columbia Estuary, while OSU is using THREDDS to distribute regular-grid ROMS model output for the Oregon Shelf. The CMOP Python IOOS-Profile SOS server code in operation since 2010 is being enhanced and adapted to provide SOS access to NVS asset data. OGC WMS access is now available for CMOP models, while the NANOOS GeoServer was upgraded and its use expanded to provide better support for the Oregon tsunami evacuation zones layer and other GIS datasets relevant to regional CMSP partnerships. Work continued in the development of a NANOOS data aggregating service (ERDDAP, upgraded to vers. 1.2.8); dataset definitions are being developed and implemented to provide methods of data discovery and access that extend beyond NVS capabilities but are consistent with its asset inventory. All these enhancements were supported by extensive hardware and software upgrades, including a new OSU server hosting model image overlays and other NANOOS services, and several APL server upgrades and base-software standardizations.

The DMAC team continued to pursue partnerships and laid out initial strategies for expansion into new areas of importance to both IOOS and regional stakeholders. In particular, several strategic meetings took place regarding biological data: 1) hosted a visit to Seattle by the OBIS-USA technical lead (Philip Goldstein) in January to identify areas of collaboration with NANOOS DMAC; 2) met with Hassan Moustahfid (IOOS) and John Payne (POST) in May to discuss possible joint work; 3) discussed collaborations regarding acoustic data with VENUS and other regional partners.

➤ **NANOOS User Products Committee (UPC)** – Chaired by Jonathan Allan (Oregon Department of Geology and Mineral Industries) this committee is composed of members from Boeing, OHSU, UW, OSU, NANOOS E&O, OR Sea Grant, and NOAA. Ongoing activities for this period included weekly NANOOS DMAC and User Products Committee (UPC) teleconferences. In addition, the UPC participated in the annual Tri-committee meeting. Chair Allan provided a dedicated UPC update at the May 2011 NANOOS Tri-Committee meeting and worked with the group to update and further develop task prioritization and tracking following the Nov. 2010 NANOOS DMAC-UPC meeting.

A core focus of the NANOOS DMAC-UPC-Web sub-working group remains the provision of ongoing technical support to the NANOOS Visualization System (NVS). In addition, to this important task, the sub-working group has initiated and completed several important enhancements to the NVS portal, the Oregon Coast Tsunami evacuation portal, the NVS mobile application, and in the initial development of a new NANOOS Integrated Data Access Program.

NANOOS Visualization System (NVS): A major enhancement to NVS was released on 30 Mar 2011 as vers. 2.5. The NVS version history web page at http://www.nanoos.org/nvs/information/version_history.php provides detailed documentation for all versions. NVS 2.5 enhancements and additions include the following (see also the DMAC section, above):

- Creation of a settings tab within NVS which provides specific controls to key NVS features;
- Creation of a “Units mode” that allows the user to define units of interest. These are distinguished between Common (US Customary System) and Scientific (International System) nomenclature;
- Introduction of a dynamic y-axis range that can be modified based on two settings: Global (data are plotted based on predefined y-axis ranges) and Local (the y-axis range is optimized for each asset variable based on statistics observed over the previous 24 hours, 7 days and 30 days);
- Creation of a myNANOOS that allows users to login and predefine the look and feel of NVS according to their specific needs;
- Addition of new image overlays from forecast model assets: 1) NANOOS OSU ROMS model (SST and surface currents composite, and SST and surface currents composite optimized for commercial and recreational tuna fishermen needs); 2) NANOOS CMOP Columbia Estuary model (salinity and SST); 3) NOAA North American Mesoscale (NAM) model (surface barometric pressure, air temperature, wind speed, relative humidity); and 4) NOAA Wavewatch III NE Pacific (wind speed and direction, and wave height, period and direction); and,

These changes necessitated a significant overhaul of the original NVS database. Other enhancements within v2.5 included the creation of services that monitor the status of the NVS hardware and applications.

In addition, a substantial enhancement to the mobile NVS apps was initiated and carried through near completion during this period, with a planned release of vers. 2.0 for the iPhone and iPad scheduled for mid June 2011. New features include asset listing and user selection of favorites, location-based map centering, and incorporation of configurable units and y-axis settings.

Oregon Coast Tsunami Hazards portal: The portal was recently modified and updated in February 2011. Modifications to the portal included the addition of new evacuations maps developed for the southern Oregon coast (Bandon to the OR/CA border) and for Cannon Beach, modifications to the "map notes" and "legend" on the front page of the portal, and fixes to the print function that had broken. The portal continues to be used by the public (in lieu of paper maps that are accessible through DOGAMI), with a significant (400%) spike on March 11 in response to the Japan Tohoku earthquake and tsunami. Of this traffic, 76% visited directly, 6.5% came from Google, 4% from Facebook, and 3.25% from IOOS. The increased interest was so significant that it crashed the NANOOS Geoserver that hosted the portal. We are particularly grateful to Nicholas Lederer (NANOOS web engineer) who was able to rapidly re-start the Tsunami portal on an alternate platform.

In February 2011, NANOOS UPC chair Allan with input from UPC members and staff from the Oregon Department of Geology produced a working document that describes the conceptual look and feel of new Pacific Northwest Tsunami Hazards portal. Since then, development of the new portal has been developed and a working prototype now exists that includes the following enhancements:

- The new portal now integrates evacuation maps developed for the Washington coast;

- It includes a new stop light warning capability that is linked directly to the US West coast and Alaska Tsunami Warning Center;
- It includes greater search capabilities, including providing pop-up information on whether a particular search location is in/out of a tsunami hazard zone.
- The interface is richer and more informative.

NANOOS Integrated Data Access Program (NIDAS): Based on Environmental Research Division's Data Access Program (ERDDAP), NIDAS continues to evolve. NIDAS is a data server that aggregates oceanographic, meteorological, and remotely sensed data and model output from diverse sources, offering users the ability to visualize, browse and download available datasets, in many common file formats, via a relatively simple to use user- interface. Development on this new platform is moving forward, albeit slowly, due to the complexity of the system and limited resources. Model data and in-situ data derived from CMOP and OSU ROMS are presently being compiled and added to the NIDAS platform as a test case. A simple GUI has been developed that will enable easier access to various capabilities offered by ERDDAP.

NANOOS website: The NANOOS website continues to undergo various enhancements and modifications to its functionality and usability. In addition, NANOOS developed a web page specific to the Tohoku Earthquake and Tsunami featuring various news items about the effects of the tsunami observed along the PNW coast. NANOOS web and E&O staff also developed a series of rich Theme pages focused on Maritime Operations, Ecosystem Assessment, Fisheries & Biodiversity, Coastal Hazards, and Climate, which are already attracting significant user traffic.

➤ **NANOOS Education and Outreach Committee (EOC)** – Chaired by Nancee Hunter (Oregon Sea Grant), work during this period has primarily been completed by Amy Sprenger and Sarah Mikulak (APL-UW), with guidance and help from EOC members. The EOC is composed of members from CMOP, OR and WA Sea Grants, OSU, Hood Canal Salmon Enhancement Group, Ocean Inquiry Project, Padilla Bay National Estuarine Research Reserve, South Slough National Estuarine Research Reserve, Olympic Coast National Marine Sanctuary, and COSEE Pacific Partnerships. The EOC continues to hold monthly conference calls, providing guidance on NANOOS EO efforts and working together to build opportunities for NANOOS EO efforts. EOC members are also collaborating to seek external funding to expand the capability of ocean observing related education in the Pacific Northwest. This past spring, with Hunter as PI, NANOOS pursued funding from an EPA environmental education grant opportunity to fund a student built buoy pilot program in OR and WA.

Outreach to users: NANOOS EOC continues to reach out to different user groups including fishers, coastal community residents, and scientists. Major events during this 6 month period included the Saltwater Sportsmen's Show, Salem in OR, with over 300 attendees; and two Washington Sea Grant/COSEE Ocean Learning Communities events in Seattle, WA both aimed to encourage and support scientists in education and outreach endeavors, with a total of 140 attendees.

Outreach efforts for the past six months include generating more outreach products including new 'theme pages' on the NANOOS web portal for each of the five NANOOS focus areas, newsletters, and maintain a NANOOS Facebook presence with now more than 120 "likes", a

number which is slowly increasing every week. In response to the Japanese earthquake and tsunami, Mikulak and Sprenger posted updates of NANOOS water level data on Facebook and Mikulak compiled information from NANOOS PIs about their observations around the region: http://www.nanoos.org/features/honshu_earthquake_2011/overview.php. Mikulak has also supported outreach efforts with NANOOS partners including partnering with CMOP to assist a graduate student in writing a blog post for sciencebuzz.org and attended a PISCO-sponsored pre-season hypoxia research exchange meeting. Seachange event here?

Ocean literacy: NANOOS is partnering with informal learning centers in both Oregon and Washington. A coastal hypoxia animation created by Mikulak will be featured in a permanent exhibit at the Hatfield Marine Science Center, which is part of Oregon State University, a NANOOS member. The other group providing content to this exhibit is the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), who also provided input on this NANOOS created animation. Mikulak also continues to work with Port Townsend Marine Science Center to develop and field test a modular inter-active computer exhibit focusing on helping visitors understand different parameters (salinity, temperature, dissolved oxygen and chlorophyll) coming from buoys in the NANOOS region.

Efforts to promote use of NANOOS regional data and products to support learning in the classroom continue. Sprenger continues to work with NANOOS members and partners to provide professional development opportunities for educators and has presented to over 100 educators during the past six months. Mikulak and Sprenger supported this year's Science and Math Investigative Learning Experiences (SMILE) program at OSU for educators and 45 underserved high school students.

On the national scale, Mikulak and Sprenger assisted in the IOOS effort to support education and outreach, including compiling and creating content for the NANOOS specific IOOS one-pagers, providing content and feedback on the design of the IOOS education web portal and attending the monthly NFRA EOC conference calls.

E&O Presentations:

Sprenger, A. *Eyes on Washington Waters, Bringing Ocean Observing Data Into the Classroom.* Washington Watershed Education Teacher Training Program: Everett, WA March 5, 2011; Seattle, WA March 26, 2011; Olympia, WA May 14, 2011. (75 educators)

Mikulak, S. and A. Sprenger. *Habitat, Habitat, Have to Have a Habitat: An Oregon Ocean Habitat Game.* Science and Math Investigative Learning Experiences (SMILE) Teacher Workshop, Oregon State University, Corvallis, OR. January 28, 2011. (15 educators)

Sprenger, A. *What's in the Water? Puget Sound Marine Science Research for the Classroom.* Washington Science Teachers Association/Environmental Education Association of Washington joint Conference, Poulsbo, WA. March 19, 2011. (15 educators)

Newton, J. *Keeping Watch Over the Sea.* SEChange 2011: From Exxon Valdez to Deepwater Horizon. University of Washington College of the Environment, Seattle, WA April 2, 2011 (20 session attendees)

Outreach Events:

Addressing Broader Impact Requirements, UW College of the Environment, Seattle, WA
January 3, 2011 (75 attendees)

- NANOOS tabled with other regional education programs able to support scientist's education and public engagement efforts. Sponsored by UW College of the Environment, COSEE OLC and WA Sea Grant

Saltwater Sportsmen's Show, Salem, OR March 2011 (300 attendees)

- NANOOS booth with targeted one-pager for fishers, newsletters, stickers, pens and a laptop showing NVS at booth. Many attendees were OR saltwater fishers, most conversations were educating people about NANOOS, demonstrating the different data products of relevance to the fishing community and getting feedback on utility of data products.

Improving Your Broader Impacts Workshop, Seattle, WA June 14, 2011 (80 attendees)

- NANOOS presented a short session on how NANOOS can help researchers with their education and outreach efforts and tabled with other regional education programs able to support such efforts. Newton addressed an audience on what NANOOS has to offer specifically regarding educational uses and resources as well as links to others. Sponsored by UW College of the Environment, COSEE OLC and WA Sea Grant.

➤ **Ongoing IOOS-related activity:**

➤ ***NANOOS participation in NFRA and IOOS***

- o Newton and Martin participate in the monthly NFRA Board phone conferences.
- o Newton participates in NFRA Executive Committee teleconference calls and meetings.
- o Sprenger participates in the NFRA-IOOS led Education and Outreach teleconferences.

➤ ***NANOOS participation in ACT***

Newton is the Co-Chair of Advisory Council of the Alliance for Coastal Technologies (ACT). As such, she participates in the scheduled meetings and teleconference calls.

➤ ***NANOOS integration with CMOP***

Throughout the reporting period, Martin and Newton remained deeply involved with a complimentary research ocean observing effort in the Pacific Northwest, the NSF-funded Science and Technology Center (STC) for Coastal Margin Observation and Prediction, which NANOOS leverages heavily in the areas of DMAC and Education and Outreach. Martin serves as Co-Director for the Center and Newton directs the UW Education efforts for this multi-institution project.

➤ ***NANOOS programmatic status updates***

- o RA organizational structure:
Changes: None. Our election of the Governing Council's Executive Committee will be in August 2011.

3) Scope of work – We had no changes to our statement of work. We neither anticipate changes to our statement of work, nor problems in meeting objectives of this effort.

4) Leadership personnel – No changes.

5) Budget analysis – Due to uncertainties in funding level and timing of the combined RA-RCOOS award NANOOS took two actions: we requested and were granted a no-cost extension for this award, and, as reported last time, we continued spending highly conservatively in order to preserve funds as much as possible, in anticipation that the new funds will not arrive on the projected started date of 1 June 2011.

At the end of this reporting period (1 December 2010 through 30 May 2011), NANOOS has obligated 93% of its anticipated expenditures in support of this project while we have expended 76% of our allotted time (including the no-cost extension).

NANOOS will encounter difficulty if new funds are not forthcoming soon, but at this point in time we remain functional and capable of meeting IOOS/NANOOS objectives within the constraints of available funds.