I. Background

The PacIOOS data management system (DMS) for archiving and serving data and model output for the Pacific region has been developing over the past several years from two separate grants from NOAA. This document provides some historical background for the DMS, an overview of the working system, and a plan for future activities. It is specifically for the DMS, but since this interconnects many different component groups these are also described. The following section provides an historical background of IOOS and PacIOOS.

A. National System

The Global Earth Observation System of Systems (GEOSS) is an international program to study the Earth as an integrated system. The ocean component is known as GOOS, the Global Ocean Observing System. The U.S. contribution to GOOS is the Integrated Ocean Observing System (IOOS). IOOS is the oceans and coasts component of the U.S. Integrated Earth Observation System (IEOS), and thus the U.S. contribution to the oceans and coasts component of GEOSS.

IOOS is a system of systems that routinely and continuously provides quality controlled data and information on current and future states of the oceans and Great Lakes from the global scale of ocean basins to local scales of coastal ecosystems. It is a multidisciplinary system designed to provide data in forms and at rates required by decision makers to address seven societal goals:

1. Improve predictions of climate change and weather and their effects on coastal communities and the nation;
2. Improve the safety and efficiency of maritime operations;
3. Mitigate the effects of natural hazards more effectively;
4. Improve national and homeland security;
5. Reduce public health risks;
6. Protect and restore healthy coastal ecosystems more effectively; and
7. Enable the sustained use of ocean and coastal resources.

Providing the data and information needed to address these goals requires an "integrated" observing system that does the following:

- Efficiently links observations, data communications and management, and data analysis and modeling (to form an "end-to-end" system);
- Provides rapid access to multi-disciplinary data from many sources;
- Serves data and information required to achieve multiple goals that historically have been the domain of separate agencies, offices or programs;
- Efficiently links advances in science and technology to the development of operational capabilities; and

- Involves cross-cutting partnerships among federal and state agencies, the private sector, and academic institutions.

The provision of data and information needed to address these goals also requires a hierarchy of observations from the global ocean to coastal ecosystems. Thus, the IOOS is being designed and implemented as two interdependent components, global and coastal. The coastal component consists of a National Backbone (NB) for the Nation's Exclusive Economic Zone (EEZ) and Great Lakes, with Regional Coastal Ocean Observing Systems (RCOOS's) nested within it.

The IOOS efficiently links three subsystems: (1) data analysis and modeling, (2) data management and communications, and (3) observations and data telemetry. The modeling and data management subsystems are the IOOS integrators and cannot (and should not) be "stove piped" specifically to any given observing subsystem element or exclusively to the global ocean component, the NB or to RCOOS's.

The "Observing and Data Telemetry Subsystem" consists of coastal and global components that include both remote (satellite-, aircraft- and land-based) and *in situ* sensing. The NB focuses on the Nation's EEZ and Great Lakes; measures and transmits data on core variables needed by all or most regions and for national scale decision making; establishes sentinel stations for early detection of large scale effects of the oceans and land-based inputs; and links global to local scales of variability. RCOOS's enhance the NB by increasing the density of observations and the number of variables measured based on data and information needs of decision makers in the respective regions.

The US component is organized at present into 11 Regional Associations (see Figure 1):

1. Alaska Ocean Observing System (AOOS)
2. Caribbean Regional Association (CaRA)
3. Central and Northern California Ocean Observing System (CeNCOOS)
4. The Gulf of Mexico Coastal Ocean Observing System (GCOOS)
5. Great Lakes Observing System (GLOS)
6. Mid-Atlantic Coastal Ocean Observing Regional Association (MARACOOS)
7. Northwest Association of Networked Ocean Observing Systems (NANOOS)
8. Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS)
9. Pacific Integrated Ocean Observing System (PacIOOS)
10. Southern California Coastal Ocean Observing System (SCCOOS)
11. Southeast Coastal Ocean Observing Regional Association (SECOORA)

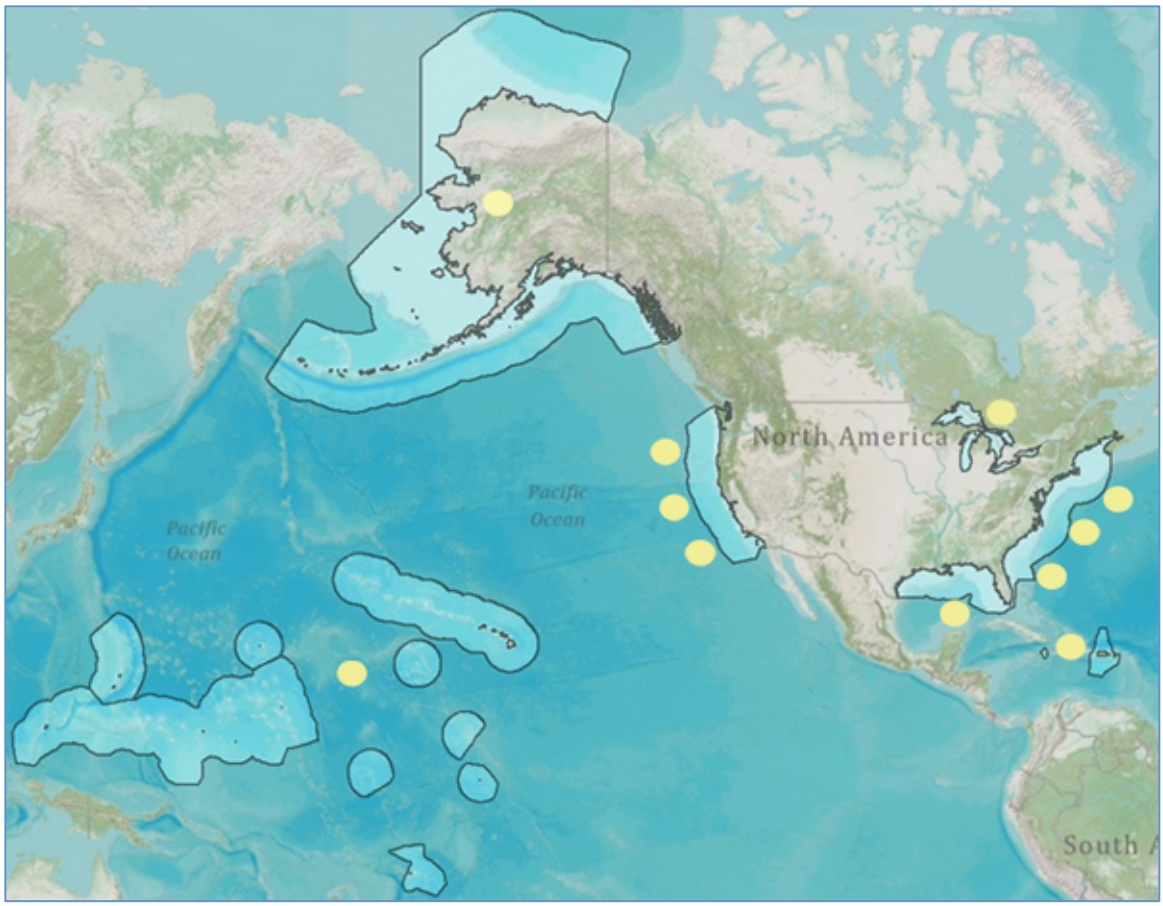

Figure 1. IOOS regional association domains.

B. Regional Association – PacIOOS

The regional ocean observing system in the Pacific began under two separate grants from NOAA. The first was an award (June 2005) to the East West Center (EWC) to establish PacIOOS. The final year of this award was transferred to SOEST in October 2007 and was managed by Sea Grant. The second award was much larger and was obtained via a proposal from SOEST. This grant was entitled "The Hawaii Pacific Ocean Observing Information System (HIPOOIS)", and established the Hawaii Integrated Ocean Observing System (HiOOS). HIPOOIS was envisioned to be a pilot project for HiOOS, while HiOOS was viewed as a sub-regional system within PacIOOS. Two follow-on grants were then award, one to extend PacIOOS for another three years, and the other was a single-year grant to extend HiOOS to end at the same time as the new PacIOOS grant. In 2011 an all-encompassing, five-year grant was awarded from NOAA. At this point, HiOOS was discontinued as a brand, and all future activities were referred to as PacIOOS.

In the early stages of both HiOOS and the concurrently developing PacIOOS, the data management system was based exclusively on components outlined in the HIPOOIS proposal. Other observations on-going in the region, *e.g.*, the Hawaii Ocean Time-

series (HOT), were presumed to have existing data management and data serving systems in place.

The HiOOS effort was organized around two cross-cutting themes. One of these themes was referred to as "catalyst projects", of which there were four, listed below with project leads:

1. Coastal ocean-state and forecast (Mark Merrifield, Roger Lukas and Doug Luther),
2. Coastal resiliency (Chip Fletcher),
3. Automated water quality sensing (Eric DeCarlo and Grieg Steward), and
4. Marine ecosystem stewardship (John Sibert, Kim Holland and Whitlow Au).

The other theme was called the "component groups":

1. Kilo Nalu cabled ocean observatory (Geno Pawlak),
2. HF Radio (Pierre Flament),
3. Near-shore sensors (Margaret McManus),
4. Ocean gliders (Glenn Carter),
5. Waves and water level (Mark Merrifield),
6. Coastal resiliency (Chip Fletcher and Ben Brooks),
7. Water quality (Eric DeCarlo and Grieg Steward),
8. Event response (Eric DeCarlo and Geno Pawlak),
9. Acoustic monitoring of fish (John Sibert and Kim Holland),
10. Acoustic monitoring of cetaceans (Whitlow Au),
11. Modeling (ocean, atm and wave; Brian Powell),
12. Data management (Jim Potemra), and
13. Outreach and education (Marcie Grabowski).

While the data management group focused on web page development and data services for these specific components (with a Hawaii focus), a parallel activity was initiated for PacIOOS. Through stakeholder meetings and informal interactions with people in the regions, two different data services were identified: GIS or map-based for the insular Pacific and data transport of real-time and forecast information for Hawaii. These two distinct servers will continue to run independently but will be linked together via web pages and search/access tools.

Due to staff turnover and reorganization, the component groups are now:

1. HF radio (Flament)
2. Near-shore sensors (McManus)
3. Gliders (Carter)
4. Waves and water level (Merrifield and Luther)
5. Water quality buoys (DeCarlo)
6. Modeling (Powell)
7. Data management (Potemra)

8. Outreach and Program Coordinator (Langenberger)
9. Director (Iwamoto)

These are described in more detail in the following section.