Glossary of Terms

ACID (Atomicity, Consistency, Isolation, Durability): a set of properties that guarantee that database transactions are processed reliably. In the context of databases, a single logical operation on the data is called a transaction. For example, a transfer of funds from one bank account to another, even though that might involve multiple changes (such as debiting one account and crediting another), is a single transaction.

ACO (ALOHA Cabled Observatory): a bottom-mouted observatory near the HOT station that is cabled to shore. Instruments include a camera, hydrophone, ADCP and others.

ADCP (Acoustic Doppler Current Profiler): a device to measure currents by active acoustics.

AIS (Automatic Identification System): an automatic tracking system used on ships for identifying and locating vessels by electronically exchanging data with other nearby ships and AIS Base stations. International law requires international voyaging ships with gross tonnage (GT) of 300 or more tons, and all passenger ships regardless of size. PacIOOS uses AIS feeds to show ship locations on the Data Viewer.

AJAX (Asynchronous Javascript and XML): a group of interrelated web development techniques used for creating interactive web applications or rich Internet applications. With Ajax, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. Data are retrieved using the XMLHttpRequest object or through the use of Remote Scripting in browsers that do not support it.

AOOS (Alaska Ocean Observing System): IOOS regional association for Alaska (http://aoos.org).

ASCII (American Standard Code for Information Interchange): basic, "human readable" data format (aka "text files").

ASP (Active Server Pages): Microsoft's server-side script language.

Apache tomcat: web container or application server (java-based), this is the main "engine" through which almost all the PacIOOS data servers run.

AWstats (Advanced Web Statistics): tool that generates advanced web, streaming, ftp or mail server statistics, graphically.

CDIP (Coastal Data Information Program): run through Scripps/UCSD, it specializes in wave measurement, swell modeling and forecasting, and the analysis of coastal environment data.

CDM (Common Data Model): an abstract data model for scientific datasets developed by Unidata. It merges the netCDF, OPeNDAP, and HDF5 data models to create a common API for many types of scientific data

CGI (Common Gateway Interface): Standard defined by the Object Management Group (OMG) that enables software components written in different languages and running on multiple computers to work together.

CSS (Cascading Style Sheets): a language for formatting web pages, CSS defines how a web page is displayed (format).

CWS (Catalog Web Service): also know as CSW, or catalog service for the web, it defines common interfaces to discover, browse, and query metadata about data, services, and other potential resources. PacIOOS is presently running two: RAMADDA and GI-CAT.

CaRA (Regional Association for the Caribbean): IOOS RA for the Caribbean (http://cara.uprm.edu).

CeNCOOS (Central California Coastal Observing System): IOOS RA for Central and Northern California (http://cencoos.org); data services are provided by SAIC.

CF (Climate and Forecast): convention for NetCDF data, follow-on to COARDS, it specifies various things such as variable names, units, *etc.* in NetCDF files.

COARDS (Cooperative Ocean/Atmosphere Research Data Service): early convention for NetCDF data, GrADS relies on COARDS-compliant data.

DAPPER: OPeNDAP web server developed by the EPIC group at PMEL that provides networked access to in situ and gridded data. DAPPER is run by PacIOOS to support DChart.

DBEDT (Department of Business Economic Development and Tourism): Hawaii State agency for economic and statistical data, business development opportunities, energy and conservation information, and foreign trade advantages.

DChart: a web-based server for display of *in situ* and gridded data sets. DChart accesses data in a MySQL database via DAPPER. Similar to LAS, it was developed at NOAA/PMEL.

DE (Data Explorer): term given to the PacIOOS map viewer developed by J. Maurer (http://pacioos.org/map) .

DIF (Data Integration Framework): IOOS program initiative to coordinate the data management groups from each region (and to promote data interoperability between the regions), in practice DIF was a network of data management leads from the RA's. The DIF technically was a three year pilot project that is now complete.

DMAC (Data Management and Communication): Generic term for the data management activities in IOOS, it was originally started by a NOAA-funded effort to develop a plan for data management in the geosciences.

DMG (Data Management Group): term to identify the PacIOOS data team.

DMS (Data Management System): term to identify the PacIOOS system for handling data streams and distribution.

DODS (Distributed Oceanographic Data System): The original term for the data transport mechanism now referred to as OPeNDAP or DAP.

DT (DataTurbine): DataTurbine is a real-time streaming data engine that allows for live-streaming data from experiments, labs, web cams and even Java enabled cell phones. It acts as a "*black box*" to which applications and devices send and receive data. It can receive data from various sources (experiments, web cams, *etc.*) and send data to various sinks (visualization interfaces, analysis tools, databases, *etc.*).

ebRIM-CIM (e-business Registration Model-Core ISO Metadata): ebRIM is a specific "registry information model", and the CIM is a specific "catalog of ISO metadata).

EEZ (Exclusive Economic Zone): Under the law of the sea, it is a sea zone over which a state has special rights over the exploration and use of marine resources, including production of energy from water and wind. It stretches from the seaward edge of the state's territorial sea out to 200 nautical miles from its coast. In colloquial usage, the term may include the territorial sea and even the continental shelf beyond the 200-mile limit.

ERD (Environment Research Division): Group at the NOAA Southwest Fisheries Science Center responsible for creating ERDDAP.

ERDDAP (Environmental Research Division Data Access Program): Multi-
dimensional web service that incorporates OPeNDAP, mapping, data
downloads, *etc*. It is one of the core data services at PacIOOS.

ESRI (Environmental Science Research Institute): Commercial developer of GIS
software, ESRI tools are probably the most popular in the community.

FDS (Ferret DODS Server): OPeNDAP server that comes bundled with the Live
Access Server (only used as a backend for LAS).

FGDC (Federal Geographic Data Committee): a United States government committee
which promotes the coordinated development, use, sharing, and
dissemination of geospatial data on a national basis. The FGDC coordinates
the sharing of geographic data, maps, and online services through an online
portal, http://geodata.gov, that searches metadata held within the NSDI
Clearinghouse Network

FTP (File Transfer Protocol): a network protocol used to transfer data from one
computer to another (at present PacIOOS does not run an FTP service but
relies on the SOEST one).

GBIF (Global Biodiversity Information Facility): is an international organization that
focuses on making scientific data on biodiversity available via the Internet
using web services. The data are provided by many institutions from around
the world; GBIF's information architecture makes these data accessible and
searchable through a single portal. Data available through the GBIF portal are
primarily distribution data on plants, animals, fungi, and microbes for the
world, and scientific names data.

GCOOS (Gulf Coast Ocean Observing System): IOOS regional association for the Gulf
(http://goos.org).

GCMD (Global Change Master Directory): a directory of Earth Science data sets and
related tools/services, many of which are targeted for the use, analysis, and
display of the data. The directory holds more than 23,000 data set
descriptions, known as DIFs (Directory Interchange Format). This format is
compatible with the Federal Geographic Data Committee's (FGDC) standard
and the international ISO 19115 standard. The purpose of the directory is to
provide users with information on the availability of data and services that
will meet their needs, along with efficient access to those data and services.
Links are provided, when available, to connect directly to the data or services
of interest. The directory is part of NASA's Earth Observing System Data and
Information System (EOSDIS) and also serves as NASA's contribution to the
Committee on Earth Observation Satellites (CEOS), through which it is also
known as the International Directory Network (IDN).

GDAL (Geospatial Data Abstraction Library): library for reading and writing raster geospatial data formats.

GDS (GrADS DODS Server): OPeNDAP server developed by COLA, the group that maintains the GrADS software. It is more flexible in the types of data that it can read (*e.g.*, unlike TDS, it is not restricted to NetCDF data), but it is not presently used by PacIOOS.

GEOSS (Global Earth Observing System of Systems): GEOSS seeks to connect the producers of environmental data and decision-support tools with the end users of these products, with the aim of enhancing the relevance of Earth observations to global issues. The result is to be a global public infrastructure that generates comprehensive, near-real-time environmental data, information and analyses for a wide range of users

GFS (Global Forecast System): global numerical weather prediction computer model run by NOAA. This mathematical model is run four times a day and produces forecasts up to 16 days in advance, but with decreasing spatial and temporal resolution over time.

GIS (Geographical Information System): a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. The acronym GIS is sometimes used for geographical information science or geospatial information studies to refer to the academic discipline or career of working with geographic information systems. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology.

GLOS (Great Lakes Observing System): Regional association for the Great Lakes, http://glos.org.

GML (Geographic Markup Language): OGC defined XML used to express geographical features (features are objects that represent physical entities, *e.g.*, a river or road).

GOOS (Global Ocean Observing System): global system for sustained observations of the ocean comprising the oceanographic component of the Global Earth Observing System of Systems (GEOSS). GOOS is administrated by the Intergovernmental Oceanographic Commission (IOC), and joins the Global Climate Observing System, GCOS, and Global Terrestrial Observing System, GTOS, as fundamental building blocks of the GEOSS.

GRIB (Gridded Binary or General Regularly-distributed Information in Binary): mathematically concise data format commonly used in meteorology to store historical and forecast weather data. It is standardized by the World Meteorological Organization's Commission for Basic Systems.

GrADS (Grid Analysis and Display System): Graphical analysis program developed by COLA, it is one of the more popular client tools for accessing and displaying geophysical data. Some PacIOOS animations are generated using GrADS scripts (*e.g.*, model forecasts).

HDF (Hierarchical Data Format): set of file formats and libraries designed to store and organize large amounts of numerical data. Originally developed at the National Center for Supercomputing Applications, it is currently supported by the non-profit HDF Group. It is mostly used for image-type data such as from satellites.

HFR (High Frequency Radar or High Frequency Radio): System that uses a Doppler shift from an active signal/receiver to determine near-surface ocean velocities. PacIOOS presently has three active HFR sites. Note that individual sites give radial currents; two overlapping systems are needed to get vector currents.

HIOOS (Hawaiian Islands Ocean Observing System): Original name for PacIOOS subcomponent for the Hawaii Islands, the name was discontinued in 2011.

HIPOIS (Hawaii Islands Pacific Ocean and Information System): Name of the pilot program that essentially started major OOS activities in Hawaii (this was the initial grant to SOEST to start regional IOOS work).

HOT (Hawaii Ocean Time-series): An ocean site for repeated observations, HOT was started in late-1980's and continues to present. Roughly monthly cruises occupy a station (ALOHA) north of Oahu.

HTML (Hypertext Markup Language): a language for making web pages; defines what get displayed on a web page.

HTTP (Hypertext Transfer Protocol): hypertext transfer protocol, a request/response protocol between a server and client for transferring web page information, it is run through apache.

IEEE (Institute of Electrical and Electronics Engineers): non-profit professional association headquartered in New York City that is dedicated to advancing technological innovation and excellence.

IOOS (Integration Ocean Observing System): organization 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. The IOOS office provides funding and oversight for the program.

ISO (International Organization for Standardization): international standard-setting body composed of representatives from various national standards organizations.

IT (Information Technology)

JSON (JavaScript Object Notation): lightweight text-based open standard designed for human-readable data interchange. It is derived from the JavaScript scripting language for representing simple data structures and associative arrays, called objects. Despite its relationship to JavaScript, it is language-independent, with parsers available for many languages.

JSP (Java Server Pages): technology that helps software developers create dynamically generated web pages based on HTML, XML, or other document types. Released in 1999 by Sun Microsystems, JSP is similar to PHP, but it uses the Java programming language.

LAS (Live Access Server): web-based data browsing tool developed at NOAA/PMEL, it is one of the main tools for on-the-fly creation of plots in the PacIOOS system.

MARACOOS (Mid-Atlantic Regional Association Coastal Ocean Observing System): Regional association for the Mid-Atlantic (http://maracoos.org).

Mapserv: a specific type of open-source web map server (not currently used in PacIOOS).

MySQL: multi-threaded, multi-user SQL database management system; in PacIOOS mainly used for DAPPER data and web-pages.

NANOOS (Northwest Association for Networked Ocean Observing Systems): Regional association for the Pacific Northwest region (http://nanoos.org).

NB (National Backbone): Concept promoted by IOOS to have a National system that ingests all the region data onto a central grid or backbone. This will be maintained by one of the national centers such as NDBC.

NCDC (National Climate Data Center): One of NOAA's national data centers, it focuses on climate-related data.

NDBC (National Data Buoy Center): One of NOAA's national data centers, it focuses on real-time, *in situ* observations.

NERACOOS (Northeast Regional Assoc. of the Coastal Ocean Observing System): Regional association for the Northeast Atlantic (http://neracoos.org).

NOAA (National Oceanographic and Atmospheric Administration)

NODC (National Oceanographic Data Center): One of NOAA's national data centers, it focuses on oceanographic data.

NSS (Near-shore Sensor): Instruments deployed by PacIOOS that are typically fixed to piers or other similar structures.

NcML (NetCDF Markup Language): XML representation of netCDF metadata, (approximately) the header information one gets from a netCDF file with the "ncdump -h" command. NcML is similar to the netCDF CDL (network Common data form Description Language), except, of course, it uses XML syntax.

NetCDF (Network Common Data Format): s a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data. The project homepage is hosted by the Unidata program at the University Corporation for Atmospheric Research (UCAR). They are also the chief source of netCDF software, standards development, updates, etc. The format is an open standard.

OBIS (Ocean Biogeographic Information System): web-based access point to information about the distribution and abundance of living species in the ocean.

OGC (Open Geospatial Consortium): international voluntary consensus standards organization, originated in 1994. In the OGC, more than 400 commercial, governmental, nonprofit and research organizations worldwide collaborate in a consensus process encouraging development and implementation of open standards for geospatial content and services, GIS data processing and data sharing. The OGC standards baseline comprises more than 30 standards, including: CSW, GML, KML, OWS, SOS, SensorML, WCS, WFS, WMS, *etc.*

OPeNDAP (Opensource Project for Network Data Access Protocol): a data transport architecture and protocol based on http, it allows client software to access data without the need to download.

OTPS (OSU Tide Prediction System): Tide model developed at the Oregon State University, PacIOOS uses this for producing Pacific-wide barotropic tide forecasts.

OWS (OGC Web Service Common):

PHP (hypertext preprocessor, originally called personal home page): hypertext preprocessor, a scripting language designed for producing dynamic web pages (used for server-side scripting).

PMEL (Pacific Marine Environmental Laboratory): A NOAA lab that has (at least) two groups providing data-server software. One group maintains LAS; another DAPPER/DChart.

PacIOOS (Pacific Islands Ocean Observing System): Regional association for the Pacific Islands (http://pacioos.org).

PostGIS: program that adds support for geographic objects into PostgreSQL relational database.

PostgreSQL (aka Postgres): object-relational database management system (ORDBMS), it is released under the PostgreSQL License and is thus free and open source software. It has extensible data types, operators, index methods, functions, aggregates, procedural languages, and has a large number of extensions written by third parties.

RA (Regional Association): Organizational entity of IOOS, there are eleven based on geographical domains.

RAID (Redundant Array of Independent Disks): originally redundant array of inexpensive disks) is a storage technology that combines multiple disk drive components into a logical unit. Data are distributed across the drives in one of several ways called "RAID levels", depending on what level of redundancy and performance (via parallel communication) is required. RAID is now used as an umbrella term for computer data storage schemes that can divide and replicate data among multiple physical drives. The physical drives are said to be *in* a RAID array, which is accessed by the operating system as one single drive. The different schemes or architectures are named by the word RAID followed by a number (e.g., RAID 0, RAID 1). Each scheme provides a different balance between two key goals: increase data reliability and increase input/output performance.

RAMADDA (Repository for Archiving Managing and Accessing Diverse Data): Catalog and metadata service designed by Unidata.

RBNB (Ring Buffered Network Bus): data structure that uses a single, fixed-size buffer as if it were connected end-to-end. This structure lends itself easily to buffering data streams.

RCOOS (Regional Coastal Ocean Observing System): IOOS was originally cast around coastal regions, and these regions were referred to as RCOOS; now they are mainly RA's or components of RA's.

RDBMS (Relational Database Management System): a database management system (DBMS) that is based on the relational model. Most popular databases currently in use are based on the relational database model in which data are stored in tables and the relationships among the data are also stored in tables. The data can be accessed or reassembled in many different ways without having to change the table forms.

REST (Representational State Transfer): approach to developing web services (it's an alternative to CORBA).

ROMS (Regional Ocean Modeling System): Open-source, community support numerical model for ocean circulation.

RPC (Remote Procedure Call): a network protocol that allows a computer program running on one host to cause code to be executed on another host.

SAS (Sensor Alert Service): currently not implemented by PacIOOS.

SCCOOS (Southern California Coastal Ocean Observing System): Regional association for Southern California (run through Scripps/UCSD).

SCUD (Surface Currents from Diagnostic Model): estimate of currents from satellite sea level and winds, normally used for near-surface applications like drifting debris.

SECOORA (Southeastern Coastal Ocean Observing System): Regional association for the Southeastern US (http://secoora.org).

sensorML (Sensor Markup Language): OGC standard for providing descriptions of sensor systems; provides sensor discovery, sensor geolocation, *etc.*

SOAP (Simple Object Access Protocol): a protocol for exchanging XML based messages over a network using http.

SOEST (School of Ocean and Earth Science and Technology): The mother ship.

SOS (Sensor Observation Service): similar in a sense to OPeNDAP, SOS provides a mechanism for users to access data feeds without downloading. It is used for point measurements. PacIOOS is currently running the OOSTETHYS implementation.

SPS (Sensor Planning Service): currently not implemented in PacIOOS.

SQL (Structured Query Language): programming language designed for managing data in relational database management systems (RDBMS). Originally based upon relational algebra and tuple relational calculus, its scope includes data insert, query, update and delete, schema creation and modification, and data access control.

SQlite: ACID-compliant embedded relational database management system contained in a small C programming library. SQLite implements most of the SQL standard, using a dynamically and weakly typed SQL syntax that does not guarantee the domain integrity. In contrast to other database management systems, SQLite is not a separate process that is accessed from the client application, but an integral part of it.

SWFSC (Southwest Fisheries Science Center): NOAA lab that is responsible for developing ERDDAP.

TDS (THREDDS DODS Server): the main OPeNDAP server used by PacIOOS, it is developed by Unidata. It requires NetCDF for the input files, but provides data in aggregated (if appropriate) and best time series mode, along with ancillary services such as ncIOS, ncWMS, *etc*.

THREDDS (Thematic Realtime Environmental Distributed Data System): Middleware used to link data in a flat-file system to users, THREDDS and TDS are the main data transport tool provided by PacIOOS.

UH (University of Hawaii)

UHSLC (University of Hawaii Sea Level Center): main archive for tide gauge data.

URI (Uniform Resource Identifier): Uniform resource identifier is a compact string of characters used to identify a name or a resource on the web. URI's can be names (URN) or locations (URL) or both.

URL (Uniform Resource Locator): A URL is technically a type of uniform resource identifier (URI) but in many technical documents and verbal discussions URL is often used as a synonym for URI. URL's consists of some of the following: the scheme name (commonly called protocol), followed by a colon, two slashes, then, depending on scheme, a server name (exp. ftp., www., smtp., *etc.*) followed by a dot (.) then a domain name (alternatively, IP address), a port number, the path of the resource to be fetched or the program to be run, then, for programs such as Common Gateway Interface (CGI) scripts, a query string, and an optional fragment identifier.

URN (Uniform Resource Name): a uniform resource identifier (URI) that uses the *urn* scheme and does not imply availability of the identified resource. Both

URNs (names) and URLs (locators) are URIs, and a particular URI may be a name and a locator at the same time.

WCS (Web Coverage Service): interface standard allowing requests for geographical coverage (gridded GIS-type files, or objects/images). Unlike WMS or GoogleMap that return only an image, WCS allows users to analyze the output. GML furnishes the default payload-encoding (but can also be a shapefile).

WCS (Web Catalog Service): The OGC Catalog Service defines common interfaces to discover, browse, and query metadata about data, services, and other potential resources. PacIOOS is experimenting with two: RAMADDA and GI-CAT.

WFS (Web Feature Service): interface standard allowing requests for geographical features (points on a map; individual locations).

WMS (Web Map Service): a way of providing geo-referenced images via a service.

WQB (Water Quality Buoy): Name for PacIOOS bottom-anchored near-shore buoys that measure a variety of things.

WRF (Weather Research and Forecasting): Numerical model for simulating atmospheric circulation.

WSDL (Web Service Definition Language): XML-based language that provides a model for describing Web services. WSDL is often used in combination with SOAP and XML Schema to provide web services.

WW3 (Wave Watch III): Numerical model for simulating ocean waves, it is mainly for open-ocean wind- and swell-waves.

XENIA: relational database; obskml in and out, PostgreSQL or SQlite or MySQL in the middle.

XML (Extendable Markup Language): a language for transferring information about documents or data across the web.