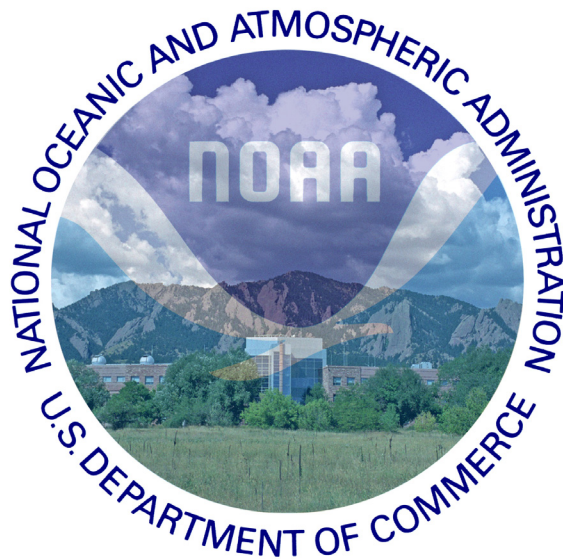


K. Data Contributions



ESRL Physical Sciences Laboratory Review

David Skaggs Research Center
Boulder, Colorado
March 9-12, 2010

GSD Data Contributions

Contributions to national and GEOSS-related data bases and programs and involvement in international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

Indicators of Preeminence Among ESRL's Global Systems Division Staff

GEO-IDE

ESRL contributed to GEOSS via a project called the Global Earth Observation Integrated Data Environment (GEO-IDE). This was a cross-organization NOAA group that helped define a web services structure to integrate NOAA's data management systems. The group met for several years and produced a document that was presented to the NOAA Data Management Committee. The document contained a description of the services-based system and recommended actions. We believe GEO-IDE is slated to receive \$2M in funding this fiscal year to work further on this effort.

WMO

In the last several years, ESRL scientist, Bill Moninger, has served as an invited participant as a "U.S. Technical Expert" for the World Meteorological Organization's (WMO) Automated Meteorological Data and Reporting (AMDAR) panel. This panel meets annually to manage and assess the global AMDAR data set. AMDAR is the set of automated upper-air weather reports from commercial aircraft. AMDAR provides about a quarter of a million measurements of wind, temperature, and some turbulence and vapor information, per day. These data are critical inputs to numerical weather prediction (NWP) models.

Local Analysis and Prediction System (LAPS) and Global Positioning System (GPS) Calibration-Validation of Satellite Moisture Data

These data corrections were made in two parts.

1. ESRL has made in-house corrections to Geostationary Operational Environmental Satellite (GOES) moisture products via our LAPS analysis. The LAPS analysis does incorporate a variational-gradient assimilation that eliminates bias from all satellite moisture product (total precipitable water) assimilation. These products cover the Continental United States (CONUS) and were possibly distributed to entities out side of the U.S.

But on a larger scale, ESRL has distributed the LAPS analysis system all over the world and the system contains the variational bias correction algorithm. In this sense, we have made an international contribution to reducing satellite bias in data assimilation since LAPS is used throughout the world.

2. ESRL publicly demonstrated calibration/validation problems with the current GOES retrievals in that they were moist-biased. ESRL scientists strongly believe that this spawned an effort to improve the retrieval algorithm. A corrected algorithm is in the process of being transferred from the Cooperative Institute for Meteorological Satellite Studies (CIMSS) -

University of Wisconsin affiliate with the National Environmental Satellite Data and Information Service (NESDIS) to NESDIS for operations. At the same time, we have validated that the new algorithm is a big improvement not only for GOES, but for polar orbiter retrieval computations as well. In this sense, we did not correct the algorithm, but undoubtedly had a hand in bringing the problem to light and have validated the improvement.

In addition:

1. ESRL has encouraged and participated in the free and open exchange of global atmospheric observations and promoted the testing, evaluation, and use of Ground-Based GPS Meteorology (GPS-MET) tools and techniques through the WMO, International Union of Geodesy and Geophysics (IUGG), International Global Navigation Satellite System (GNSS) Service (IGS), International Committee on GNSS (ICG), and affiliated organizations.
2. ESRL has also promoted international capacity building and transfers of technologies to various countries including India, China (People's Republic of China and Taiwan), Korea, Canada, and most recently, South Africa.
3. Through peer-reviewed papers, ESRL scientists have pioneered the use of GPS-MET for radiosonde quality control and calibration, validation of satellite moisture observations and derived products, and the assessment of numerical weather prediction models.
4. ESRL is currently involved in an experiment to assess the long-term characteristics of off-shore satellite observations and their impact on weather forecast accuracy (primarily precipitation). These data and derived products will be available through our web site at http://gpsmet_test.fsl.noaa.gov.

Betsy Weatherhead

Dr. Weatherhead is involved in the following four GOESS-related activities:

1. She serves as a member of the World Meteorological Organization's (WMO) Scientific Advisory Group for Ultra-Violet (UV) Radiation.
2. She represented Unmanned Aircraft at the most recent WMO Global Atmospheric Watch review in Geneva, Switzerland.
3. She hosts the WMO UV data pages to promote access to data.
4. The data NOAA collected with Unmanned Aircraft in Greenland in summer, 2009 is linked to GEOSS through the National Snow and Ice Data Center.

MADIS

The U.S. contribution to GEOSS is the Integrated Earth Observation System (IEOS). The Architecture and Data Management Working Group for the IEOS has listed GSD's Meteorological Assimilation Data Ingest System (MADIS), currently undergoing technology transfer to National Weather Service operations with research and development at GSD, along with the Cross-Chain Loran Atmospheric Sounding System (CLASS) and NOAA's Integrated Ocean Observing System (IOOS), as examples of cutting-edge information and knowledge management technologies that

can be leveraged for the U.S. IEOS.

MADIS directly provides quality-controlled observations to hundreds of users, including 19 national meteorological centers, including the National Centers for Environmental Prediction (NCEP), the European Center for Medium-Range Weather Forecasts (ECMWF), the United Kingdom's National Weather Service (UK Met Office), the Korean Meteorological Administration (KMA), Taiwan's Central Weather Bureau (CWB), EUROCONTROL (European Organization for the Safety of Air Navigation), and the Chinese and Finnish Meteorological Centers.

PSD Data Contributions

Contributions to national and GEOSS-related data bases and programs and involvement in international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

Contributions to National and GEOSS-Related Data Bases and Associated Quality Control Activities

PSD participates in a wide variety of field programs spanning local to global scales. The purpose of the field programs varies widely as well, spanning major national and international programs, which may have as primary outputs the development of large-scale standardized data sets, to local and regional studies of specific physical processes. PSD data sets associated with field programs are typically archived for use by the broader research community. They are described briefly in the Research Products section of the review supporting documents.

At least three of the reported PSD data sets might be considered GEOSS-related. The two repeated here are related to global PSD air-sea flux and cloud radiative property measurements.

Surface Flux Analysis Data Archive

PSD scientists and collaborators developed and maintain the [Surface Flux Analysis \(SURFA\)](#) data archive of operational numerical weather prediction global flux fields as part of a World Climate Research Program (WCRP) to improve treatment of fluxes in climate models.

Tropical Eastern Pacific Synthesis Data Set

PSD scientists and collaborators developed and maintain the [Tropical Eastern Pacific Synthesis Dataset](#), which consists of two synthesis data sets containing observations of air-sea fluxes and cloud/radiative properties from nine years of cruises (1999-2007) in the Eastern Equatorial Pacific. The datasets are from Eastern Pacific Investigation of Climate (EPIC) Extended Monitoring cruises from fall 1999 through fall 2007. These observations were made as part of a joint ESRL, NOAA Pacific Marine Environmental Laboratory (PMEL) and Woods Hole Oceanographic Institution (WHOI) climate monitoring project funded by the Climate Prediction for the Americas (CPPA) program in NOAA's [Climate Program Office](#).

Associated quality control activities include the development of an international climate standard for air-sea flux measurements, described below.

Air-Sea Observations

Sea-going observing technologies developed at PSD are being applied in several ways within NOAA. PSD has been working with NOAA and the University-National Oceanographic Laboratory System (UNOLS) research vessels to upgrade their observations to climate quality. These observations are archived at the NOAA-sponsored Shipboard Automated Meteorological and

Oceanographic System (SAMOS) site at Florida State University. PSD has been working with Woods Hole Oceanographic Institution (WHOI) and NOAA's Pacific Marine Environmental Laboratory (PMEL) to improve [climate quality observations from flux reference buoys](#). A 'How To' manual was written and distributed.

The third data set is related to our [Arctic Observatories](#), also repeated here. Associated quality control activities include regular calibration of the associated instrumentation and the collection long-term homogenous records.

Arctic Observations

PSD has a long history of involvement with Arctic observations through collaboration with the Study of Environmental Arctic Change ([SEARCH](#)) Program. To better understand the mechanisms that control the changing Arctic climate, PSD coordinates the deployment of Intensive Arctic Atmospheric Observatories (IAAOS), where observations of such things as cloud properties, atmospheric and surface radiation, aerosols, gases, and synoptic weather patterns are collected. Detailed measurements taken with instruments such as radar, lidar and radiometers allow for a better understanding of why change is occurring, and also provide calibrated, long-term, high-quality measurements that will better track the long-term trends that are presently difficult to determine accurately in the remote polar regions of the planet. Our primary observation sites are the [North Slope of Alaska](#), [Eureka, Canada](#) and [Tiksi, Russia](#), with further expected deployments.

ICOADS

A PSD scientist and collaborators have assembled, quality controlled, and made widely available to the international research community, ship data from the late 17th century to date, together with a range of data for recent decades from buoys and other automated platform types, in the International Comprehensive Ocean-Atmosphere Data Set ([ICOADS](#)) - the world's most extensive marine meteorological data archive. Since the project's inception in 1981, ICOADS has grown from a US-centric effort between NOAA (ESRL and Climatic Data Center) and the National Center for Atmospheric Research (NCAR), to an expanded US and international partnership. The objectives of ICOADS remain: to collect as much original estimated (non-instrumental) and measured surface *in situ* data as possible; to treat each observation systematically—preserving data source identification and measurement metadata with each record, and converting units and coding schemes to a uniform set; to perform basic quality checks; and to freely distribute the data and products worldwide.

A PSD scientist also chairs the Expert Team on Marine Climatology (ETMC) of the Joint WMO (World Meteorological Organization)-IOC (Intergovernmental Oceanographic Commission) Technical for Oceanography and Marine Meteorology (JCOMM), that has within its mandate to collaborate with a variety of international programs - including the International Oceanographic Data and Information Exchange (IODE) of IOC, and the Global Ocean and Climate Observing Systems (GOOS and GCOS) - to determine procedures and principles for the development and management of climatological datasets. These datasets may range from global down to regional scales, and span both oceanographic and marine meteorological data. In developing them, the

Team is also mandated to take account of requirements for quality and integration, and to develop appropriate procedures and standards for data assembly.