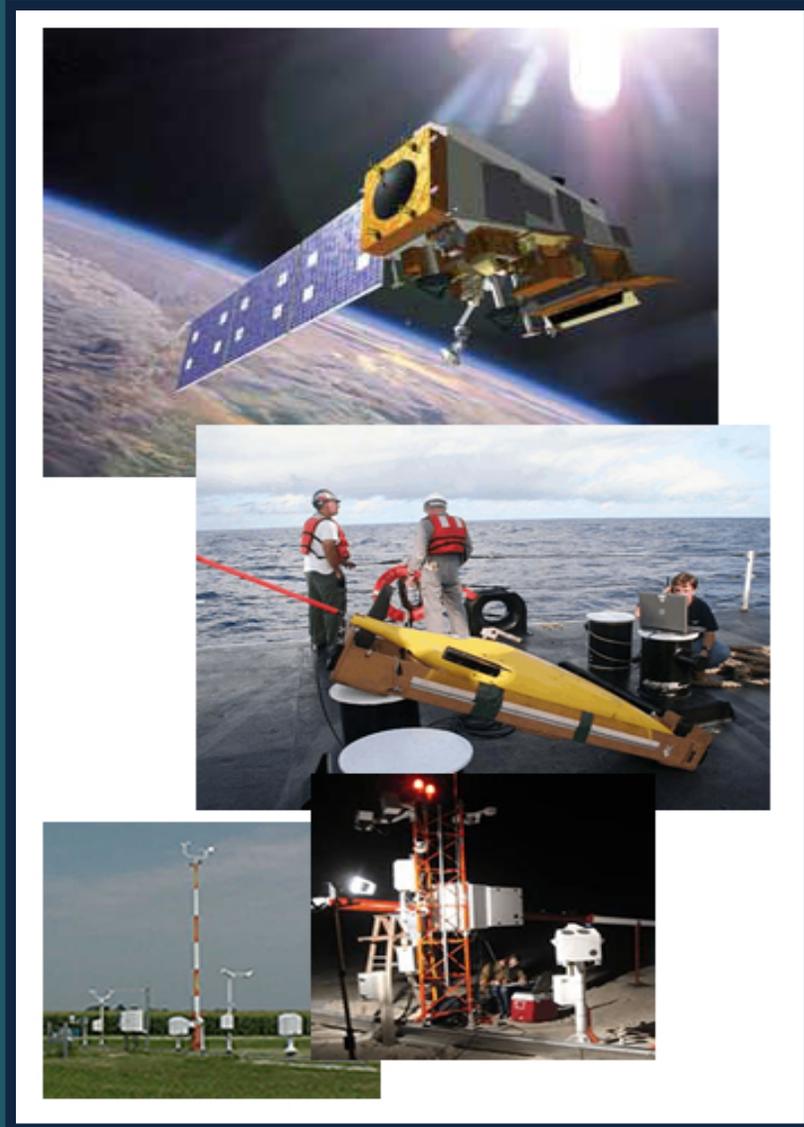


# SUMMARY REPORT NATIONAL OPERATIONAL PROCESSING CENTERS OBSERVATIONAL DATA WORKSHOP



**May 2012**  
FCM-R35-2012

**Office of the Federal Coordinator for Meteorological Services  
and Supporting Research**

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### Cover images (Top to Bottom)

- Artist's rendition of the Suomi National Polar-orbiting Partnership satellite. – Credit: NOAA NESDIS
- The launching of a seaglider unmanned underwater vessel. – Credit: Navy
- FMQ-19 weather sensing system – Credit: Air Force
- Automated Surface Observing System – Credit: NOAA NWS

SUMMARY REPORT

**NATIONAL OPERATIONAL PROCESSING CENTERS  
OBSERVATIONAL DATA WORKSHOP**

Office of the Federal Coordinator for  
Meteorological Services and Supporting Research

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FCM-R35-2012  
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## FOREWORD

Acquiring observational data for assimilation into today's numerical models remains a key ingredient in their successful performance, accuracy, and further improvement. During this two-day workshop, representatives of the National Operational Processing Centers and other national data centers met to discuss their environmental data needs and the use of those data in analysis and prediction. Presentations and discussions were focused on the types of data being used, to include data coverage, timeliness, new data, and data sources being developed. The participants also discussed the sources from which the data are received, the purposes and applications for which the data are used, and estimates of the impact on model performance these data might have.

Most importantly, workshop participants outlined their specific agency data needs, particularly deficiencies in data void areas, and they identified concerns or problems with existing and future data types. Although group discussions were expected to be at a high level for framing overarching needs and objectives, participants were able to reach consensus on establishing 5 key data focus areas, including 18 separate recommendations related to needs. In addition, the recommendations were prioritized based on the participants' perceived sense of urgency and potential for successful accomplishment. These items will form the basis for follow-up action by the Joint Action Group for Operational Data Acquisition for Assimilation (JAG/ODAA).

This very important workshop was planned and conducted by the members of the JAG/ODAA based on a recommendation from the OFCM-sponsored Committee for Operational Processing Centers (COPC), and I want to express my special thanks to the JAG/ODAA members for a job well done. I also want to thank the COPC directors and their technical directors for their outstanding support of this effort, and the workshop participants and my staff for making the workshop a very successful and highly productive event.

// Signed //

Samuel P. Williamson  
Federal Coordinator for Meteorological Services  
and Supporting Research



## Table of Contents

FOREWORD .....	iii
TABLE OF CONTENTS.....	v
SECTION I: OVERVIEW .....	2
PURPOSE, THEME AND OBJECTIVES .....	2
SECTION II: WORKSHOP SYNOPSIS.....	3
PRESENTATIONS.....	3
PARTICIPANTS .....	3
SECTION III: OUTCOMES.....	13
KEY TAKEAWAYS/WORKSHOP ACTION ITEMS .....	13
DELIVERABLES AND NEXT STEPS .....	16
RECOMMENDATIONS GOING FORWARD.....	17
APPENDICES	
APPENDIX A: WORKSHOP AGENDA .....	A-1



OFFICE OF THE FEDERAL COORDINATOR FOR METEOROLOGICAL  
SERVICES AND SUPPORTING RESEARCH

NATIONAL OPERATIONAL PROCESSING CENTERS

OBSERVATIONAL DATA WORKSHOP  
SUMMARY REPORT

**Dates:** 13-14 September 2011

**Location:** Office of the Federal Coordinator for Meteorological Services and Supporting  
Research, Silver Spring, MD

**Participants:**

Air Force Weather Agency (AFWA)  
14<sup>th</sup> Weather Squadron

Fleet Numerical Meteorology and Oceanography Command (FNMOC)

Naval Oceanographic Office (NAVO)

National Environmental Satellite Data and Information Service (NESDIS)  
National Climatic Data Center (NCDC)  
National Oceanographic Data Center (NODC)  
National Geophysical Data Center (NGDC)

National Weather Service (NWS)  
National Centers for Environmental Prediction (NCEP)  
NWS Telecommunications Operations Center (TOC)  
National Data Buoy Center (NDBC)

The Joint Center for Satellite Data Assimilation (JCSDA)

This document provides a summary of the Observational Data Workshop sponsored by the  
Office of the Federal Coordinator for Meteorology, Silver Spring, MD.



Workshop Participants: Front Row: Ken Barnett, La'Tanya Burton, Leslie Baran, Tony Ramirez, Vince Tabor, Jon Whiteside, Eric Wise. Second Row: Terry Tielking, Jim Yoe, Dennis Keyser, DaNa Carlis, Kyle Rushing, Quentin Freeman, Dennis Hobson. Back Row: Randy Haerberle, Doug Stewart, Jim Vermeulen, Brad Ballish, Keith Willis.

## I. OVERVIEW

### **Purpose and Theme:**

The Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) hosted the Operational Data Workshop (ODW) at the request of the Committee for Operational Processing Centers (COPC) for the purposes of initiating discussion/discovery of each Center's use of unclassified observational data for environmental analysis and prediction and to identify and develop methods to resolve data coverage and source gaps.

During the workshop, members of the Joint Action Group for Operational Data Acquisition for Assimilation (JAG/ODAA) and several invited data centers presented briefings detailing their respective agency's access to, use of, and distribution of unclassified environmental data.

### **Objectives:**

The ODW presentations were structured to address the following workshop objectives:

1. Identify a baseline of data acquired, used, and shared between the OPCs
2. Identify gaps in international data coverage for follow-up action
3. Improve analyses and forecasts through better use of data
4. Prioritize plans for acquisition and timely use/sharing of new data sources
5. Recommend problem fixes with respect to existing data types and to avoid problems with

- future data types
6. Share work, code, data sources, and findings
  7. Recommend opportunities to expand collaborative activities and leverage new/future capabilities

## II. WORKSHOP SYNOPSIS

**Workshop Facilitators:** Mr. Anthony Ramirez and Mr. Kenneth Barnett, OFCM

**Moderators:** Mr. C. Kyle Rushing (NAVO) and Mr. Dennis Hobson (AFWA).

**Opening Remarks:** Mr. Michael Babcock, Deputy Federal Coordinator, OFCM, presented welcoming and opening remarks on behalf of the Federal Coordinator.

### **Presentations:**

There were a total of 13 presentations delivered during the workshop. A synopsis of each presentation and the key points raised during the ensuing discussions are provided as follows.

Presentation	Agency/Presenter
1	Air Force Weather Agency (AFWA) / Mr. Eric Wise
2	Fleet Numerical Meteorology and Oceanographic Center (FNMOC) / Mr. James Vermeulen and Ms. Leslie Baran
3	Naval Oceanographic Office (NAVO) / Mr. C. Kyle Rushing
4	Nation Centers for Environmental Prediction (NCEP) / Dr. DaNa Carlis
5	National Environmental Satellite and Information Service (NESDIS) / Mr. Keith Amburgey
6	Joint Center for Satellite Data Assimilation (JCSDA) / Dr. James Yoe
7	NWS Telecommunications Operation Center (TOC) / Mr. Walter Smith
8	14 <sup>th</sup> Weather Squadron (14thWS) / Mr. Randy Haeberle
9	NCEP / Dr. Bradley Ballish
10	National Climatic Data Center (NCDC) / Mr. Jay Lawrimore
11	National Geophysical Data Center (NGDC) / Mr. Dan Kowal
12	National Oceanographic Data Center (NODC) / Mr. Terry Tielking
13	National Data Buoy Center (NDBC) / Mr. Rex Hervey

### **Other Participants:**

- WG/CSAB Chair/CNMOC, Mr. David McCarren
- AFWA – Mr. Jon Whiteside, Mr. Doug Stewart, Mr. Jay Martinelli, Mr. Richard Ritz
- NAVO – Mr. Keith Willis, Mr. Lamar Russell, Dr. Frank Bub, Mr. Doug May
- NCEP – Mr. Dennis Keyser
- NESDIS – Mr. Vince Tabor, Mr. Tom Schott, Mr. Quentin Freeman
- NWS – Ms. LaTanya Burton, Ms. Julie Hayes

## **1. Air Force Weather Agency (AFWA) / Mr. Eric Wise assisted by Mr. Doug Stewart and Mr. Richard Ritz**

Mr. Wise identified the various weather models run at AFWA and described the types, sources, assimilation, and distribution restrictions of AFWA observation data. These data are critical to the content and accuracy of models used to support a large spectrum of military operations. In response to a question, he confirmed that AFWA does not assimilate any observation data into the global Unified Model but, rather, leverages UKMO's analysis fields. This approach affords AFWA the advantage of incorporation of a number of satellite data types not currently available at AFWA but, as Mr. Vermeulen noted, omits the DoD-unique observation sets. Mr. Ritz noted that AFWA does assimilate those unique observations into the regional WRF model runs.

As the observation types were covered, a question was raised about marking of restricted observation data when it is distributed to other production centers. Would the Navy or NOAA be aware of the restrictions? Mr. Wise acknowledged that the current distribution approach does not include any markings for downstream users but that AFWA's WDA Increment 4 delivery would provide that capability. He also pointed out that the WMO bulletin structure has no provision for marking release restrictions, since the WMO intent is the full sharing of information.

Discussions about the nature of mesonets indicated that, since most were implemented to support needs not well addressed by traditional observations, each varies in observed phenomena, data format, and quality of observations. The MADIS collection of mesonets alleviates the format differences but production centers should assess each mesonet's data for applicability to the task(s) at hand. It was noted that nobody is aware of a listing of OCONUS mesonets; this could be a good JAG/ODAA project. It was also noted that the Department of Energy has some automated rawinsondes which may be useful for the production centers. The group collectively expressed an interest in getting more information about the DOE data.

Mr. Wise described the meteorological satellite (METSAT) data currently assimilated into AFWA's models. He also indicated that a spreadsheet of future needs was included in the backup slides. This led to a discussion of the JAG/ODAA coverage of METSAT data in the DAPE ESDA TR-1. While the appendix to the DAPE document covers users and sources of exchanged METSAT data, it does not cover all planned satellite launches and the data sets that will be available from them. Mr. Vermeulen noted there was another listing that JAG/ODAA is supposed to maintain with that information. Mr. Vermeulen also inquired about the creation of Feature Track Winds from GOES-12 data over South America. Neither AFWA nor NOAA is producing such. He noted that there would be definite benefits but as the GOES-12 satellite is reaching end of life it was not clear that the benefits would outweigh the costs for development of that data.

Mr. Wise included space weather observations in his briefing however there was no representation from the space weather community at this workshop. A participant noted that data processing/distribution now handled by NOAA's Space Weather Prediction Center in Colorado was going to be moved to NESDIS so the source of much of AFWA's space weather data would be changing.



AFWA’s briefing included daily data counts by observation type. Mr. Vermeulen suggested that comparison of counts among the various processing centers could yield benefits.

Mr. Wise identified the following issues regarding observation data:

- Verifying the content in TOC-issued bulletins. MANOP header alone is not always sufficient. He praised the BUFR catalog developed by NOAA and suggested a similar catalog for non-BUFR data would be useful. Flagging attention to newly available products by the TOC would be helpful.
- Quality of non-traditional observations
- US SYNOP lacking cloud type due to creation from METAR impact utility for cloud models
- BUFR migration issues include duplicate observations arriving in Traditional Alphanumeric Code (TAC) forms and BUFR, differences in geographic location for TAC (catalog driven) and BUFR (carried in message) and lack of a standard way to choose the “best” from the duplicates
- Many US sites don’t report snow depth. FAA is aware of the issues, linked to airfield construction projects, and is working with their contractors to try to resolve this.
- Precipitation reporting issues – many ASOS sites report 1/100 inch of precipitation when there was no precipitation. Mr. Joe Facundo, NWS was recommended as a point of contact for the ASOS issue.

Mr. Vermeulen asked Mr. Wise to discuss AFWA’s decode and QC process. Mr. Wise and Mr. Stewart said that the ingest system has recognition and formatting capabilities that correct some formatting errors before passing data along. The decoders do gross range checks before storing

the decoded data. The decoders also accomplish conversion of units of measure when necessary to ensure standardized data is stored. Finally, the model assimilation code runs checks of observations against other nearby observations, as well as comparisons to the model background.

## **2. Fleet Numerical Meteorology and Oceanographic Center (FNMOC) / Mr. James Vermeulen and Ms. Leslie Baran**

Mr. Vermeulen and Ms. Baran presented information about the observation data used, sources of data, models and products provided, data assimilation and acquisition needs, and projects in progress. These projects included data acquisition of new conventional and satellite data types. A description of the FNMOC data acquisition and quality control process was presented. The presentation described the types of data being received at FNMOC and their sources. Data decoding is completed on a data availability basis (i.e. not batch driven); this is to assure that data are decoded and available for models as quickly as possible. Examples of FNMOC's coverage charts were also shown (i.e. global coverage of conventional obs: RAOB, buoy, AMDAR, and satellite obs: FTW, ASCAT, ATOVS, geostationary).

The presentation also addressed data acquisition needs for NOGAPS/ NAVDAS-AR. Satellite data have become the single most important component of the global observing network for NWP. Highlighted were two observations types with the greatest impact to the models: radiosondes/dropsondes and geostationary winds (satellite observations). Discussion with NCEP indicated that their greatest impact comes from AMSU-A (while FNMOC showed greatest impact from geostationary winds). Agreement was made to collaborate to determine what each agency is doing with their respective "highest impact" data to try to improve the impact of the other. The group discussed the importance of geostationary and polar feature track winds to Navy operations. The Navy is tuned to ocean and polar data while other agencies may be tuned other observations.

FNMOC is organized with respect to parallel testing for the different satellites. Further, FNMOC has alpha, beta, and operational computing environments which allows software developers to do testing and quality control on the satellite data while still having access to all the other data ingested (i.e. all conventional obs and other satellite data). FNMOC and NRL work together to acquire the operational data and work with the data. R&D is done by NRL, while FNMOC is responsible for making the software that NRL provides operational.

During a summary of FNMOC models, the new global model, under development, NAVGEM was introduced which will replace NOGAPS. Examples of other products provided included a tropical cyclone product webpage.

Information was also presented regarding FNMOC data acquisition work in progress: new AMDARs becoming available, improvements to J-OBS, radiosonde replacement system, JPSS/DWSS satellite issues, and the WMO ASCII to BUFR transition. Discussions regarding J-OBS led to a recommendation to discuss J-OBS improvements and data needs in more detail at an upcoming JAG/ODAA meeting. There was also group discussion about various satellite needs i.e. McMurdo data, FMQ-17 and CNMOC satellite CONOPS program, and JPSS backup capabilities in Fairbanks, AK.

### **3. Naval Oceanographic Office (NAVO) / Mr. C. Kyle Rushing**

Mr Rushing discussed the core competencies of the organization, the observational data flow and quality control processes, and the Ocean Model Suite at NAVOCEANO. He identified data problems with the standardization of ocean data formats during real-world events and the lack of a central drop-off point. (Many universities and agencies do not know about or use GTS).

Mr. Rushing emphasized NAVOCEANO's ability to collect data that are used in the models: Charts, Bathymetry, Buoys and Floats, and Ocean Gliders. NAVOCEANO expends a significant portion of their resources collecting data. NAVO's needs and recommendations are as follows:

- Standardized formats for oceanographic observation data
- A capability for Centers to deliver their oceanographic data onto the GTS (or a central data repository)
- Real time oceanographic data delivery to the GTS (or repository)
- A global listing of available oceanographic data subscriptions
- A web service by which outside oceanographic data entities can post data onto the GTS

### **4. National Centers for Environmental Prediction (NCEP) / Dr. DaNa Carlis assisted by Dr. Bradley Ballish and Mr. Dennis Keyser**

Dr. Carlis presented the current status of NCEP conventional and satellite observations and the impact of observations on the RUC and GFS models. His summary provided the following points:

- NCEP Bufr and PrepBufr files are open source and downloadable from several locations
- Data format is KEY and timely observations are the only observations that will get into the NCEP data assimilation system.
- Dennis Keyser's website provides up-to-date information on observation processing and individual obs processed by model (i.e. RUC/NAM/GFS) at NCEP.
- Satellite coverage is very good for AMSUA, MHS, and HIRS due to multiple instruments being flown. Overall, the poles and tropics are where the fewest observations are available.
- In the RUC Data Denial experiments, the most important observation types for RH are RAOBs and GPS-PW for 3, 6, and 9-hr forecasts. For TEMPS and WIND, aircraft and RAOBs are high impact.
- The GOES5/GSI adjoint method in theory can be applied to the impact of observations for the GFS/GSI due to very similar data assimilation methods using the GSI.
- The adjoint method allows observation impact to be partitioned for any set or subset of observations, by instrument type, observed variable, geographic region, vertical level or other category. Also, it's very inexpensive to run daily.
- AMSUA radiances show high impact along with RAOBS globally using the adjoint method.
- Using OSEs, Zapotocny et. al show the importance of satellite radiance observations compared to conventional observations where both sets are about equally important to the GFS model skill (0-7 days) in the NH, but in the SH the importance of satellite radiance

observations is magnified by the immediate loss in forecast skill.

- NOAMSU and NORAOB OSEs show the largest loss of skill for 5-day anomaly correlation scores in the polar, northern, and southern hemispheres

During discussions, Dr. Carlis expressed NCEP's desire to collaborate with FNMOC on their use of satellite winds and a study from an NCEP vs FNMOC satellite wind usage perspective. Mr. Vermeulen, FNMOC, described several successful data sources and processes used by FNMOC and agreed that collaboration in this area would be very useful.

## **5. National Environmental Satellite and Information Service (NESDIS) / Mr. Keith Amburgey assisted by Mr. Vincent Tabor and Mr. Geoff Goodrum**

NOAA/NESDIS acquires and manages the Nation's operational environmental satellites, operates the NOAA National Data Centers, provides data and information services including Earth system monitoring, performs official assessments of the environment, and conducts related research.

- NOAA/NESDIS maintains the Data Acquisition, Processing and Exchange (DAPE) Gateway at the NOAA Satellite Operates Facility (NSOF) Building in Suitland and its Critical Infrastructure Protection (CIP) site at Wallops Island, VA.
- Using this Gateway, NOAA/NESDIS distributes 46 data products to DAPE Partners over the DAPE DATMS-U/OTN network.
- This Gateway is also used to obtain products from DoD partners for distribution to the civilian community (i.e. National Weather Service)

The NESDIS Operational Support system operated successfully and experienced very minimal impacts from an earthquake and hurricane.

Key presentation points:

- GOES-15 is moving West to replace GOES-11 as GOES West
  - Should result in Improved satellite performance
- GOES-R will be launched in 2015
  - Satellite will be equipped with improved instrument suite and improved data handling.
- EUMETSAT report
  - In exchange for costs incurred by EUMETSAT, an Amendment to the JTA agreement will require NOAA to extend its support for the Advanced Very High Resolution Radiometer (AVHRR), which is designated for integration on the Metop-3 satellite. NOAA will support the AVHRR for 3.5 years after the launch of the last IJPS satellite, rather than two years. The Amendment also calls for NOAA to extend the maintenance support for AMSU for an additional three months beyond what was previously agreed.
- NPP will be launched Oct. 25, 2011
  - NOAA plans to use the NDE system to generate NOAA unique products

- The NDE Project's primary mission is to provide near real time products derived from NPP observations to NOAA's operational and climate communities and other civilian and U.S. government users.
- GCOM
  - NOAA is planning to acquire GCOM data and generate products
- OceanSat-2
  - NOAA is anticipating acquiring OceanSat-2 data
  - If successful, products are anticipated to be available in the 2014 time frame
- Korean COMS
  - NOAA is investigating acquiring but needs requirement for these data

## **6. Joint Center for Satellite Data Assimilation (JCSDA) / Dr. James Yoe**

Dr. Yoe presented an overview of the JCSDA, describing its mission to accelerate, improve, and increase the use of operational and research satellite data in operational numerical weather prediction models through a collaborative effort involving the U.S. Air Force, Navy, NOAA, and NASA. He noted the JCSDA goal to have operational users ready to assess data from new sensors from the day they are made available and to be able to assimilate data from new sensors within one year of launch. The JCSDA has identified a number of priority science areas and related working groups to share information and results on problems of common interest and applicability, and has encouraged the used of common tools and methods as much as possible. The Community Radiative Transfer Model is not only used by all of the JCSDA partners to help assimilate dozens of sensors, it has been developed and expanded collaboratively by them. Dr. Yoe emphasized the relationship of the JCSDA to the COPC, how the research counterpart of each of the Operational Centers is party to the JCSDA. Among the routine activities of the JCSDA is identifying means to acquire and share various satellite data for calibration, evaluation, and impacts assessment. These efforts can readily be exploited by the Operational Centers. Other relevant JCSDA activities include the preparation of proxy data, BUFRization of data, and modification/testing of satellite data assimilation system and tools. These activities have had a clear impact on operational activities of all partners and helps U.S. operational centers to benefit from new satellite data as soon as possible after launch.

## **7. NWS Telecommunications Operation Center (TOC) / Mr. Walter Smith**

The Telecommunication Operations Center (TOC) is a component of the OPS and manages the NWS Telecommunication Gateway (NWSTG). The NWSTG operates and ensures continuous acquisition and dissemination of NWS and other domestic and foreign hydrometeorological data and products. The central switching system of the NWSTG controls the exchange of data with remote locations. The primary remote locations are with the NWS specialized modeling centers (AWIPS and NCF), the commercial meteorological community, and major international communication switching centers. Issues identified included:

- Data Explosion: Increased resolution of observations and models, increased frequency of

observations and models, increased number of sensors, improved sensing technology, new spatial and temporal requirements, graphics, imagery, and video, and thousands of small products

- Bandwidth: technology selection and estimation of capacity growth
- Transmission of “information” versus “raw data”

He also noted that the NWSTG is installing a new software tool which converts traditional alphanumeric codes (TAC) to table-driven code forms (TDCF). The migration is the United States national plan to align with WMO policy. The target TDCF code form is BUFR. The first experimental exchange of observational temp and pilot data was scheduled for October 2011 with the operational exchange temp and pilot data taking place in April 2013. The migration of all targeted codes is expected to be completed by October 2015. TAC codes will continue to be produced in parallel with BUFR, allowing end users time to update their systems.

## **8. 14<sup>th</sup> Weather Squadron (14thWS) / Mr. Randy Haeberle assisted by Mr. Jon Whiteside**

Mr. Haeberle noted that the mission of the 14<sup>th</sup> WS is to characterize the environment for war fighters, providing historical weather statistics that aid military planners in making tactical and strategic decisions. He noted that the 14WS strives to produce timely and relevant climate-based products for anywhere at the world. Planners try to utilize climatology in the planning phase as soon as possible to best use resources and safeguard lives by positioning assets in places that are not prone to bad weather. In addition the 14<sup>th</sup> creates long range forecasts for up to 6 months to characterize anomalies and deviations from the longer term climatological patterns. These long range forecasts are especially produced for areas of military interest such as Iraq, Afghanistan or Korea. Conditional climatology products aid on-site forecasts by characterizing the probability of future events based on current conditions.

The key issues include the quality of the underlying data used to produce the climatological products and the availability of the products on-demand for critical areas of the world on short notice. He cited the ability to rapidly quality control and summarize data for Northern Japan during the earthquake event and the following nuclear power plant crisis last year. This provided both military and civilian civil defense workers with information to assist the Japanese response.

The 14<sup>th</sup> strives to create operationally sound data for representative sites around the world, especially in areas of military activity or interest. This requires balancing the needs for quality control against the resources spent to achieve it and the impact on the resulting climatological statistics. This is accomplished by establishing specific limits for each station and then checking the data against these limits. A well bounded data set can then be used to quickly create tailored climatological products on demand. If possible, when persistent problems are noted, feedback is provided to the data source so the problem can be corrected. Once the data have been quality controlled and pre-summarized, standard climatological statistics are staged on a web site so user's in the field have instant access 24 hours a day.

Sound traditional data are needed for areas prone to military operations (includes humanitarian efforts), areas of the world such as Africa, South America, and large parts of Asia. Another need is for better quality techniques (preferably automated), especially for precipitation/snowfall and

clouds. The Squadron is currently investigating spatially-based techniques to supplement their existing station specific statistical approach. Acquisition of non-traditional data sets such as global lightning and non-US mesonet data would be highly valuable to them.

### **9. Special Presentation: Prolonged Tropical Wind Observational Data Void Region with Large Analysis Uncertainty / Dr. Bradley Ballish, NCEP**



A new project at NCEP computes height forecast-forecast correlations of the GFS with the ECMWF, which warns us in advance of large forecast uncertainties and possible model dropouts with the correlations displayed on an internal website. The website also displays graphics of cases where there are extreme differences in the ECMWF and GFS analyses as well as the same for the GFS analysis minus guess.

The extremes code uses 1x1 degree grib files for the NCEP Guess, and the ECMWF and GFS analyses as input, with output on extreme differences sorted by approximate volumetric integrals of squared differences in height, temperatures and winds on mandatory pressure levels for input to graphic codes.

One case of prolonged extreme analysis differences in winds between the ECMWF and GFS analyses in the tropical Pacific around 200 hPa was examined and appears to be due to a prolonged period with very few wind observations.

Further work will address the following issues/concerns:

- Which analysis winds are closer to the truth in this data void area, and what about the winds in this area from other centers?

- What is the forecast impact of these tropical wind differences?
- Considering the large analysis differences in winds, are the analysis estimates of background error reasonable in this area?
- The analyses can use the mass-motion balance of the background even near the equator to use radiance data to analyze winds. How well is this working in this difficult case?
- When NESDIS performs rapid scans, there are far less NESDIS satellite winds in the southern hemisphere. What is the more general impact of these data losses?

## **10. National Climatic Data Center (NCDC) / Mr. Jay Lawrimore**

The mission of NCDC is to manage the Nation's resource of global climatological in-situ and remotely sensed data and information to promote global environmental stewardship, to describe, monitor and assess the climate, and to support efforts to predict changes in the Earth's environment. Its resources include the Automated Surface Observing System (ASOS), the Cooperative Observers Network (COOP), the Climate (Regional Climate) Reference Network (CRN/RCRN), Global Historical Climatology Network (GHCN-Daily and Monthly), International Surface Temperature Initiative, and Marine Data.

## **11. National Geophysical Data Center (NGDC) / Mr. Dan Kowal**

NOAA/NESDIS operates three national data centers: NGDC, the National Climate Data Center (NCDC), and the National Oceanographic Data Center (NODC). NGDC is responsible for marine geological and geophysical data, Earth geophysical data, and solar-terrestrial data from the ionosphere to the surface of the sun. NODC is responsible for data from the wet ocean (except water column sonar data), and NCDC is responsible for data from Earth's atmosphere and climate, and paleoclimate data.

NGDC is responsible for the long-term stewardship of data from the surface of the Sun to the core of the Earth (except the wet-ocean & weather layer). They deliver over 100 Tb per year (use and re-use) to a diverse set of customers. NOAA Hydrographic data is one of the fastest growing data streams stewarded by NGDC.

## **12. National Oceanographic Data Center (NODC) / Mr. Terry Tielking**

NOAA's Data Centers (National Oceanographic Data Center, National Climatic Data Center, and National Geophysical Data Center) are the stewards of the nation's environmental data – collectively they preserve and provide access to scientific quality ocean, climate, and geophysical data and information for current and future generations. The Data Center's holdings:

- provide a history of the ocean, atmosphere, and our geophysical environment
- are used to determine the state (and changing state) of the climate
- are used to evaluate earth system models
- are used in operations and planning for every sector of society
- are used to understand how both natural and human-made systems work and affect each other.

NOAA's Data Centers are equipped for handling the 20<sup>th</sup> Century data, but will be challenged to handle 21<sup>st</sup> Century data (complex, high volume satellite data, high resolution ship and buoy data, autonomous vehicles, model output). NOAA's Data Centers are working to integrate data in a seamless manner for easy access to a variety of users.

Issues include Standards and Formats (i.e., FGDC and ISO), timely data collection/submission, and increased resolution required for models (climate, ecosystem, etc.)

### **13. National Data Buoy Center (NDBC) / Mr. Rex Hervey**

The mission of the NDBC is to provide a real-time, end-to-end capability beginning with the collection of marine atmospheric and oceanographic data and ending with its transmission, quality control and distribution. Mr. Hervey noted that Wave gliders can potentially replace weather buoys at selected stations if they can collect data that meet NOAA/NWS requirements. If they can meet accuracy requirements, they may reduce the reliance on available Coast Guard ship time since they can be deployed and retrieved by small boats close to shore. Wave Gliders, in some cases, could be deployed and repositioned without requiring fielding of maintenance teams or larger vessel support. NDBC is just beginning to evaluate the potential of wave gliders as meteorological stations. Much more work is required to determine what the quality of the data will be under a variety of conditions.

## **III. OUTCOMES**

### **Key Takeaways:**

Following the conclusion of the presentations, the ODW participants discussed their observations and understanding of the information, and jointly compiled a list of key takeaways. In addition, the participants organized the takeaways into 5 broad categories, based on various aspects of data issues which suggest some necessary collaborative action based on the workshop goals: Data Discovery and Access, Data Use and Coverage, Data Standardization, Data Access and Distribution, and Administrative. Items within each category were assigned a relative priority based upon the perceived urgency of need and the potential for successful accomplishment. These findings will be used as a basis for follow up refinement and action by the JAG/ODAA.

#### **1. Data Discovery and Access**

- (Priority: 1) Data Bulletin Subscription Process
  - Lack of knowledge of bulletins available, especially new bulletins
  - Need a central “go to” point for bulletin subscriptions
  - Determine agency responsible for cataloging and updating available bulletin headers
  - Provide comprehensive (list of and pointers to) bulletins available, especially new and updated bulletins

- (Priority 2) Identification of and access to existing and emerging data sources
  - e.g. DOE radiosondes, Nacell/Tower/SODAR wind farm data . (NCEP presentation)
  - Need a clearing house for information regarding global MESONET collections, availability, and distribution (not readily available through current WMO channels)

## 2. Data Use and Coverage

- (Priority 1) Establish a method to list and compare data types being used by OPCs
  - Start with AFWA template as model to develop a template for all OPCs
  - By category e.g satellite vs conventional, feature track winds, polar winds
- (Priority: 1) Develop a process to determine, identify data gaps (especially geographical, regional)
  - Has implications for how agencies pursue budget support for major acquisitions
  - If a gap is found to be absolute, common to all COPC partners and none of them has the means of filling the gap.
- (Priority: 2) Improve collaboration of data impacts on forecast skill
  - e.g a repository (or more practically a consolidated set of pointers) to studies and sites that provide ongoing assessments of data forecast impacts using (a) various methodologies (OSE, data denial)

### **Key Workshop Item:** Important Large Differences in Observational Data Impact Estimates

- ❖ NCEP estimates that ASMU-A has biggest impact on 24-hour forecast skill, while FNMOC has satellite winds as most important
- ❖ These estimates are uncertain and based on adjoints of the analysis and forecast model
- ❖ If NCEP can learn from FNMOC on how to optimally use satellite winds and FNMOC learn from NCEP on how to best use ASMU-A data, both centers would likely improve in forecast skill

## 3. Data Standardization

- (Priority 2) Oceanographic data standard (format) change impacts to data ingest
  - Standard formats and real-time transmission are critical to OPCs ability to ingest large quantities of ocean data with minimal programming and man power (data manipulation).
  - Oceanographic real-time data users have historically followed WMO data exchange standards for formatting and transmission.

- WMO is switching from character codes to BUFR (table driven binary format).
  - Large portion of oceanographic community not following new WMO standards (many using non-standard formats) making simple access and ingest from the GTS possibly a thing of the past. This will significantly increase manpower required to ingest real-time oceanographic data and make it virtually impossible to identify and process much of the real-time oceanographic data available worldwide.
  - Need to work through NCEP U.S. representative to WMO to consider using Net CDF as an acceptable format
- (Priority 2) Develop a process to standardize OPC data counts for routine comparison.
    - e.g. Follow a chain approach – raw versus thinned versus those passing quality control, etc.
    - Consider making/using standard definitions: is one radiosonde a count, or a series of counts for multiple variables.
    - Avoid counting bits and bytes, since much of the volume is contained in geolocation, etc., which may be used by some centers but not others.
- Coordinate efforts on ocean heat content data projects – currently multiple data sources (Jim V)
    - also for simple skin (SST) temperature (Jim Y)
- (Priority 2) Assess the capability to identify unclassified, limited distribution (proprietary, restricted) data exchanged between OPCs
  - (Priority 3) Continue to monitor and coordinate resolution of issues that arise due to text to BUFR transition (BUFR migration)

#### 4. Data Access and Distribution

- (Priority 1) Review/evaluate TOC back-up capability
  - Consider TOC's nominal operational requirements and those which must be backed up for COOP purposes
  - Review status of back-up capabilities (planned, under development, or completed)
  - Consider anticipated growth of data volumes due to higher resolution model output and higher resolution radar and satellite data streams.
- (Priority 2) Need quick access to new satellite data for testing – prior to data becoming operational
  - COPC partners should work through their R&D counterparts in the JCSDA

- The JCSDA Partners – NCEP/EMP, NESDIS/STAR, NRL, NASA/GMAO, and AFWA, should be testing on pre-operational data streams, so that the permissions, protocols, and system adjustments for operations should be well-understood and prepared for by the time the data become available on an operational basis.

## 5. Administrative

- (Priority 3). Review Navy representation in Met Codes working group and routine cross-feed of met code activities to ODAA
- (Priority 3). Obtain capability to share large file, controlled access/FOUO information among COPC members (presentations, TR-1, etc)
- (Priority 3). Reinvigorate the Ocean data community as part of JAG/ODAA
- (Priority 3). Review and evaluate observational data group procedures and structure to determine if any changes are needed to better accommodate the different areas of data interest
- (Priority 3). Address how to move forward to incorporate space weather data sector into JAG/ODAA
  - Already promoting the Space Weather Annex to the DAPE
  - As the Global Assimilative Ionospheric Model (GAIM) matures, there will be increased interest in facilitate effective access/exchange of space weather data.
  - For NCEP, the Strategic Plan points to forecasting from the Sea to the Sun.
- (Priority 3). Submit OPC requirements for NDE Data
  - OPCs need to make their NDE data requirements known to NESDIS.

*Note: Need to emphasize the context of near-real time data, and in particular, for so-called NOAA-unique data products that are generated by NDE (downstream from the NOAA IDPS) . DoD OPCs will and should access NPP EDRs and SDRs from the IDPS implemented at AFWA.*

## **Deliverables and Next Steps**

- A workshop summary report that documents: shared challenges; best practices; current and planned collaboration to address those challenges; forward recommendations and actions needed
- An online repository of workshop presentations

- Wrap-up action items will be referred to the JAG/ODAA for refinement and a dedicated follow up session will be held to develop an action plan.

### **Recommendations Going Forward**

- Classified Data – Classified data were not discussed during the workshop. Initial discussions regarding classified data were held following the November 2011 COPC meeting at NAVO. Participants were: Mr. Howland for AFWA, Mr. Cuff, Mr. Jugan, and Mr. May for NAVO, and Dr. Swenson and CAPT Sauer for FNMOC. There was consensus to hold further discussions, to be determined, regarding sources and sharing of classified data.

# National Operational Processing Centers Observational Data Workshop

September 13-14, 2011

## AGENDA

Office of the Federal Coordinator for Meteorological  
Services and Supporting Research  
8455 Colesville Road, Suite 1500  
Silver Spring, MD 20910  
301-427-2002

### DAY 1 – September 13, 2011

8:30 - 9:00	<b>Welcome</b>	<b>Mr. Michael Babcock</b> Deputy Federal Coordinator for Meteorology
	<b>Administrative Information</b>	<b>Mr. Tony Ramirez</b> Executive Secretary, JAG/ODAA

#### **Air Force Weather Agency**

9:00 - 9:30 AFWA Presentation - Mr. Eric Wise  
9:30 - 10:00 AFWA Open Discussion  
  
10:00 Break

#### **Fleet Numerical Meteorology and Oceanography Center**

10:15 - 10:45 FNMOC Presentation – Mr. James Vermeulen and Ms. Leslie Baran  
10:45 - 11:15 FNMOC Open Discussion  
  
11:15 - 12:30 **LUNCH BREAK**

#### **Naval Oceanographic Office**

12:30 - 1:00 NAVO Presentation – Mr. Kyle Rushing and Mr. Keith Willis  
1:00 - 1:30 NAVO Open Discussion  
  
1:30 - 1:45 Break

#### **National Centers for Environmental Prediction**

1:45 - 2:15 NCEP Presentation – Dr. DaNA Carlis  
2:15 - 2:45 NCEP Open Discussion

2:45- 3:00      **Break**

**National Environmental Satellite, Data, and Information Service**

3:00 - 3:45      NESDIS Presentation – Mr. Keith Amburgey, Mr. Geoffrey Goodrum

3:45 - 4:30      NESDIS Open Discussion

4:30 PM          **Adjourn Day 1**

**DAY 2** – September 14, 2011

**Joint Center for Satellite Data Assimilation**

8:30 - 9:00      JCSDA Presentation – Dr. James Yoe

9:00 - 9:30      JCSDA Open Discussion

**NWS Telecommunications Operations Center**

9:30 - 10:00    TOC Presentation – Mr. Walter Smith

10:00 - 10:30   TOC Open Discussion

10:30 AM   **BREAK**

**14th Weather Squadron**

10:45 - 11:00   14<sup>th</sup> WS Presentation – Mr. Randy Haeberle

11:00 - 11:15   14<sup>th</sup> WS Open Discussion

11:15 AM   **LUNCH BREAK**

11:45 - 12:15   **Special Presentation -- NCEP** Dr. Bradley Ballish

**NESDIS/NCDC**

12:30 - 12:45   NCDC Presentation – Mr. Jay Lawrimore

12:45 - 1:00    NCDC Discussion

**NESDIS/NGDC**

1:00 - 1:15      NGDC Presentation – Mr. Dan Kowal

1:15 - 1:30      NGDC Discussion

**NESDIS/NODC**

1:30 - 1:45      NODC Presentation – Mr. Terry Tielking

1:45 - 2:00      NODC Discussion

2:00      **Break**

## **NDBC**

2:15 - 2:30 NDBC Presentation – Mr. Rex Hervey

2:30 - 2:45 NDBC Discussion

2:45 Wrap Up (**all attendees**)

- Next Steps
- What to report out

4:30 PM **Adjourn**



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