# **CICS-MD @ NODC** Current Activities and Future

## Margarita Conkright Gregg, Ph.D. Director, U.S. National Oceanographic Data Center

National Environmental Satellite and Data Information Services DOC/National Oceanic and Atmospheric Administration



## **National Oceanographic Data Center**







Mission: To provide scientific stewardship of marine data and information

# So how do we do it?

...by building, from the ground up, tiers of data stewardship...



# **NODC CICS-MD Team**

Yongsheng Zhang James Reagan Mathew Biddle Liqing Jiang Kora Saha

TASK NAME: CICS Support for the National Oceanographic Data Center

Percent contribution to CICS Main Research Themes: Theme 1 Climate and Satellite Research and Applications: 10% Theme 2 Climate and Satellite Observations and Monitoring: 57% Theme 3 Climate Research and Modeling: 33%

# **Key Strengths and Current Foci**

## **Scientific Data Stewardship**

- Development of improved satellite data products
  - Satellite Altimetry
  - High Resolution Sea Surface Temperature
  - Ocean Salinity
  - Synthetic Aperture Radar

## Development of improved in situ data products

- World Ocean Database
- Comparison of in situ and satellite SSS
- Ocean Indices and Indicators

### Scientific data management

Facilitate discovery, ingest, preservation (Ocean carbon, video)

#### Total Portfolio: \$1.7M

#### **Current CICS-MD Projects with NODC Development of improved satellite data products**

- 1. NOAA Jason Ground System Development Primary CICS Scientist at NODC: Yongsheng Zhang NODC Staff Investigator: Deirdre Byrne
- 2. Pathfinder Sea Surface Temperature Primary CICS Scientist at NODC: Yongsheng Zhang NODC Staff Investigator: Deirdre Byrne
- 3. Ocean Surface Salinity Investigation Primary CICS Scientist at NODC: Yongsheng Zhang NODC Staff Investigator: Deirdre Byrne
- 4. Synthetic Aperture Radar (SAR) Sentinel-1 Archival Services

Primary CICS Scientist at NODC: **Yongsheng Zhang** NODC Staff Investigator: Deirdre Byrne

#### Development of the data Quality Monitoring System for Jason-2 altimetry, SMOS and Aquarius

- Develop data quality monitoring methods and massive data processing and visualization tools;
- Make the results available to public users and data achievers via web interfaces in both graphical and numerical representations.
- Monitoring products: OSTM/Jason-2 Geophysical Data Records, SMOS and Aquarius satellites sea surface salinity data, Pathfinder SST, Group for High-Resolution SST (GHRSST) ...



## **Current CICS-MD Projects with NODC** Development of improved in situ data products

- World Ocean Database Updates and Seasonal Estimates of Ocean Temperature, Salinity, Heat Content, and Steric Sea Level
  - Primary CICS Scientist at NODC: Alexey Mishonov
  - NODC Staff Investigator: Tim Boyer

2. Comparison of Aquarius to in situ Sea Surface Salinity

- Primary CICS Scientist at NODC: James Reagan
- NODC Staff Investigator: Tim Boyer
- 3. Archival Services for Ocean Indices and Indicators in the Tropical and South Atlantic Ocean
  - Primary CICS Scientist at NODC: Mathew Biddle
  - NODC Staff Investigator: Deirdre Byrne

## **Improved In Situ Data**

#### 1. Ingest: World Ocean Database



#### 2. Data Quality Control



#### 3. World Ocean & Regional Atlases



#### 4. Data publishing and dissemination



#### **Alexey Mishonov**

## **Improved In Situ Data**

- Assessing climate change on global and regional scales
  - Oceanography north of 60° N from World Ocean Database by D Seidov, JI Antonov, KM Arzayus, OK Baranova, M Biddle, TP Boyer, DR Johnson, AV Mishonov, C Paver, MM Zweng, Progress in Oceanography, 2014
  - 2013 World Ocean Atlas Aids High-Resolution Climate Studies by TP Boyer, HE Garcia, RA Locarnini, MM Zweng, AV Mishonov, JR Reagan, JI Antonov, OK Baranova, MM Biddle, DR Johnson, CR Paver - EOS, Transactions American Geophysical Union, 2014

- Comparing in-situ climatology with modelled output, abstract submitted to AGU Fall Meeting)
  - Coupling analyses of new high-resolution regional ocean climatologies and ocean model output in relation to long-term AMOC fluctuations by D Seidov, R Parsons, S Cross, A Mishonov, AFU OS43D-1314

**Alexey Mishonov** 

## **Future work**

- Adding new essential oceanographic parameters to regional ocean climatologies
- Coupling climate change indicators with fisheries data in order to assess possible response of the ecosystems to the climate variation (proposal submitted to NOAA in co-operation with NCDDC and Fisheries).
  - Quantifying oceanographic variability in the NW Atlantic by A. Mishonov (PI), J. Hare, M. Fogartry, D. Seidov, T. Boyer, S.Cross, R. Parsons. Tracking ID # is : GRANT11738050
  - Coupling analyses of new high-resolution regional ocean climatologies and ocean model output in relation to long-term AMOC fluctuations by A. R. Parsons, D. Seidov, S. L Cross<sup>2</sup>, A. V. Mishonov<sup>3</sup> and J. R Reagan (AGU Fall Meeting, San Francisco, 2014)

## **Aquarius/WOD Comparison**



**Figure 1:** a) 09/2011-09/2013 average monthly difference between WODSSS and AQ251. b) Same as (a) except for AQCAP251 c) Zonal average of both (a) (lime) and (b) (blue).

#### This research compared WODderived SSS fields to Aquarius SSS fields.

 Interannual changes in the WOD and Aquarius products are very comparable to each other and corresponded well to changes in evaporation and precipitation in regions where E-P is known to dominate the mixed layer salinity budget.



**Figure 2:** Monthly time series plot for September 2011<u>1-2</u> September 2013 of a) root-mean-square error (RMSE).

#### Jim Reagan

## **Current/Future Work and Publications**

#### SSS Annual Harmonic Amplitude 2005-2013













Current work is focused on understanding changes in the seasonal cycle of near surface salinity over the Argo-era (2004-present) and relating these changes to changes in various global climate indices *(i.e., SOI, NAO,* etc.).

Future work, in addition to continuing efforts in understanding near surface salinity variability, will focus on the development of a comprehensive Mixed Layer Depth climatology.

# Four Publications in 2014: BAMS, EOS, 2 in JGR-Oceans

Boyer, T., J. Antonov, **J. Reagan**, C. Schmid, and R. Locarnini , 2014: [Subsurface salinity] Global Oceans [in State of the Climate in 2013], *Bull. Amer. Meteor. Soc.*, 95, S62-S65, doi: 10.1175/2014BAMSStateoftheClimate.1

Boyer, T.P., H. E. Garcia, R. A. Locarnini, M. M. Zweng, **A. V. Mishonov, J. R. Reagan**, J. I. Antonov, O. K. Baranova, M. M. Biddle, D. R. Johnson and C. R. Paver, 2014: 2013 World Ocean Atlas Aids High-Resolution Climate Studies, *Eos, Transactions American Geophysical Union*, 95, 41, 369-370, doi: 10.1002/2014EO410002.

- **Reagan, J. R.,** T. Boyer, J. Antonov, and M. M. Zweng, (in press): Comparison analysis between Aquarius sea surface salinity and World Ocean Database in situ analyzed sea surface salinity. *J. Geophys. Res. Oceans*
- Xie, P., T. Boyer, E. Bayler, Y. Xue, D. Byrne, **J. Reagan**, R. Locarnini, F. Sun, R. Joyce, and A. Kumar, 2014: An in situ satellite blended analysis of global sea surface salinity. *J. Geophys. Res. Oceans*, 119, 6140 6160, doi: 10.1002/2014JC010046.

#### Jim Reagan

# Current CICS-MD Projects with NODC Scientific data management

- 1. Ocean Acidification Scientific Data Stewardship
  - Primary CICS Scientist at NODC: Liqing Jiang
  - NODC Staff Investigator: Krisa Arzayus
- 2. NODC Data Stewardship
  - Primary CICS Scientist at NODC: Matt Biddle
  - NODC Staff Investigator: Krisa Arzayus
- 3. Video Data Management System Modernization
  - Primary CICS Scientist at NODC: **TBD**
  - NODC Staff Investigators: Sharon Mesick and Donald Collins

# **Scientific Data Management**

- Ocean Acidification Data Project
  - Developing metadata standard for OA data, compiled guidelines for documenting OA data and metadata;
    Ocean Acidification Data Submission Workshop Series
- Work with ocean carbon community to assemble and preserve a comprehensive carbon data set (i.e. CDIAC and WHOI BCO-DMO)
- Develop requirements and tools to facilitate the submission of data to NODC

# Send2NODC - Goals

### • Make data submission easy!

- User-friendly interface
- Tab based navigation
- Auto-completion for metadata
- o "Browse" and "Upload" style data files uploading
- Inline and context-sensitive help
- Tracking of all previous submissions and their status

## • Capture the data providers' expert knowledge!

- Allows selections from controlled vocabularies
- Enables recording of funding agency
- Supports data quality, units, platforms, analysis methods, and more
- o Instantaneous validation to ensure minimum requirements are met

## Aragonite saturation state in the global oceans





- Compiled global ocean station data that have both DIC and TA.
- Calculated aragonite saturation state (or Omega)
- To present spatial and vertical distributions of Omega.
- To discuss their controlling factors
- To present its decadal changes in the Pacific Ocean.

This work by Liqing Jiang will be presented in the 2014 CICS science meeting as well as work on the Ocean Acidification Data Stewardship Project

# Future ocean acidification work (science components)

- The goal is to establish empirical relationships for estimating pH and aragonite and calcite saturation states in the global oceans.
- Paper one: Algorithms between pH and aragonite and calcite saturation states as a function of T, S, and DO is established for some regions of the global oceans.
- Paper two: Global distributions of pH and aragonite and calcite saturation states in all seasons at standardized depths will be plotted by using the developed algorithms together with the currently available T, S, and DO data. The underlying mechanisms controlling them will be discussed.
- Pending funding support, this work will be completed in collaboration with PMEL, AOML, and Princeton University.

Liqing Jiang

## **NODC Data Stewardship**

## Primary CICS Scientist at NODC: Matt Biddle

NATIONAL OCEANOGRAPHIC DATA CENTER

CERTIFICATE OF APPRECIATION IS HEREBY GRANTED TO

#### MATHEW BIDDLE

FOR SUCCESSFULLY ESTABLISHING THE FIRST AUTOMATED ARCHIVE PROCESS WITH THE SOUTHEAST COASTAL OCEAN OBSERVING REGIONAL ASSOCIATION (SECOORA), AN IOOS REGIONAL ASSOCIATION

Harganta Serr MARGARITA GREGG, DIRECTOR NODC

JUNE 16, 2014

# Collaboration between NODC and CICS

### Data management through science

- To serve as a channel to keep NODC abreast with the needs of the research community in terms of data management.
- To deliver help in improving the data management system, e.g., quality monitoring system, quality control for the WOD, etc.

## Science through data management

 Publications taking advantage of two unique things: the vast amounts of data from NODC and our expert knowledge of it, and the research resources and analytical power of U MD.

## Employee training

 To provide research/education opportunities, e.g., field work/ship cruises, free online oceanographic courses, etc.

# A Changing World

 New NESDIS Assistant Administrator: Dr. Steve Volz;

• FY15 CR through December 11

- Data Center Consolidation
  - NOAA's National Climatic Data Center, National Oceanographic Data Center, and National Geophysical Data Center will merge into one data center upon Congressional approval
  - The new organization will be responsible for preserving, monitoring, assessing, and providing public access to the Nation's treasure of geophysical, oceanographic, and historical weather and climate data and information