



ICOADS Release 3.0— Data Characteristics and Future Priorities

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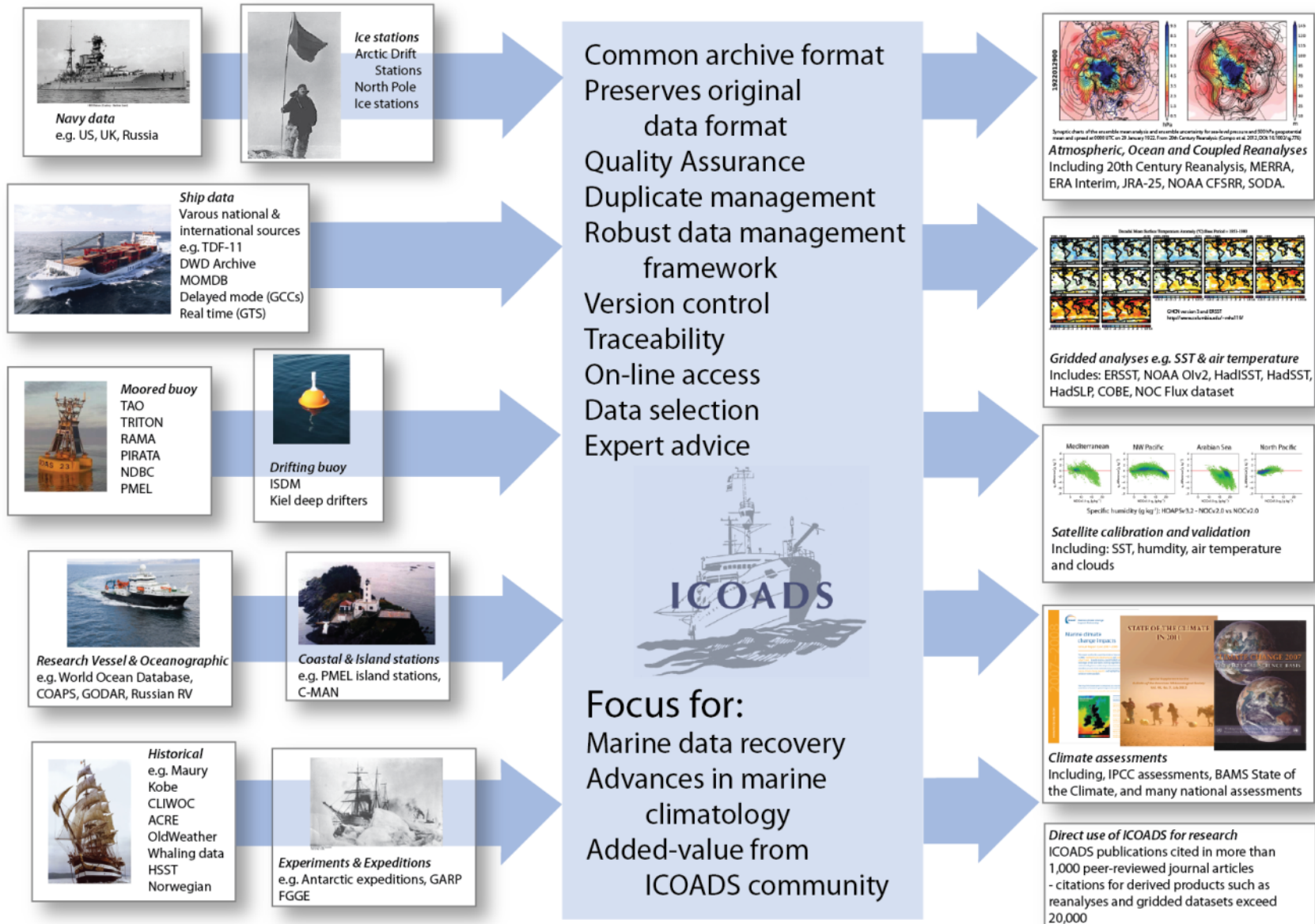
With contributions from members of the
ICOADS Steering Committee

Presentation Outline

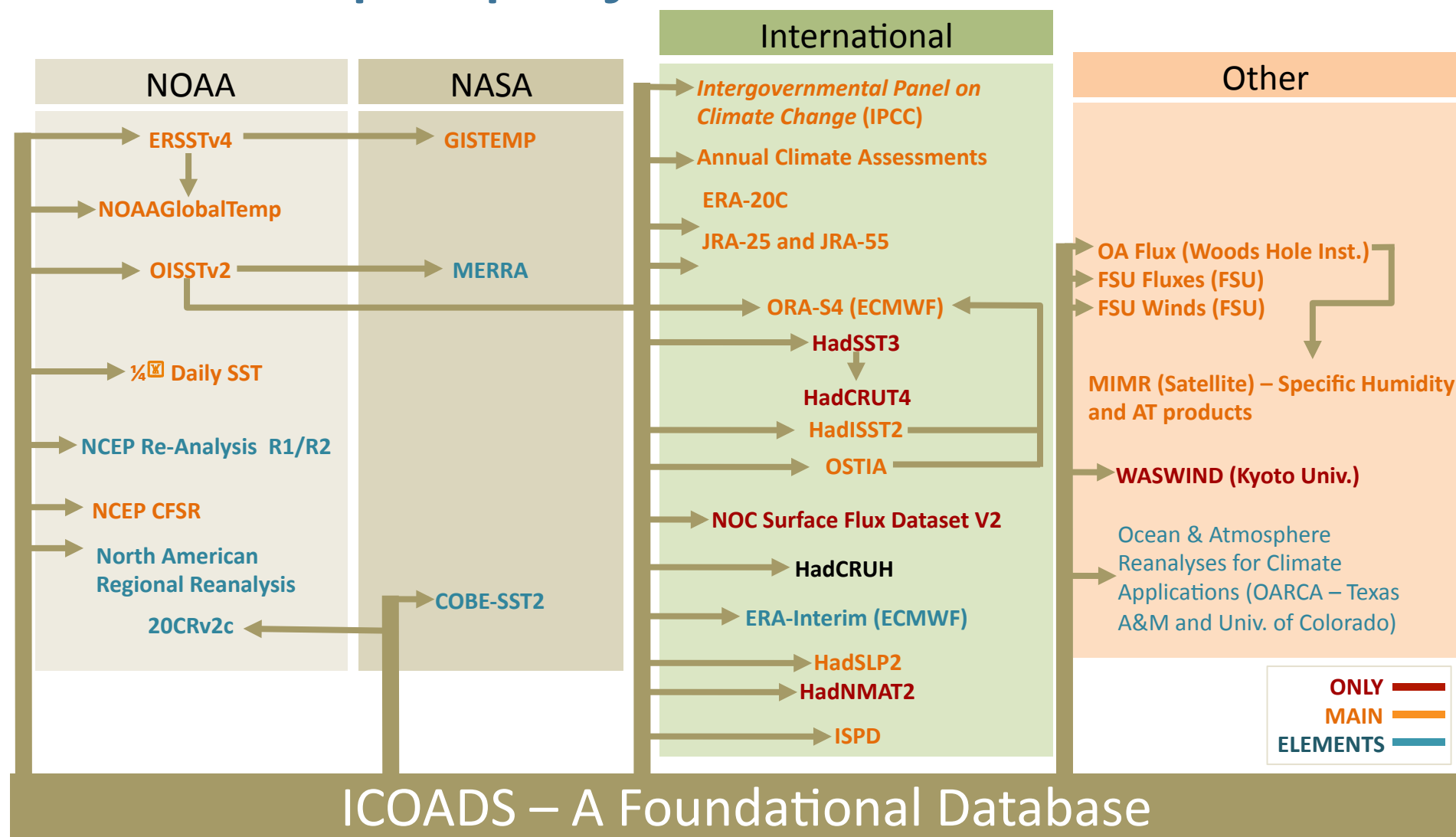
1. ICOADS overview
2. Introduction to Release 3.0 (R3.0)
3. Enhancements to the observational format (IMMA1)
4. Future directions

1. ICOADS Overview

Slide from Liz Kent, UK NOC



Example project users of ICOADS



Slide from William Angel, NCEI

Announced 27 June 2016 by NOAA/NCEI.

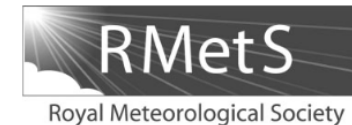
Paper now available Early Online from IJC:

<http://onlinelibrary.wiley.com/doi/10.1002/joc.4775/full>



2. Introduction to R3.0

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ICOADS Release 3.0: a major update to the historical marine climate record

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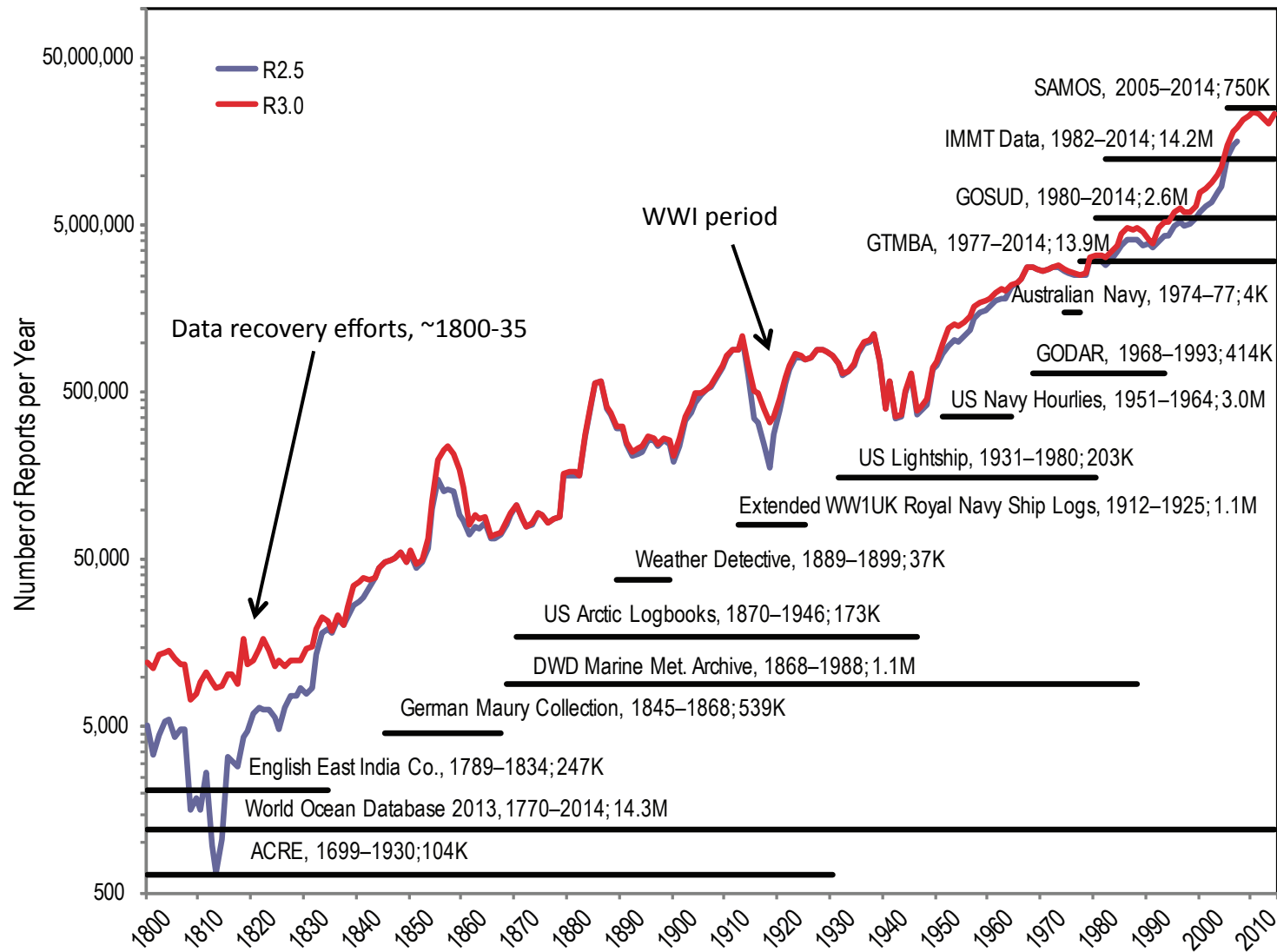
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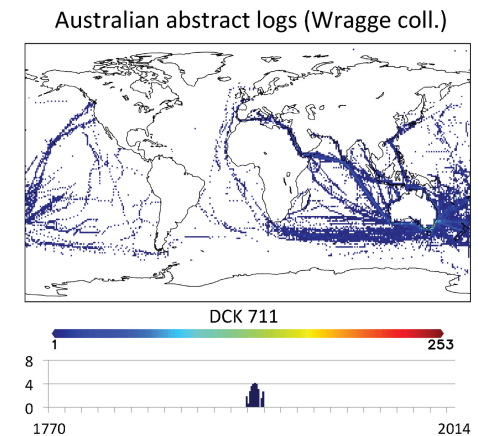
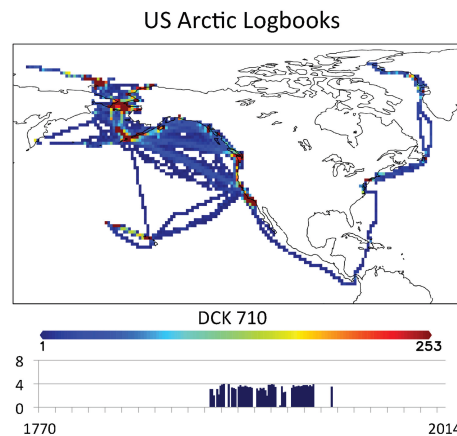
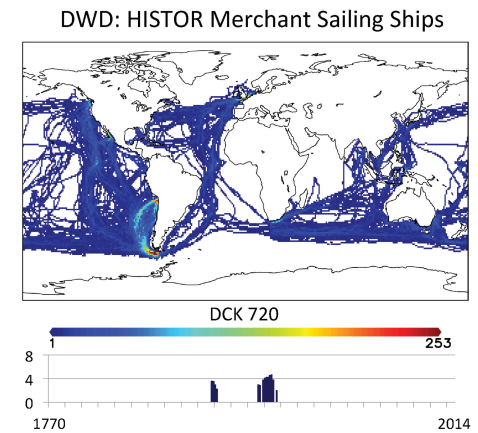
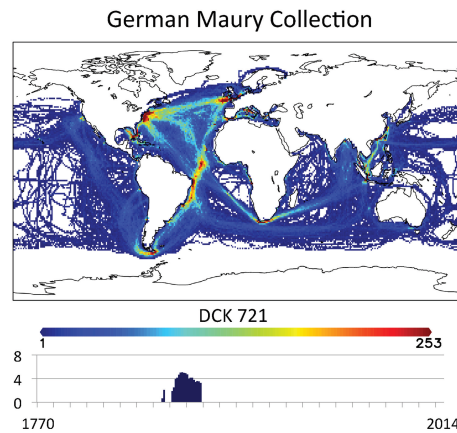
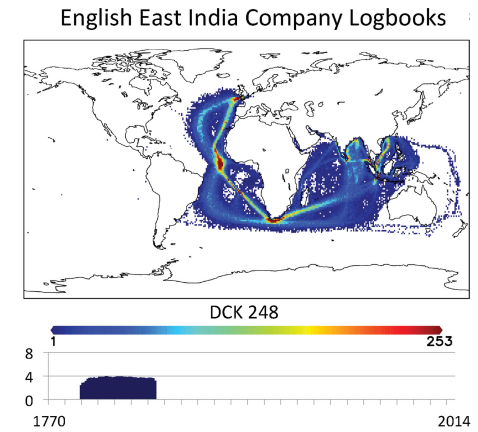
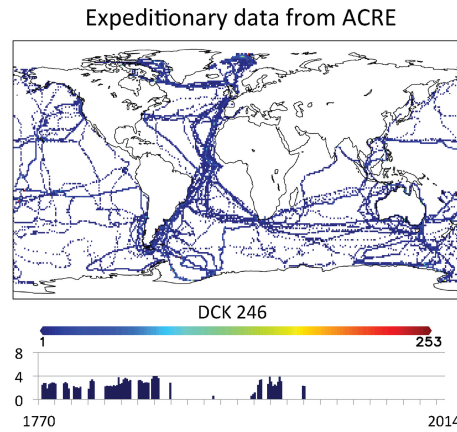
Primary data collections merged into R3.0

Over 1 billion reports input; over 455 million reports output for final product



Coverage of selected R3.0 historical inputs (Freeman et al. 2016)

Each data source is plotted over its period of record, with colors indicating the total counts of marine reports per 1¹/₂ box. An additional bar graph highlights the annual count of reports for the data source.





3. Enhancements to the International Maritime Meteorological Archive format: IMMA1

IMMA: flexible format schematic

record structure



- *Core* : the basic data: date, location, met./ocn.
- attachments (attms) – being defined as needed
 - *Icoads* : deck/source provenance, QC flags
 - *Nocr* : depth-referenced near-sfc ocean profile data

Key requirement: add original input data

Experience demonstrates format translations **frequently** contain errors/omissions; exact copy of input data permits re-translation and cross-checks at any time

New IMMA1 attms for R3.0

- Unique identifier attm [*Uida*]
 - includes *UID* assigned permanently to each marine report
 - attm also including: Release provenance information
 - *UID* provides absolute record tracking mechanism
 - makes user interactions (consulting) easier
 - simplifies data contributions from partners
 - *UIDs* assigned in R2.5.1/R2.5.2 (experimental releases) have been carried forward for continuity and provenance

Also: Assignment initiated (at NCAR) of overall dataset Digital Object Identifiers (DOI) to ICOADS observational data and products

New IMMA1 attms for R3.0 (cont'd)

- Near-Surface Oceanographic Data attm [*Nocn*]
 - Temperature, salinity, oxygen, phosphate, silicate, nitrate, pH, total chlorophyll, alkalinity, partial pressure of carbon dioxide, and dissolved inorganic carbon and associated sample depths
 - Closest to the surface and <100 meter depth
 - Data from WOD 2013, GOSUD, GTMBA, and the SAMOS archive
- Edited Cloud Report attm [*Ecr*]
 - Using software provided by Univ. of Washington and with implementation by UK NOC (Liz Kent)
 - Check cloud and weather reports for errors and inhomogeneities
 - Corrected (in this attm) or flagged as invalid

New IMMA1 attms for R3.0 (cont'd)



- ICOADS-Value Added Database attm [*Ivad*]
 - Goal: make results of research activities available alongside obs., e.g. bias adjustments for different parameters
 - Scientifically demonstrate the impact of value-added records on air-sea flux estimates & common climate indicators
 - Prototype adjustments w/ R3.0: Beaufort) winds & adjusted Air Temps.
- Reanalysis QC/Feedback attm [*Rean-qc*]
 - Comparison of model-driven first guess with in-situ obs
 - Contains the first-guess, bias corrected obs value, the data fields capture the analysis project, the data provider and a code that points to reference doc describing reanalysis effort
 - Feedback from ECMWF ERA-20C will be the first added to R3.0



4. Future Directions

ICOADS Steering Committee

Current Membership:

- NCEI: Eric Freeman (co-Chair)
- UK NOC: Elizabeth Kent (co-Chair)
- NCEI: William Angel
- UK Met Office: Philip Brohan
- DWD: Lydia Gates
- NCAR: Steve Worley

Affiliate

- Shawn Smith, FSU (Chair for planned IVAD Task Team)

Ex-Officio

- NCEI & CIRES: Scott Woodruff

Letter-of-Intent (LOI)

Eight organizations Germany-UK-USA, signed April 2014



Enhancements/alternatives for IMMA format

- While extensible, technologically stable (ASCII), and thus highly suitable for permanent archival requirements
- Challenge, IMMA is not user friendly, too complex
 - Continuing need for on-demand software drivers to create friendly user products, e.g. csv tables (via NCAR), or netCDF files

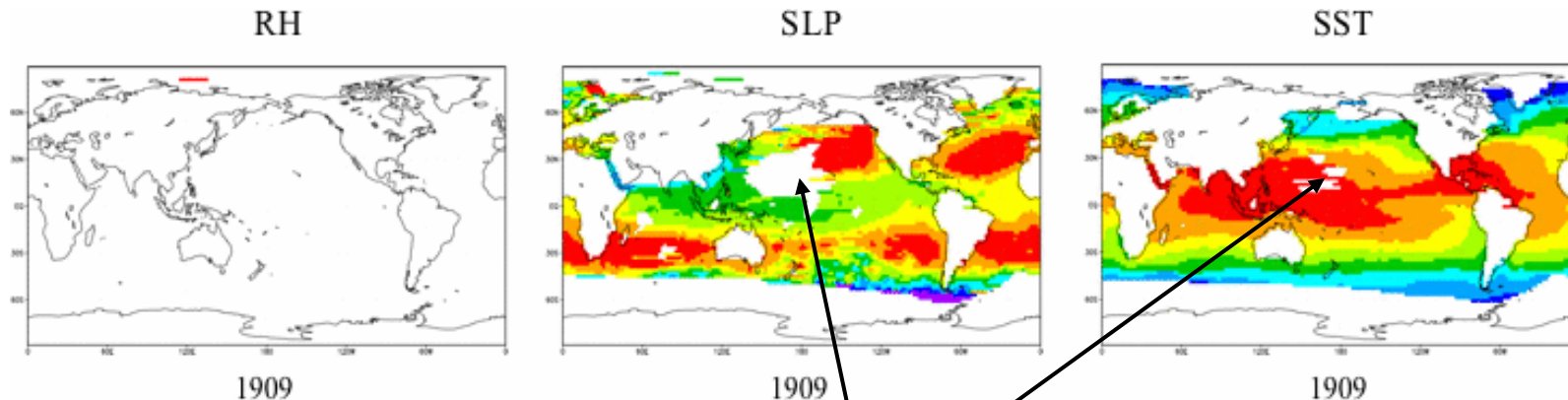
Big Environmental Data Initiative Proposal

- FY17 proposal (work to be completed by June 2017) funded (\$75K)
 - ✓ Tim Boyer (lead PI)
- For implementing a standardized netCDF format and metadata set for search and delivery through the NCEI Granule Geoportal and THREDDS server system
- Companion proposal for incorporating GTSP and Argo into the same search and discovery routines as WOD (past funding) also accepted

QC improvements: urgently needed

- ICOADS QC and “trimming” is outdated (1985), complex, robust, but challenging to replace
 - Faults: Climatological trimming too narrow in low sample areas, lack estimates in historically data void areas
 - Needed: Simplified and more modular QC, estimating data voids from modern data (we have ongoing work in this area)

Early trimming limits coverage for 1854-1909 period:

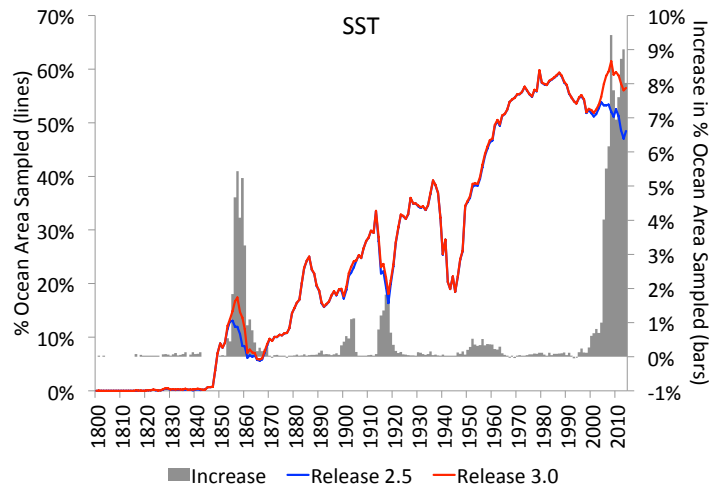


Early RH missing, and gaps also exist in SLP and SST coverage

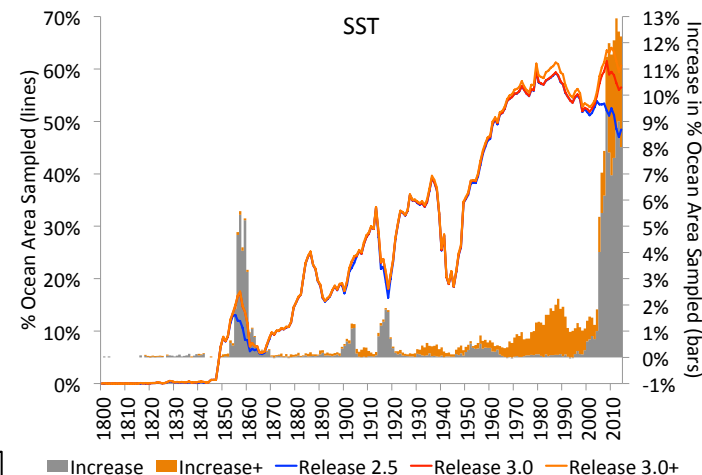
R2.5: Ad Hoc QC Modification: Trimming Limits (e.g. July) for RH: Used 1910-49 for 1854-1909

R3.0 coverage improvements, actual (L)/potential (R)

Potential improvements (orange) from allowing unfiltered data into ocean/coastal boxes with trimming limits missing

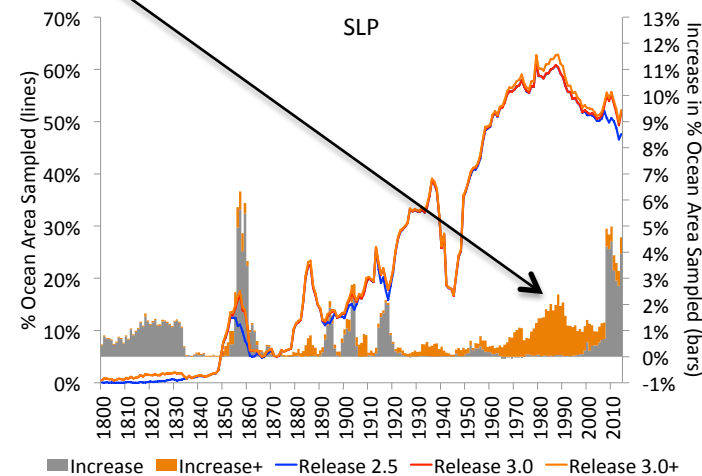
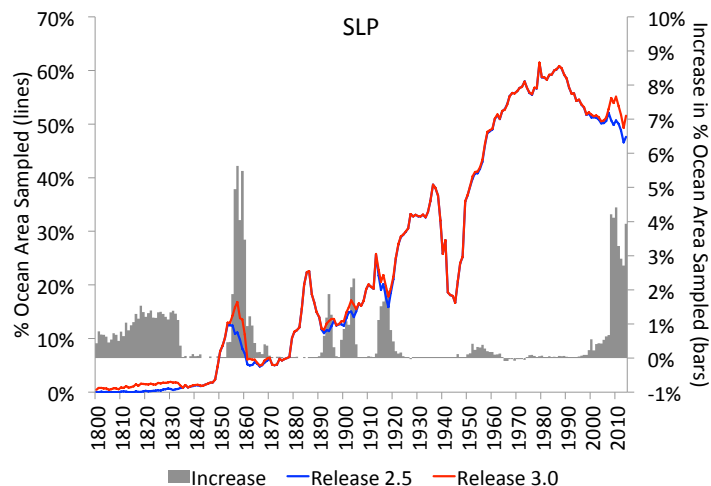


a)



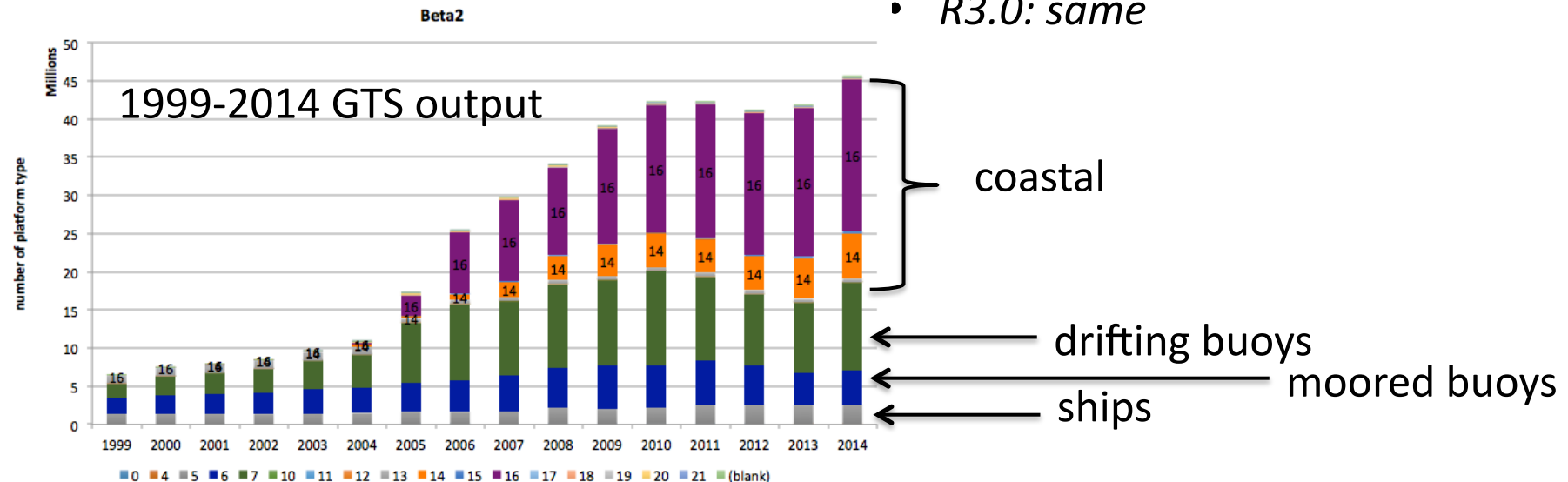
a)

For early GTS receipts etc.,
apparent augmentations
may arise merely from noisy,
spatially mislocated data



Logistics & importance of making high-temporal-resolution data available alongside synoptic ICOADS data? – e.g.:

- | | | |
|---|---|---|
| a) SAMOS R/V project: 2005-,
43.5M 1-min marine obs. | ➔ | <ul style="list-style-type: none"> • Old approach (used for WOCE 1990-98): mimic hourly • <i>R3.0: same</i> |
| b) Global Tropical Moored Buoy Array (GT MBA) (TAO, etc.) | ➔ | <ul style="list-style-type: none"> • Old: mostly hourly • <i>R3.0: hourly (max.)</i> |
| c) coastal buoys/C-MAN (NDBC) & tide gauge met. records | ➔ | <ul style="list-style-type: none"> • Old: mostly hourly • <i>R3.0: same</i> |





**Establishment of CMOC-China (in 2015);
& Plans for ICOADS (and WOD) to be formalized as a WMO-IOC Centres
for Marine-meteorological and Oceanographic Climate Data (CMOC)**

- CMOC: Highest-level component of the emerging JCOMM Marine Climate Data System (MCDS: to be implemented by 2020)
- Overall objectives:
 - ✓ Shared work, database enhancements, and more rapid development of ICOADS and similar high-level data consolidation and QC efforts
 - ✓ Potential for funding (e.g. WMO's Global Framework for Climate Services)
- Planned Asian-Pacific and data rescue foci of CMOC-China to be discussed at:
 - ACRE-China Workshop on Recovery, Digitization and Analysis of Pre-mid-20th Century Climate Observational Data in East Asia (23-25 Aug. 2016, Beijing)
 - CMOC-China Workshop (29 Aug.-1 Sept., Tianjin)

Questions?

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Thanks to the ICOADS partners...and for several years of funding support by NOAA's Climate Program Office (CPO)

ICOADS

- <http://icoads.noaa.gov/>
- <http://icoads.noaa.gov/products.html>

IVAD

- <http://icoads.noaa.gov/ivad/>

