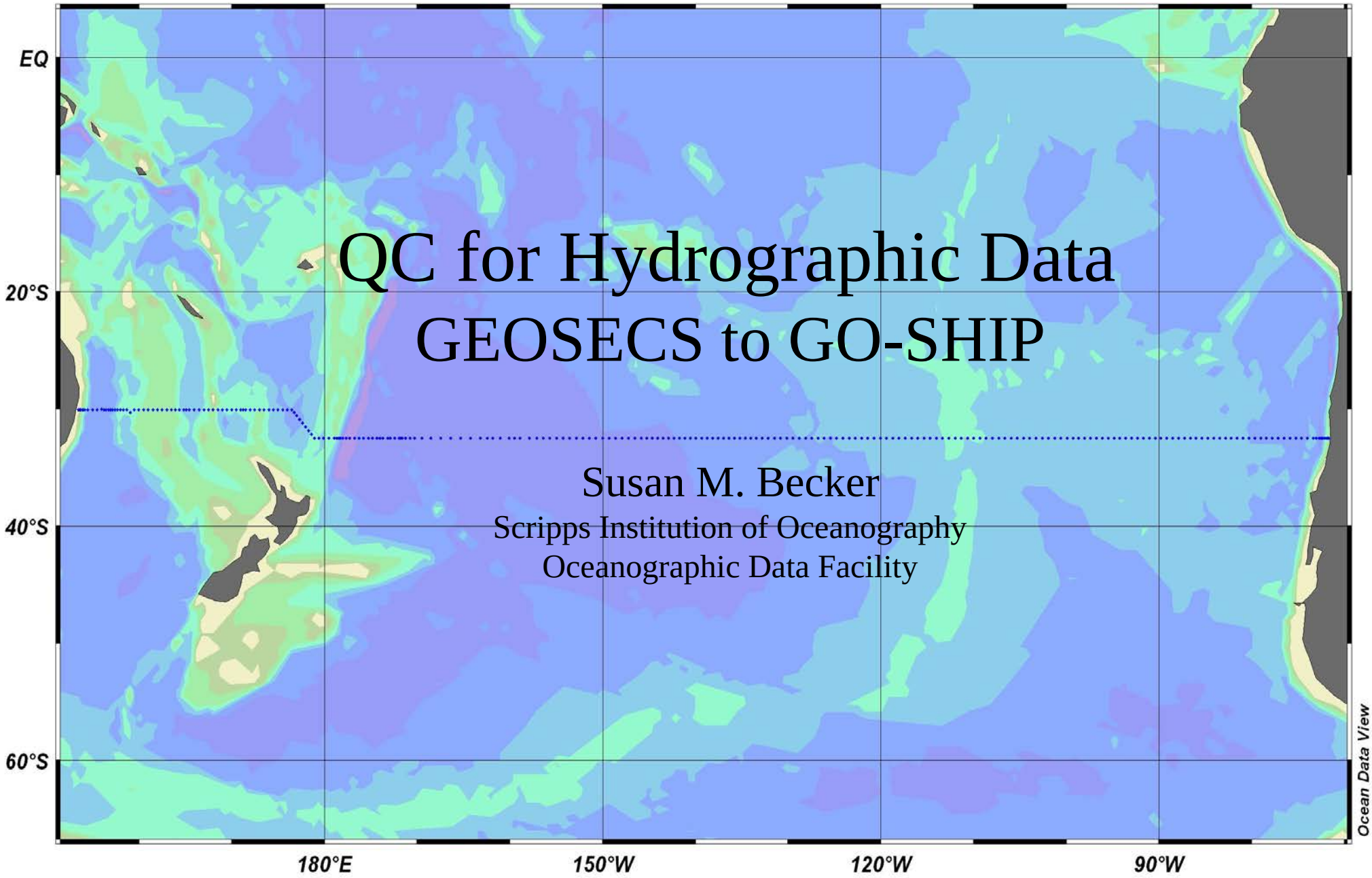


QC for Hydrographic Data
GEOSECS to GO-SHIP

Susan M. Becker
Scripps Institution of Oceanography
Oceanographic Data Facility

Global Hydrographic Efforts

Geo-chemical Ocean Sections (GEOSECS)
World Ocean Circulation Experiment (WOCE)
Joint Global Ocean Flux Studies (JGOFS)
Climate and Ocean Variability (CLIVAR)
Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP)

http://www.go-ship.org/Hydroman.html

GO-SHIP STANDARDS FOR CTD SENSORS

Temperature

Accuracy = 0.002°C. Precision = 0.0005°C (ITS90).

Salinity

Accuracy = 0.002 g kg-1 (TEOS-10) depending on frequency and technique of calibration. Precision = 0.001 g kg-1 (TEOS-10), depending on processing techniques.

Pressure

Accuracy = 3 decibar (dbar) with careful laboratory calibration. Precision = 0.5 dbar, dependent on processing.

O2

Accuracy = 1%. Same for precision.

STS calibration of Pressure Sensors

Pressure laboratory calibrations are done at several temperatures to provide coefficients that are corrected for the effect of temperature

at sea:
Follow the recommendations in the GO-SHIP methods: "monitor on-deck pressure values at the beginning and end of every cast, and from cast to cast. Usually no additional adjustment is necessary, and on-deck pressure stays within 1 dbar of pre-cruise calibrations"

At Sea Calibration of CTD Sensors

Temperature calibrations:

- **comparison of primary and secondary SBE 3plus temperatures on each cast**
- **a single SBE 35 at bottle stops as a tertiary temperature check.**

Two independent metrics of conductivity correction accuracy are examined:

- **At each bottle closure, the primary and secondary conductivity are compared with each other.**
- **Each sensor is also compared to conductivity calculated from check sample salinities using CTD pressure and temperature.**

"Collecting and calibrating electrochemical oxygen sensor profiles of dissolved oceanic oxygen data requires some expertise and perhaps some art as well. When calibrations are complete, the residuals between oxygen sensor data and bottle oxygen sample data should be small (< 2 µmol kg-1 overall and even < 1 µmol kg-1 in some locations of the water column) if water sample data quality are high and oxygen sensor performance is good. "

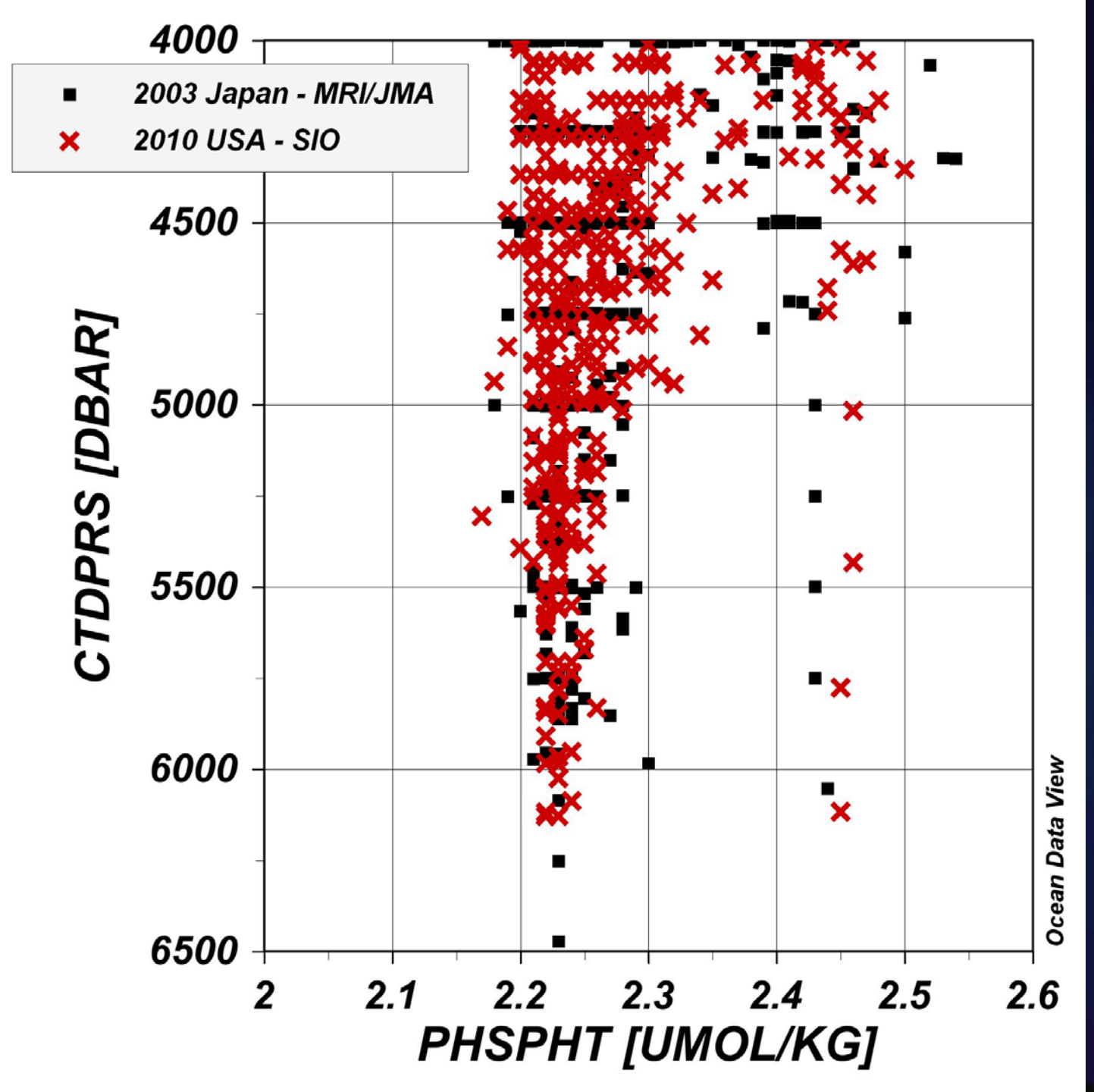
GO-SHIP STANDARDS FOR WATER SAMPLES

Salinity:
Accuracy of 0.001 is possible with Autosal™ salinometers

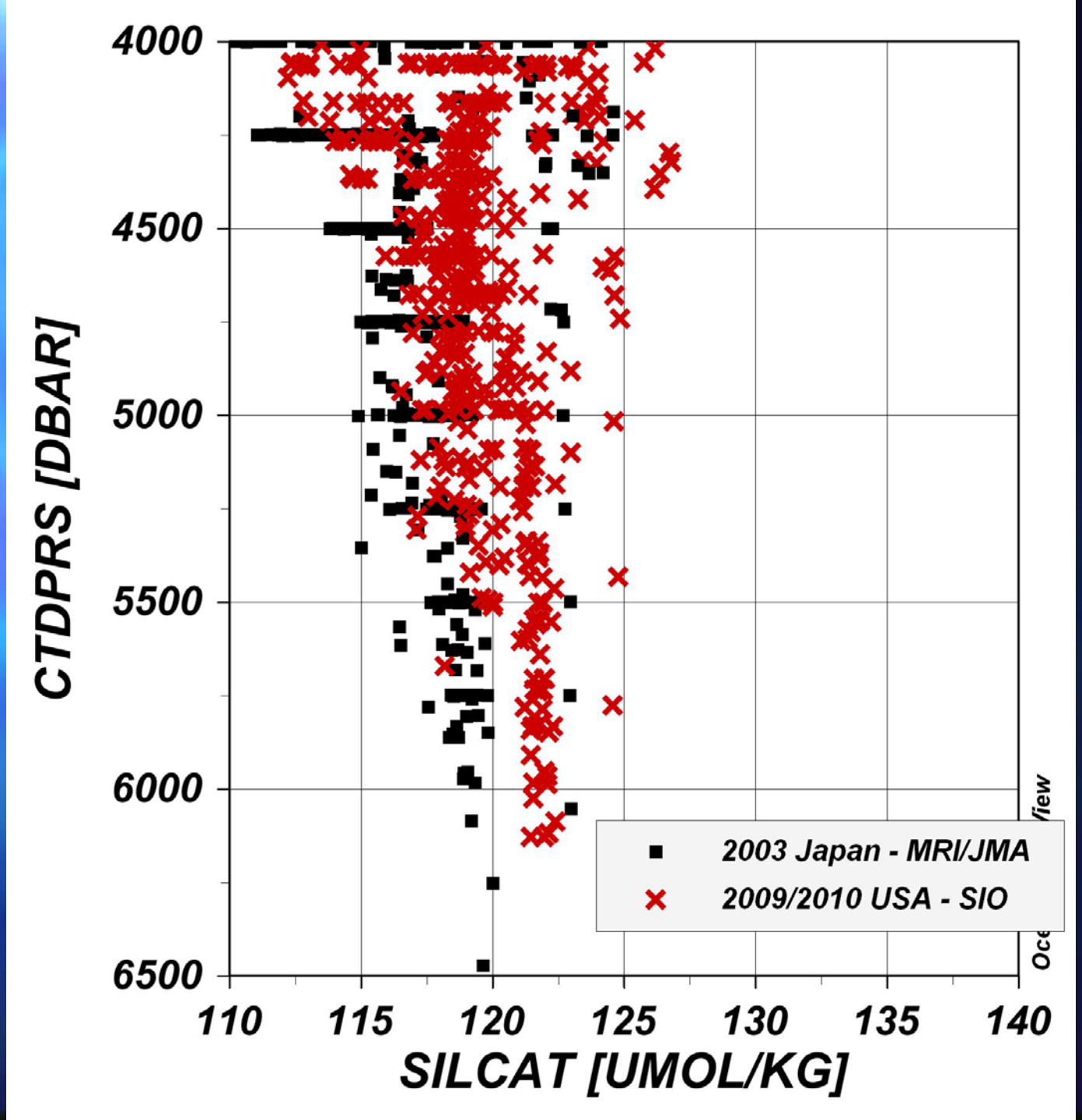
O2:
Target accuracy is that 2 sigma should be less than 0.5% of the highest concentration found in the ocean. Precision or reproducibility (2 sigma) is 0.08% of the highest concentration found in the ocean

NO3 approximately 1% accuracy and 0.2% precision , full scale
PO4 approximately 1-2% accuracy and 0.4% precision, full scale
SiO2 approximately 1-3% accuracy and 0.2% precision, full scale

P06


2003 Japan - MRI/JMA
2010 USA - SIO
CTDPRS [DBAR]
4000
4500
5000
5500
6000
6500
2
2.1
2.2
2.3
2.4
2.5
2.6
PHSPHT [UMOL/KG]
Ocean Data View

P06


4000
4500
5000
5500
6000
6500
CTDPRS [DBAR]
110
115
120
125
130
135
140
SILCAT [UMOL/KG]
2003 Japan - MRI/JMA
2009/2010 USA - SIO

SIO RMNS Summary

- For NO3 and PO4, the observed differences between the deep data and the differences between the observed RMNS values and the assigned values are within the intra cruise variability (<1%)

- The intra cruise variability for SIL was good (<1%)

- For SIL the observed differences data is very close to the observed difference in the observed vs. assigned RMNS values

Summary

The potential changes scientists are looking for are at or near the detection limits of most sensors and instruments. It is critical that any observed changes are not due to differences in sensors, methodologies, or differences in calibration standards, laboratories collecting and analyzing the data for the different ocean parameters.

Purkey and Johnson (2010, 2012)
CARINA (Carbon In the Atlantic) [Key et al., 2010]
GLODAP (GLobal Ocean Data Analysis Project) [Key et a., 2004]
GLODAP V2

Hood, E.M., C.L. Sabine, and B.M. Sloyan, eds. 2010. *The GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines. IOCCP Report Number 14, ICPO Publication Series Number 134.*
Available online at http://www.go-ship.org/HydroMan.html.