

NOAA/AOML efforts to resolve XBT fall rate equation issues

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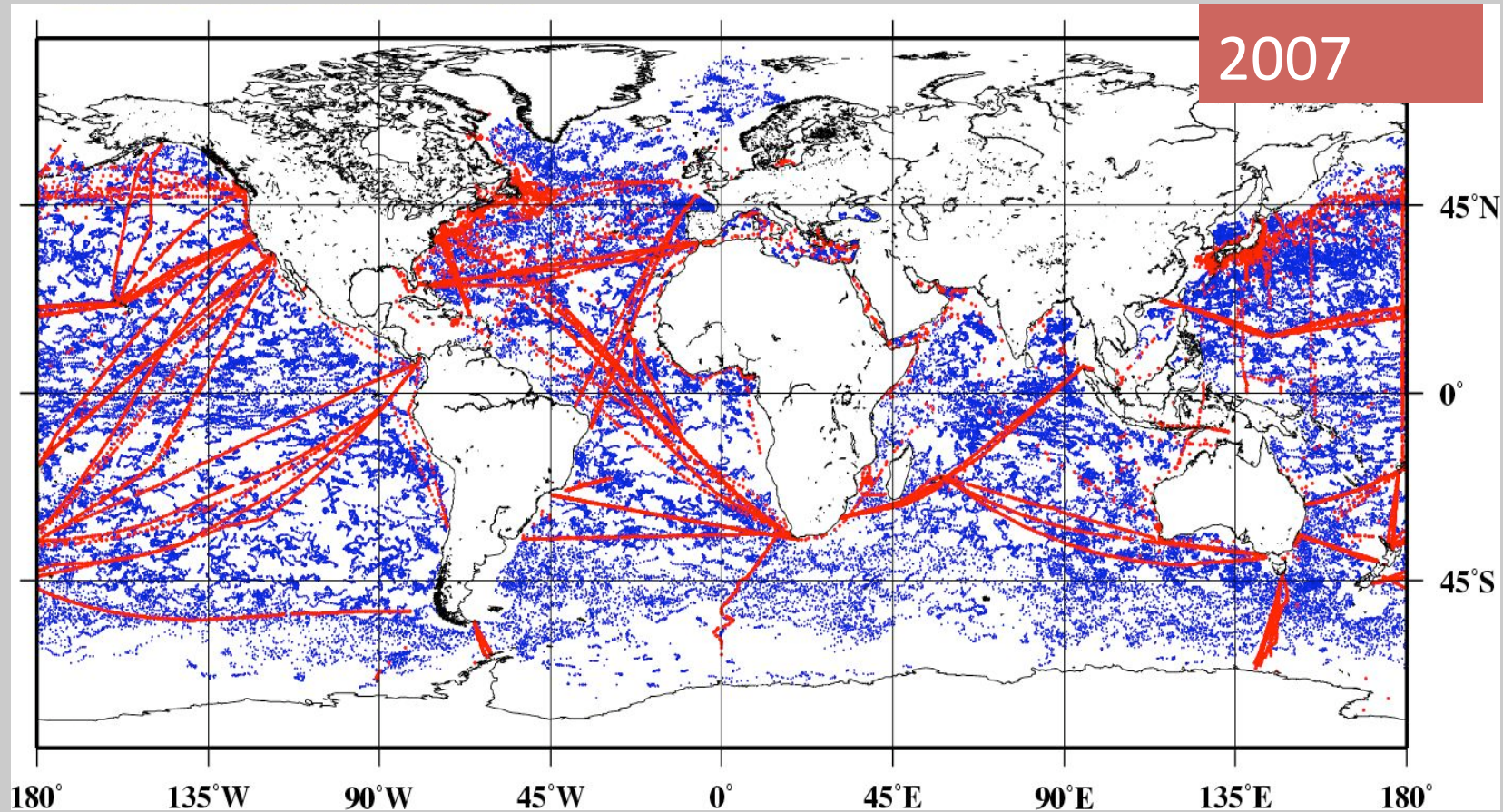
NOAA/AOML efforts to resolve XBT fall rate equation issues

- 1) CTD/XBT experiments (GG)**
- 2) Argo-XBTs-Altimetry studies (PDN)**
- 3) Data acquisition system experiments (GG, RM, DS, MB)**
- 4) Data management (JT)**

- 5) Support of non-NOAA experiments**



XBT and Argo observations



SEAS and non-SEAS XBT transmissions

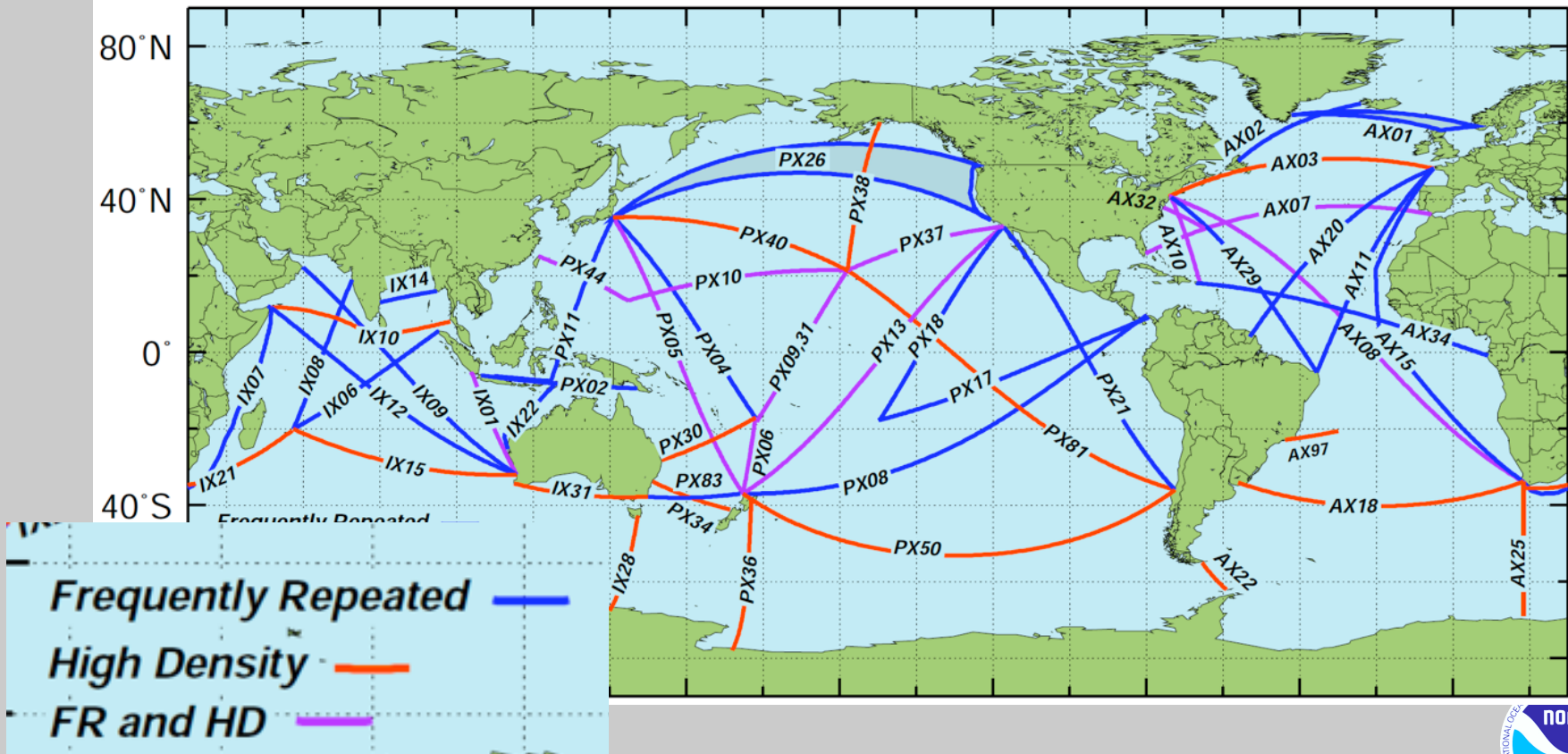
Year	SEAS	Non-SEAS	
2000	4395	2988	
2001	8752	7227	
2002	8314	8056	
2003	9922	11607	
2004	13637	10904	
2005	12254	9912	
2006	12830	6818	
2007	12858	5532	
2008	13408	6408	
2009	12965	5669	
2010*	7626	4647	



Ship Of Opportunity Program (SOOP)

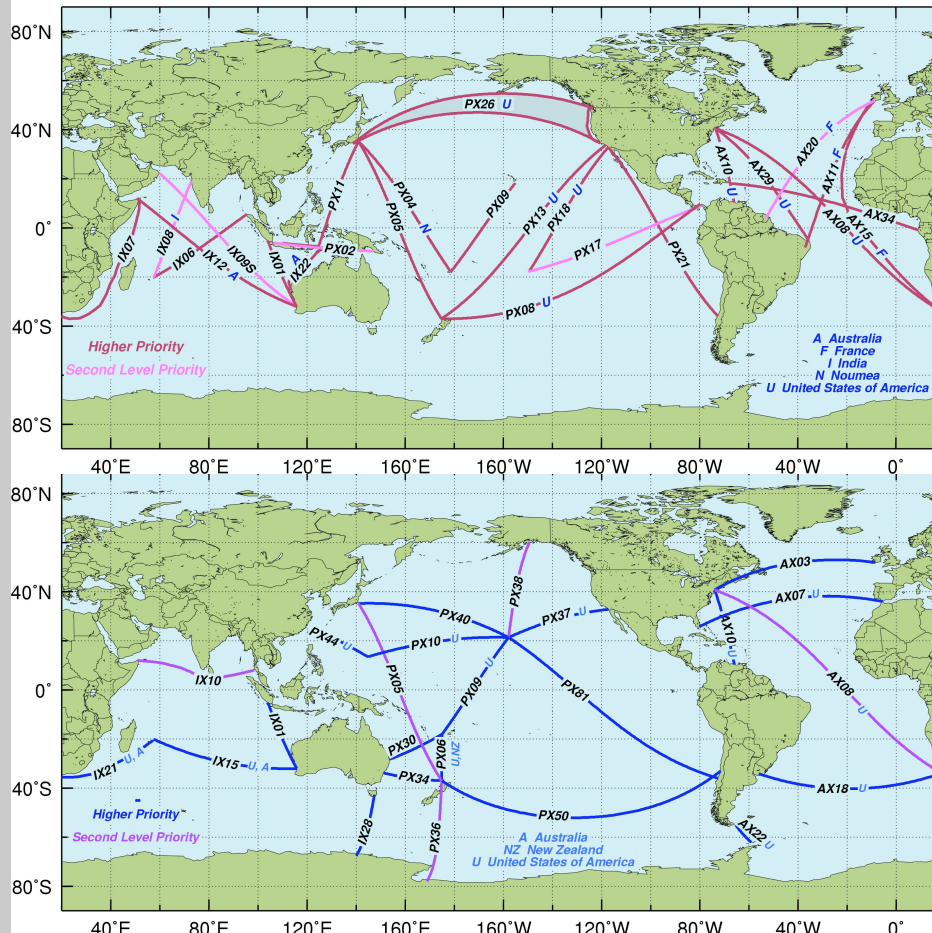
THE SHIP OF OPPORTUNITY PROGRAM

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Modes of XBT Deployments

Frequently Repeated (FR) XBT Network, OceanObs99 Recommendations



Low Density:

4 deployments per day
12 transect per year

Frequently Repeated (25):

6-8 deployments per day
12-18 transect per year

High Density (23):

1 deployment every 25-50 km
(18-35 deployments per day)
4 transects per year

OceanObs09 Recommendations

- 1) The scientific community implements and maintains the XBT network.**
- 2) Explore possibility of having XBT transects in marginal seas.**
- 3) Analyze and evaluate the correct temporal and spatial sampling of each deployment mode.**
- 4) Evaluate effectiveness of Argo floats to duplicate XBT-derived signals.**
- 5) Support RT transmissions.**
- 6) Support advisory panels such as GOSUD and SAMOS.**
- 7) Support integration of XBT observations with those from other platforms (TSG, pCO₂, CPR, etc).**
- 8) Support technological improvement of XBT launcher and transmission systems.**



OceanObs09 Recommendations

- 9) Establish community-based procedures to calibrate XBTs with CTDs when research-quality data are collected.**
- 10) Establish consistent data QC procedures.**
- 11) Make recommendations on what parameters (FRE coeffs, recording device, ship speed, launcher type, launcher height, etc.) must be included in the metadata.**
- 12) Complete high quality, historical, and global XBT data base**
- 13) Continue strong emphasis of XBT data analysis for scientific studies and increase its operational applications.**
- 14) Support strong presence of XBT science and operational results in scientific and operational meetings.**
- 15) Recommend the creation of an international panel for upper ocean thermal observations to support and evaluate recommendations of the integration of the different platforms, including XBTs.**



XBT – CTD deployments

NOAA AOML and PMEL PIRATA Northeast Extension:

July 2009

Longitude: 23°W (0-8°N)

12 CTD casts

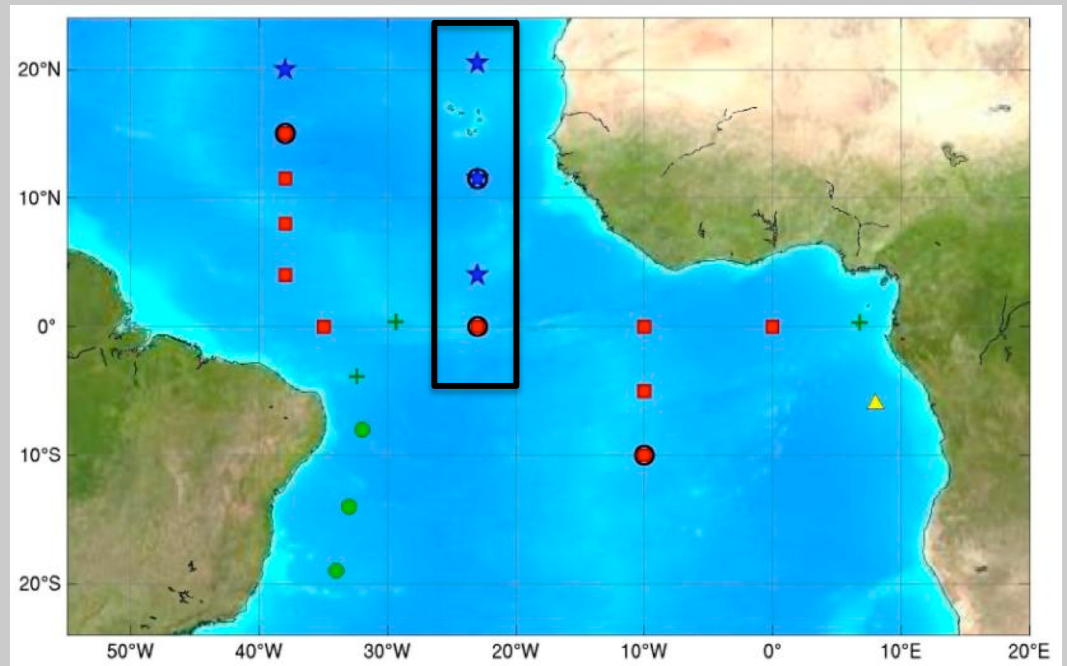
56 XBT deployments:

1986 : 21 XBTs

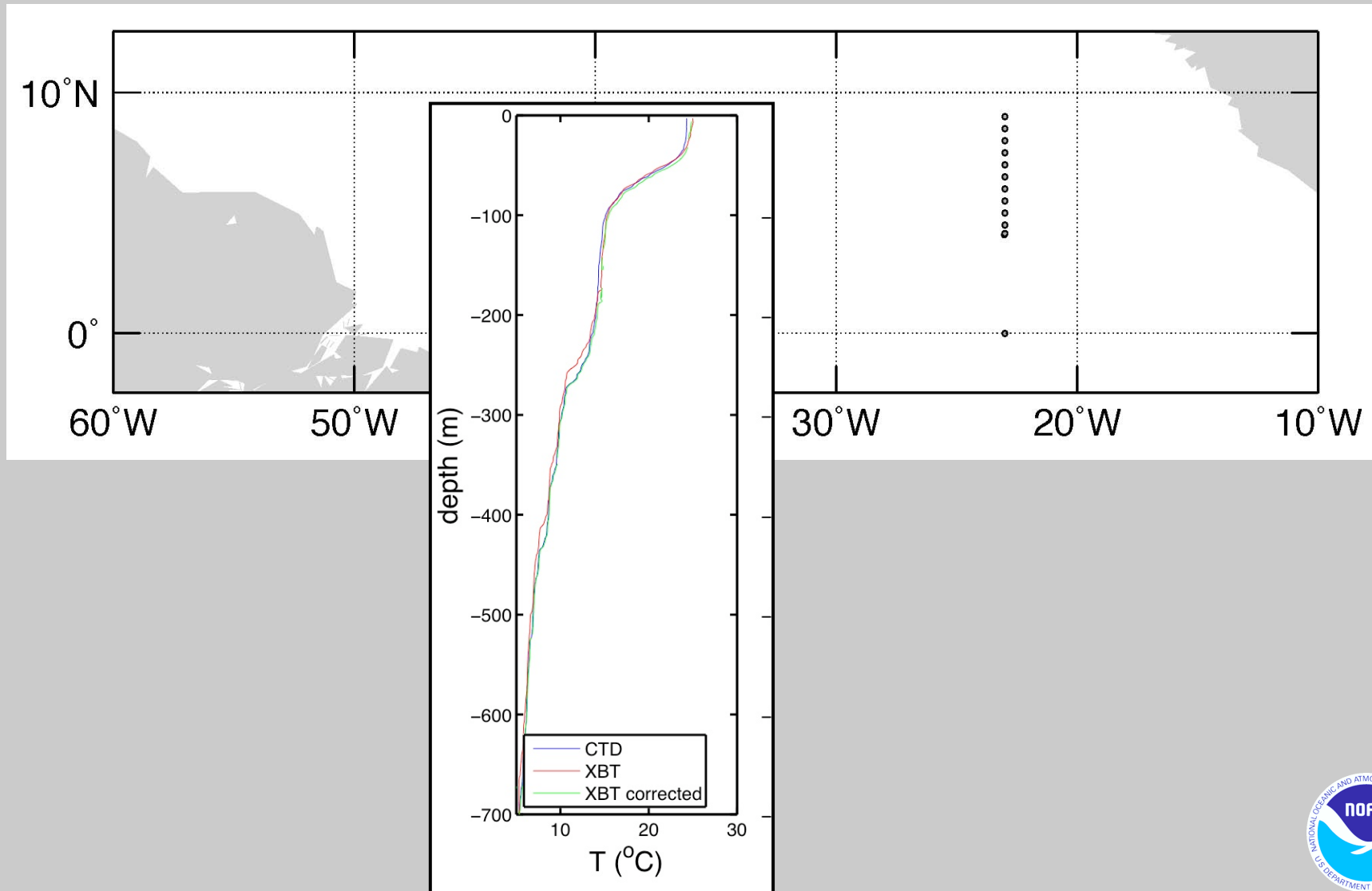
1990-1991: 10 XBTs

1995: 13 XBTs

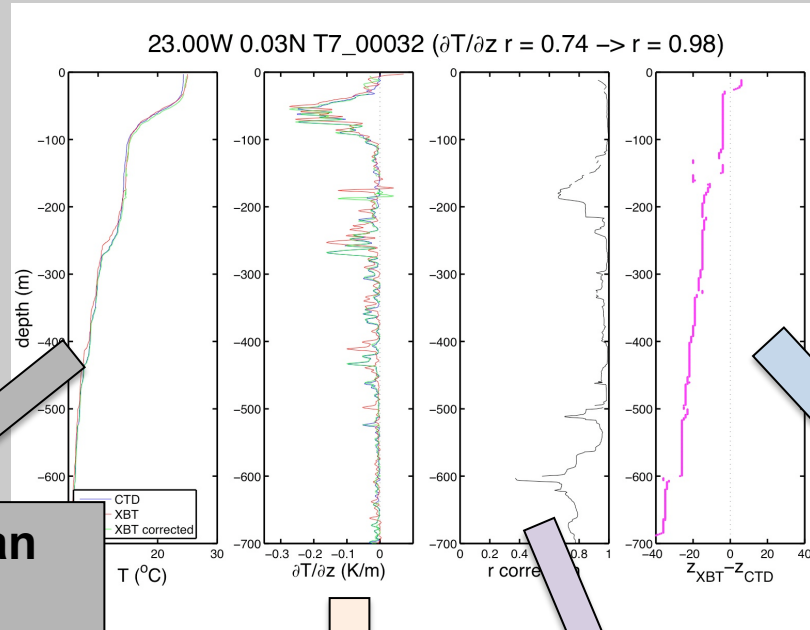
2008: 12 XBTs



The experiment



XBT and CTD deployments



XBT profile: Sippican coefficients. CTD profile

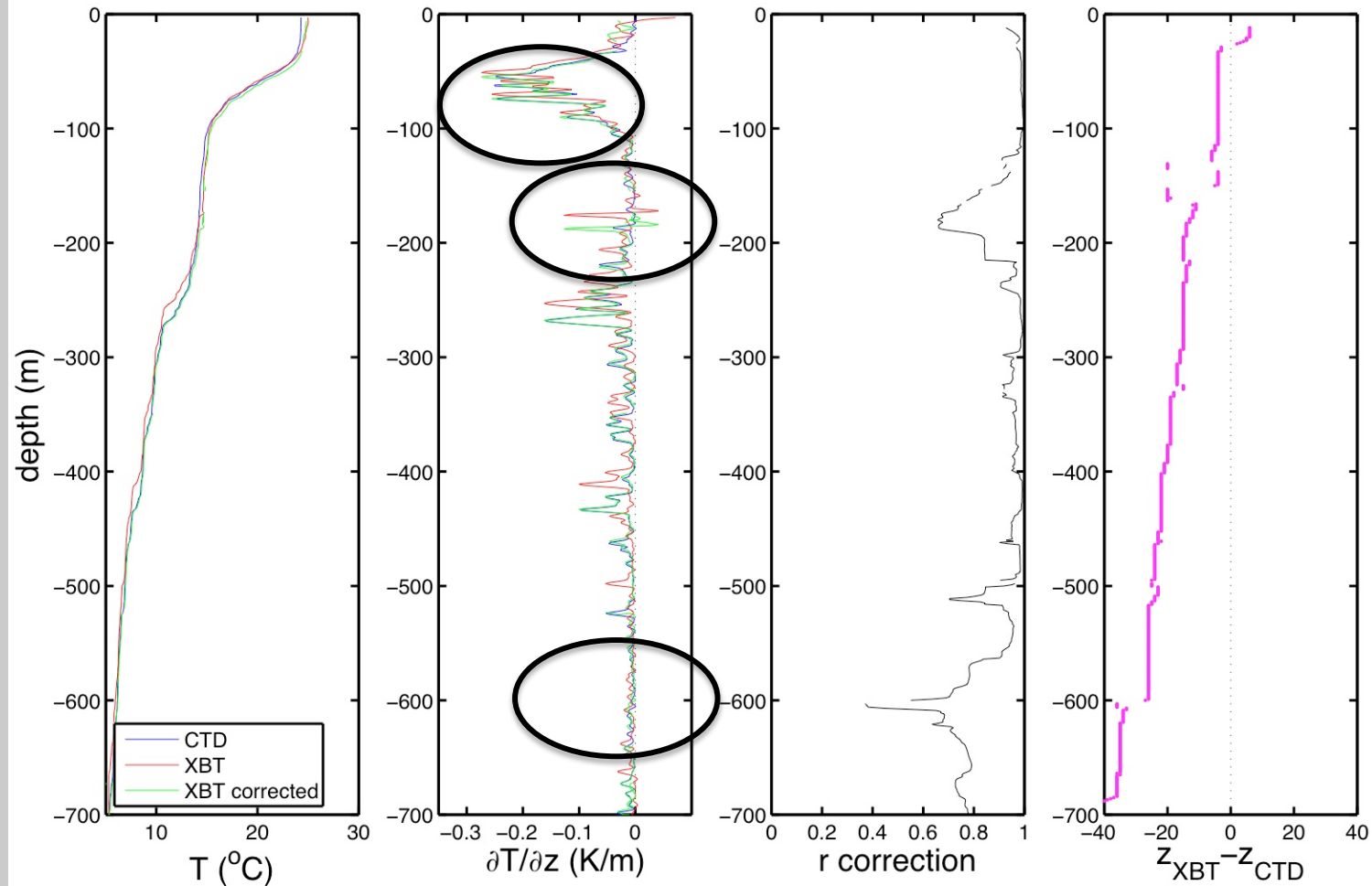
$Z_{\text{CTD}} - Z_{\text{XBT}}$

Dt/dz for XBTs and CTDs

Max correlation coefficient in 100m window

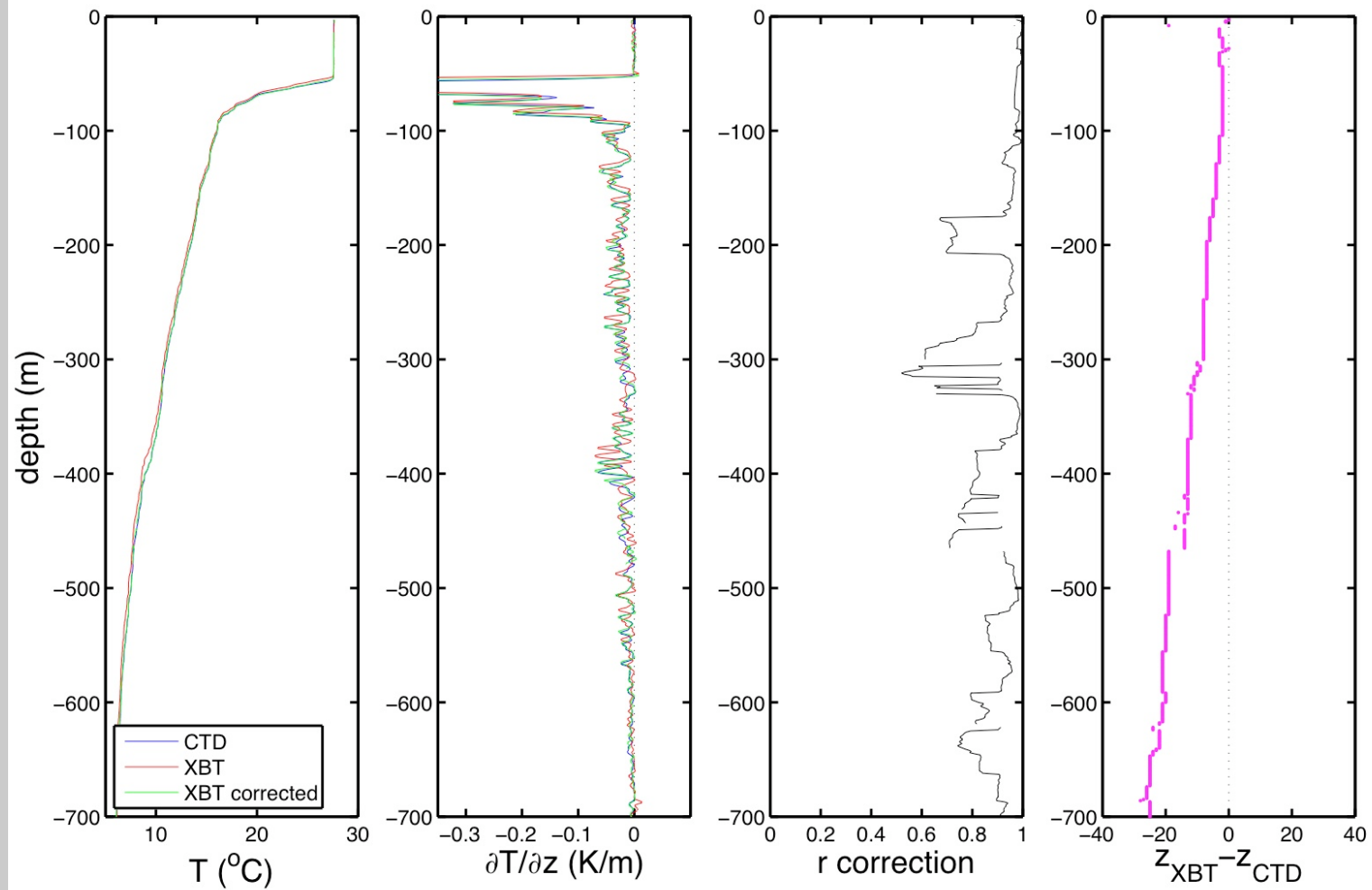
XBT and CTD deployments

23.00W 0.03N T7_00032 ($\partial T/\partial z$ $r = 0.74 \rightarrow r = 0.98$)



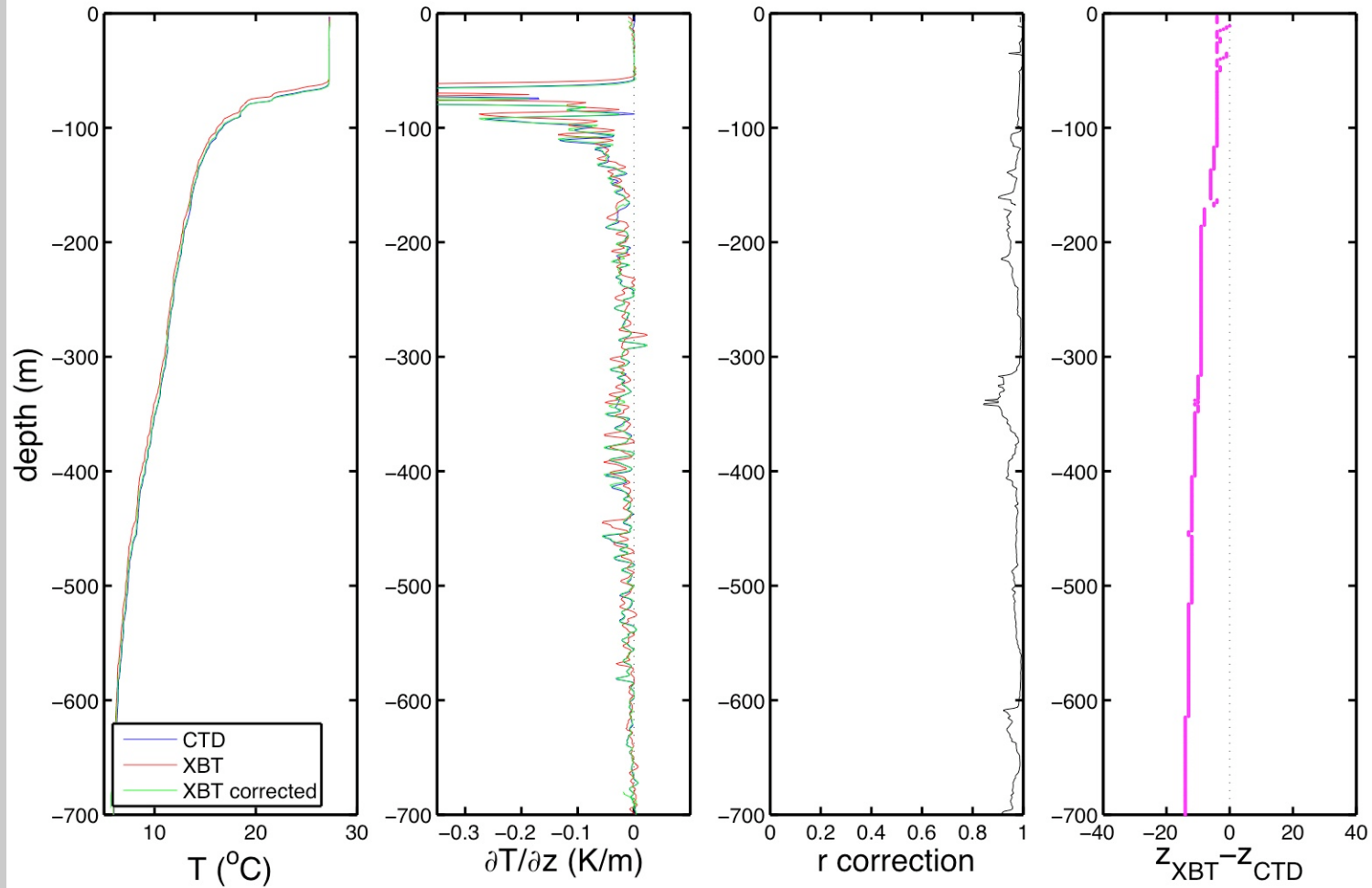
XBT and CTD deployments

23.00W 4.50N T7_00072 ($\partial T/\partial z$ $r = 0.88 \rightarrow r = 0.98$)



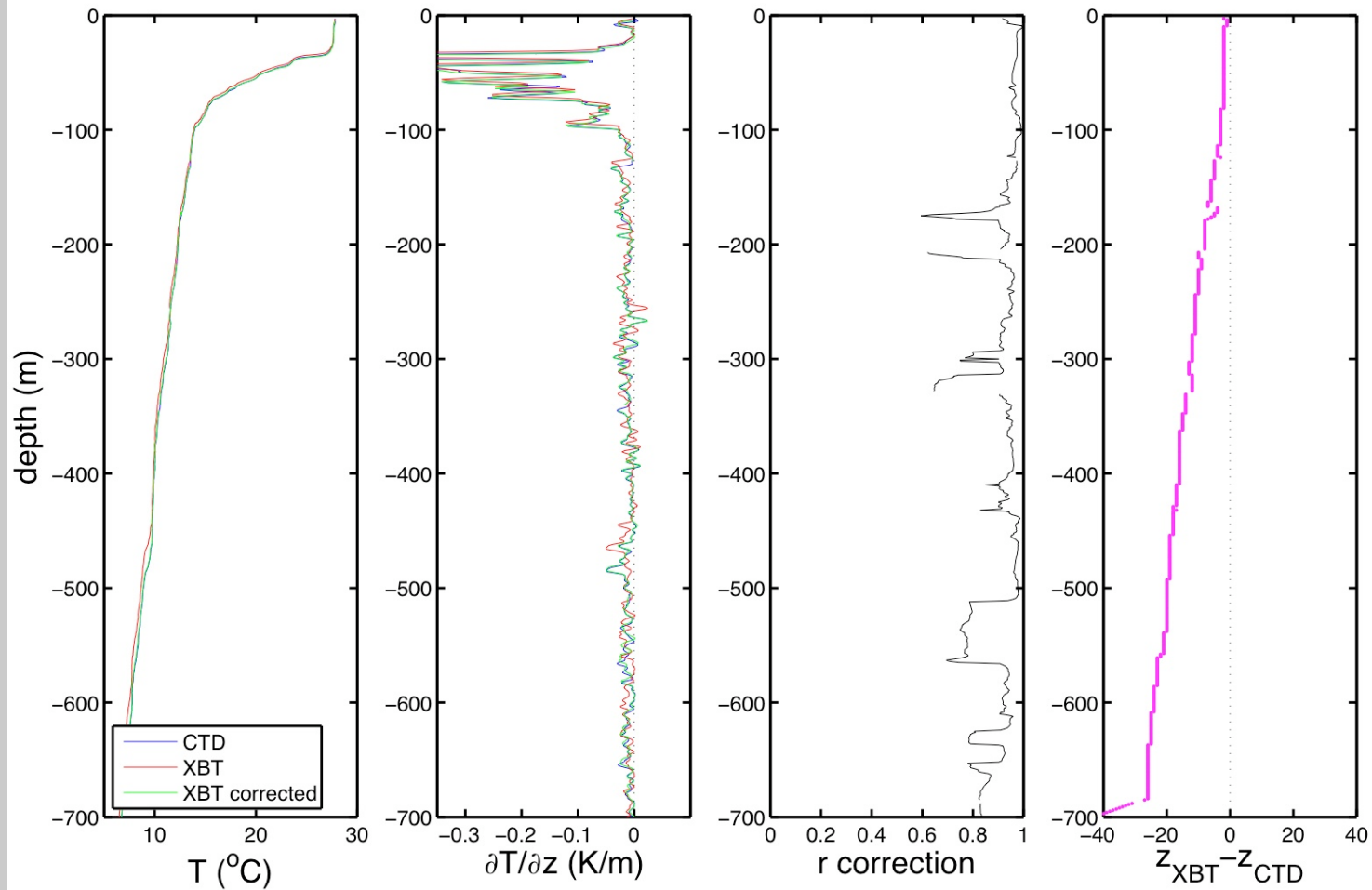
XBT and CTD deployments

23.00W 5.00N T7_00080 ($\partial T/\partial z$ $r = 0.68 \rightarrow r = 0.99$)

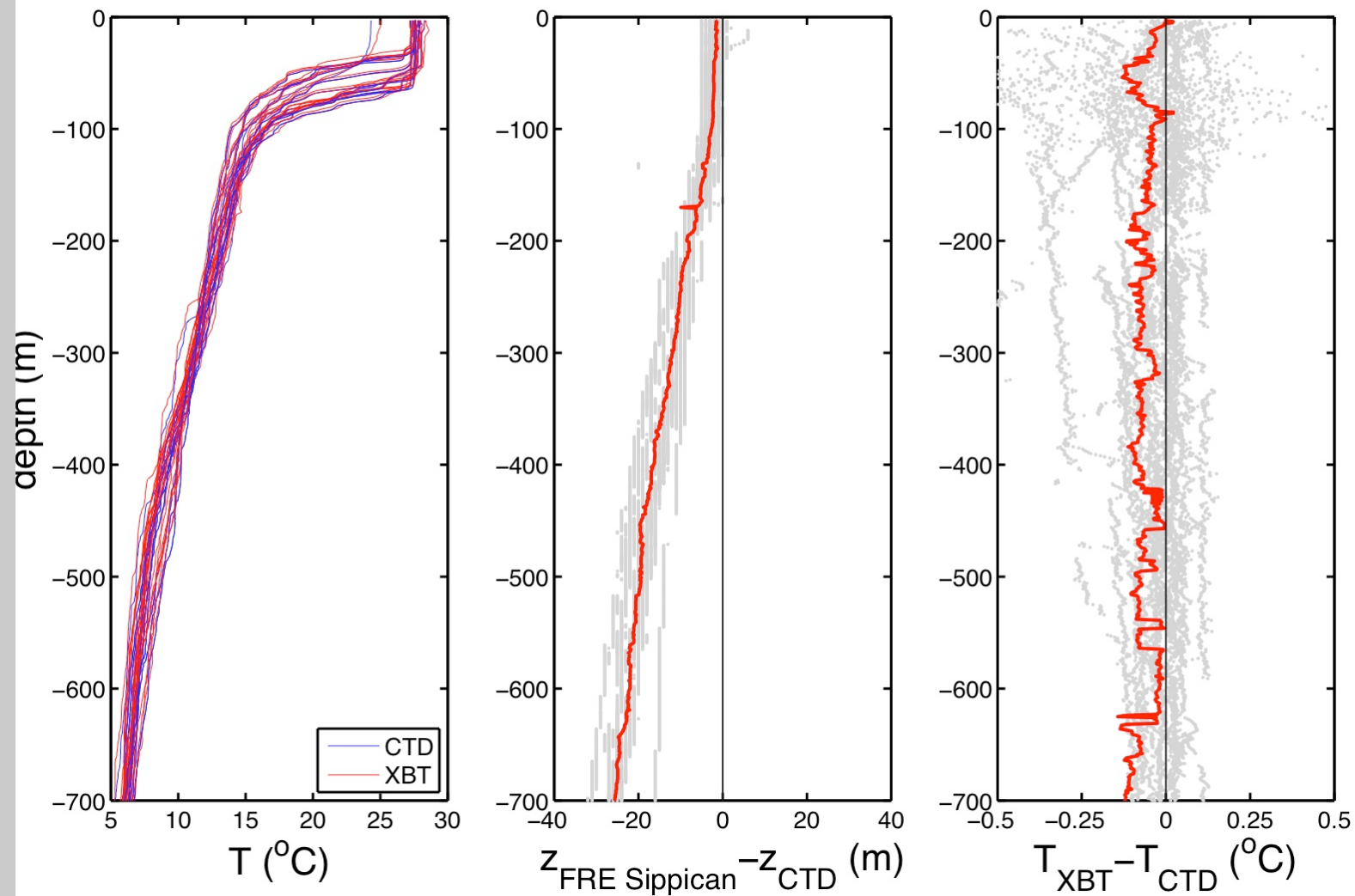


XBT and CTD deployments

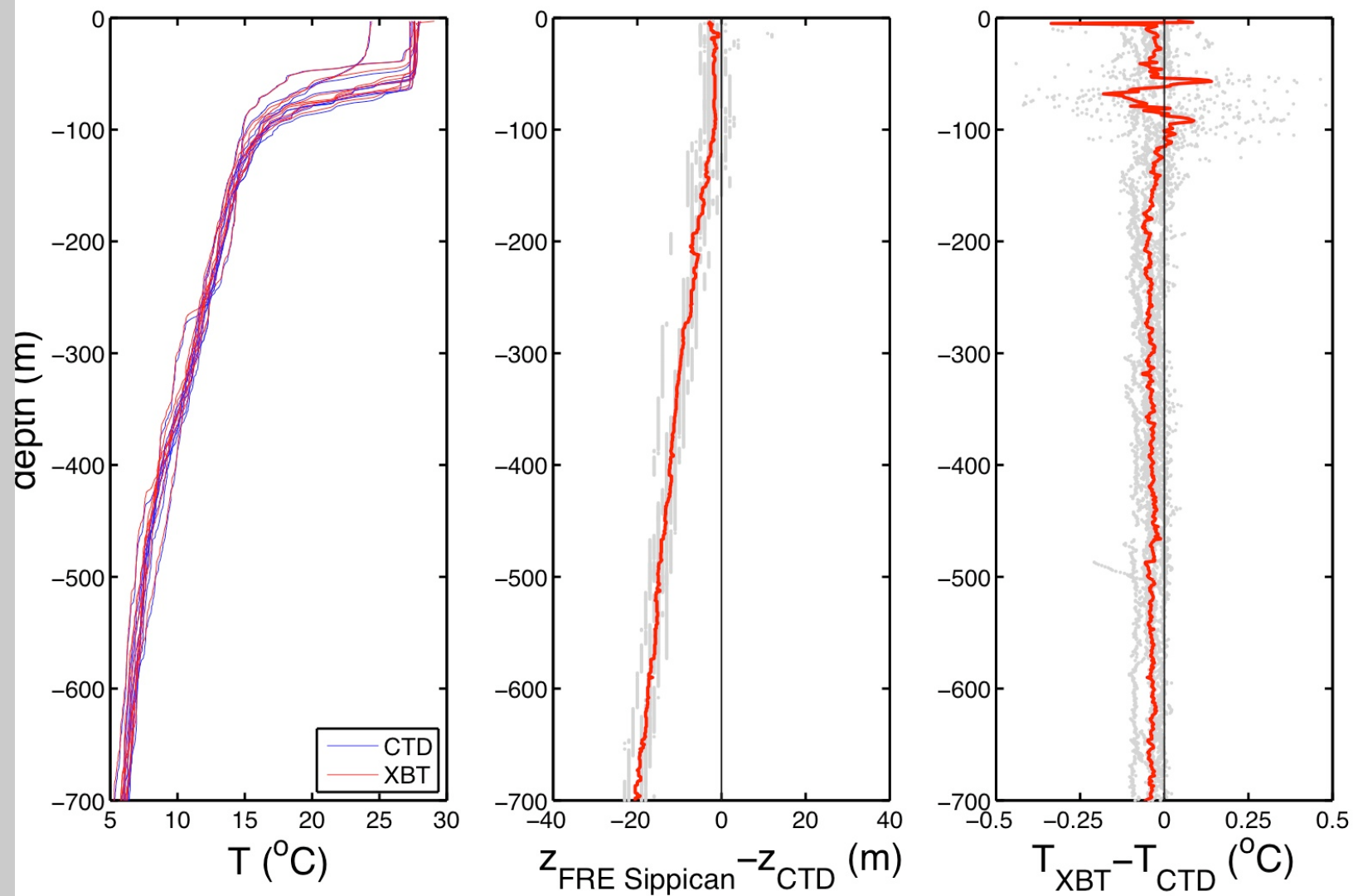
23.00W 8.50N T7_00125 ($\partial T/\partial z$ $r = 0.85 \rightarrow r = 0.98$)



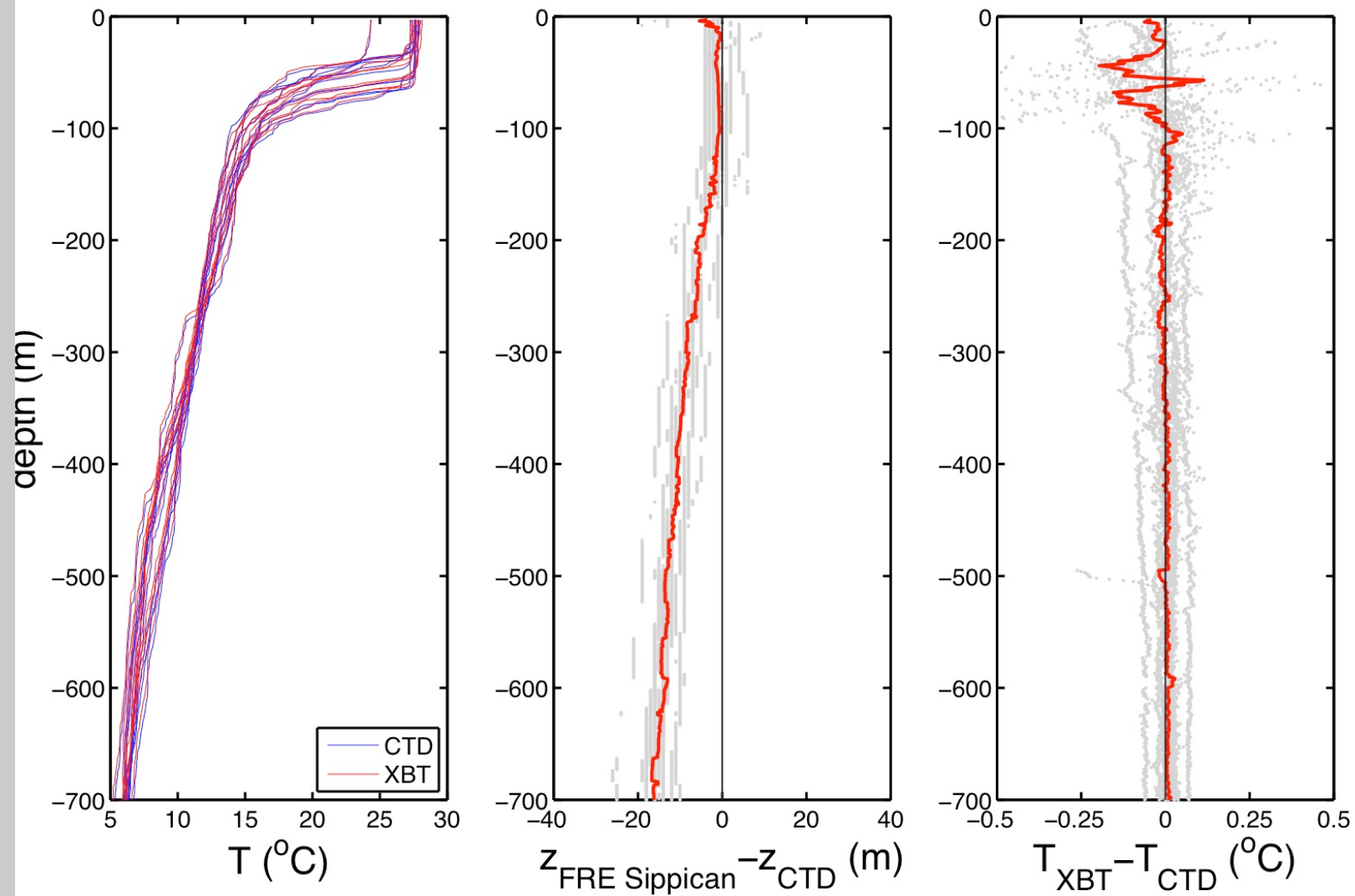
CTD-XBT comparison (XBT manufacturing date: 1986)



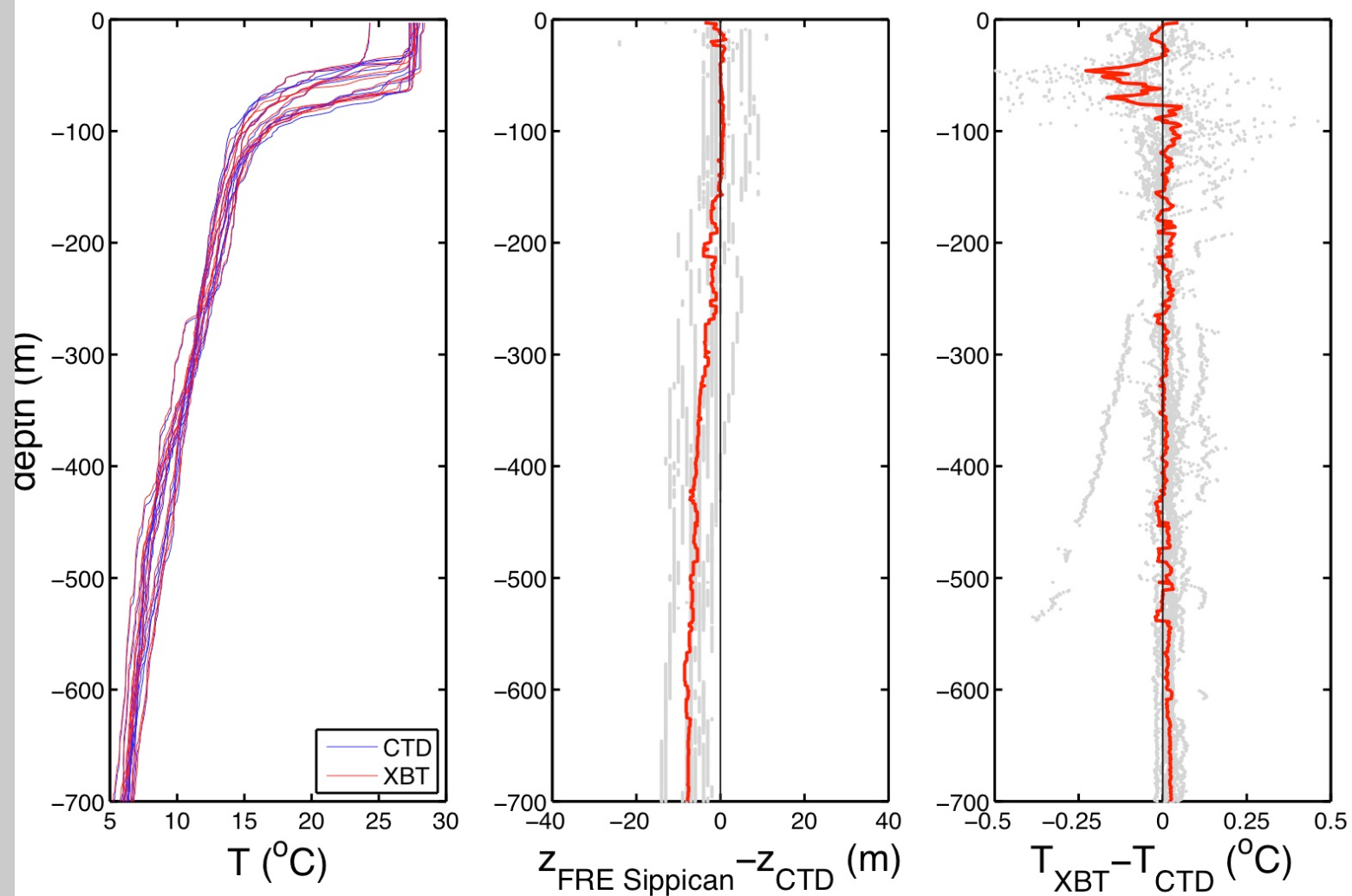
CTD-XBT comparison (XBT manufacturing dates: 1990 – 1991)



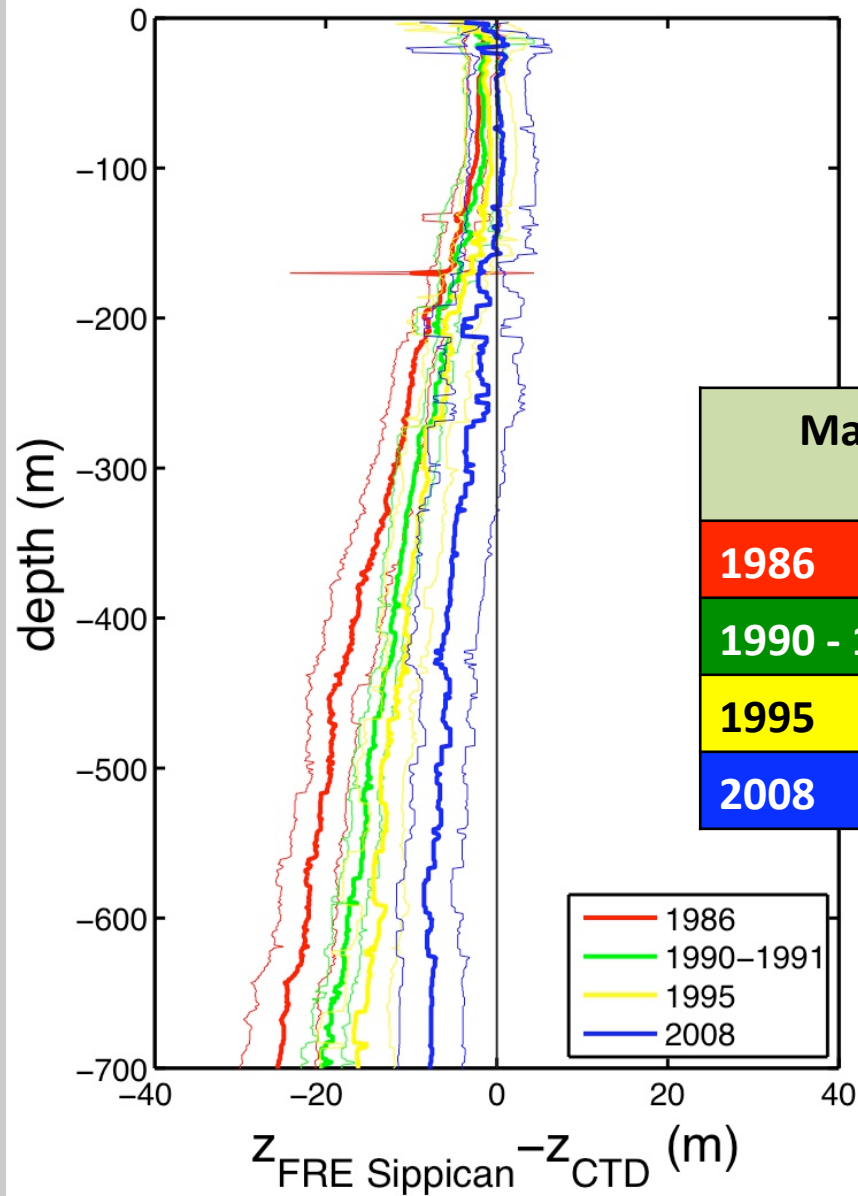
CTD-XBT comparison (XBT manufacturing date: 1995)



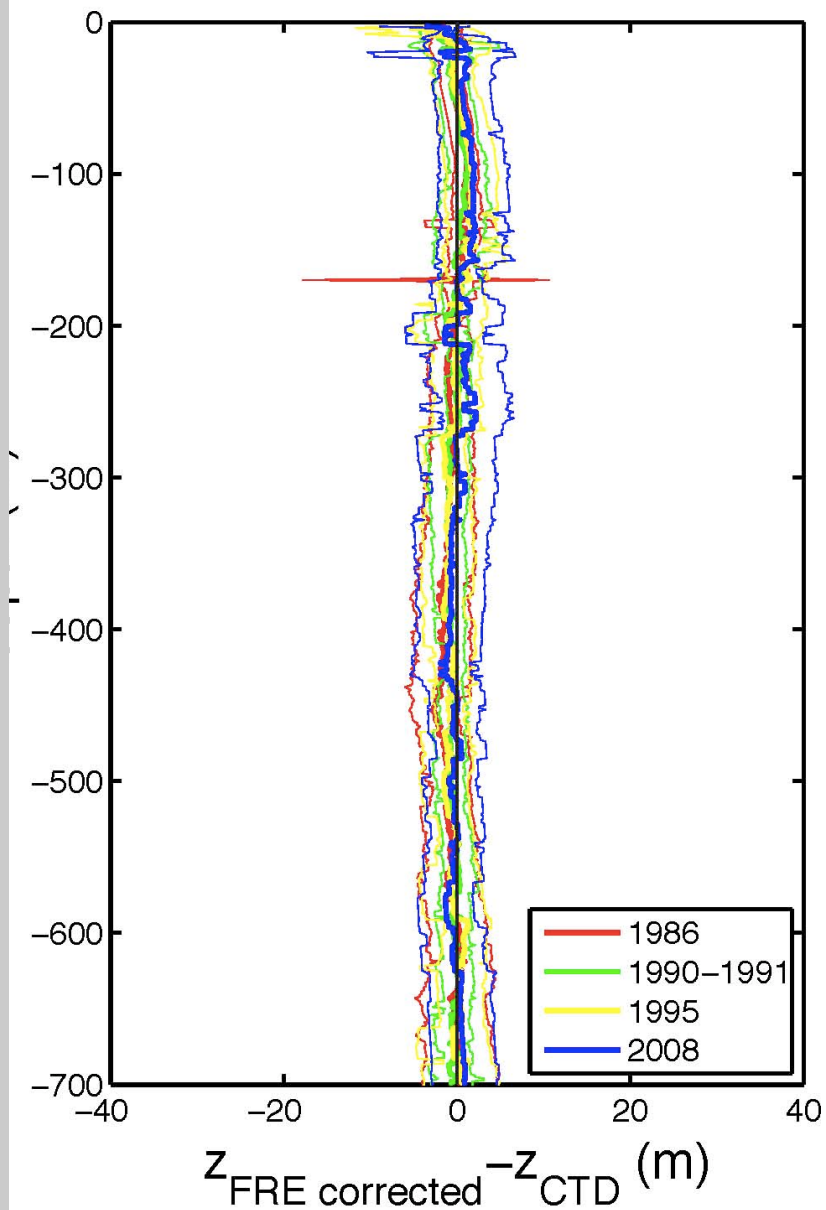
CTD-XBT comparison (XBT manufacturing date: 2008)



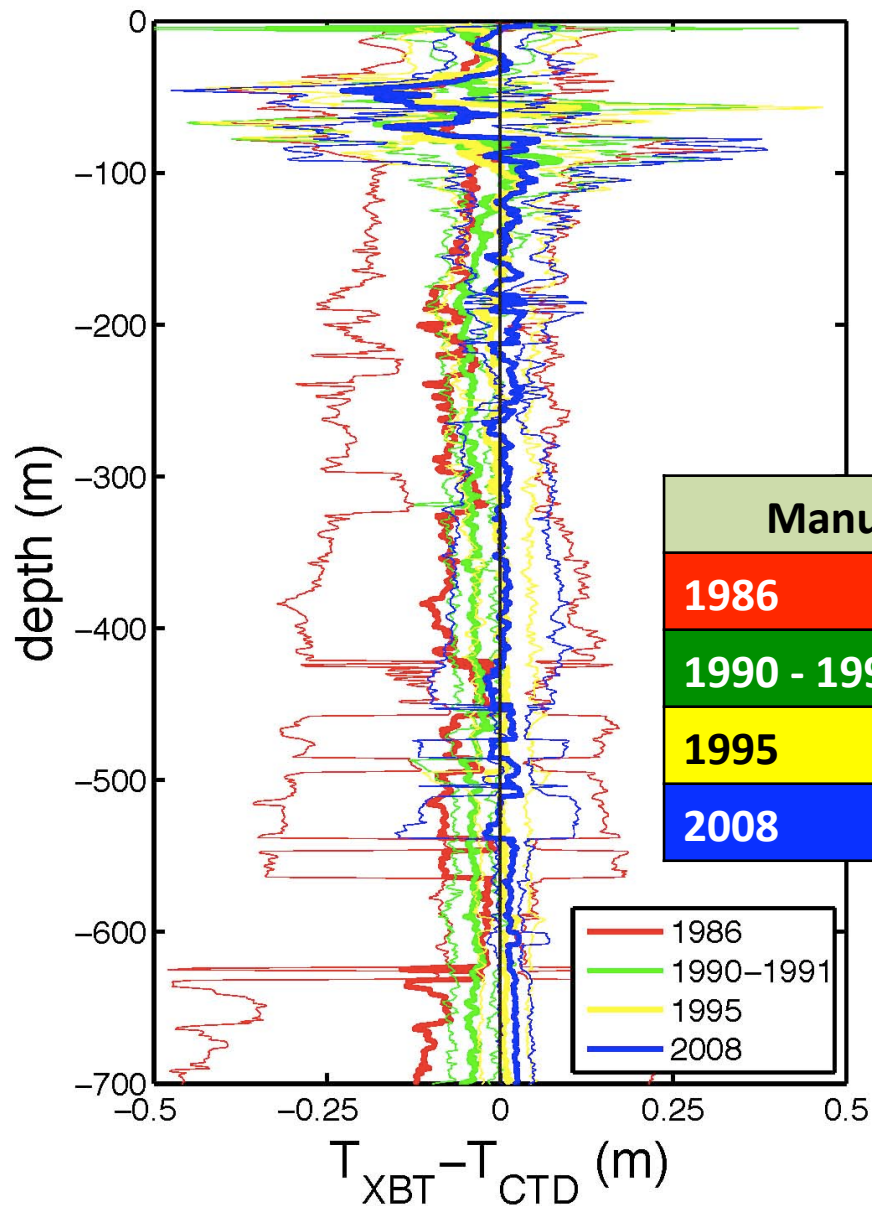
Comparison of XBT and CTD deployments by year



Comparison of XBT and CTD deployments by year



Comparison of XBT and CTD deployments by year



Manufacture date	Temperature Bias (C)
1986	-0.06 +/- 0.15
1990 - 1991	-0.03 +/- 0.03
1995	-0.01 +/- 0.04
2008	-0.00 +/- 0.06

NOAA/AOML efforts to resolve XBT fall rate equation issues

- Results obtained from one experiment carried out in the TA indicates that differences between XBT and CTDs appear to be from FRE problems only.
- The FRE coefficients appear to be time dependent.
- These results imply that using expired XBTs will not introduce errors. In fact, we did not find problems associated with thermistors.
- How the stretching factor relates to these time-dependent changes in FRE ?



Future work

- Analyze results from similar experiments carried out last year.
- Support international collaboration with Australia, France, and Brazil by providing XBTs (conditions will apply).
- Support improvement of technology: Pressure measurements with XBTs.
- Continue carrying experiments with remaining old XBTs:
 - 10 cases T4s 1986-87
 - 4 cases T4s 1991-94
 - 5 cases T6s 1986-87
 - 2 cases T7s 1995
 - 2 cases T7s 1996
 - 4 cases Deep Blues 1997-1999

