The origin of XBT errors during 1998-2009

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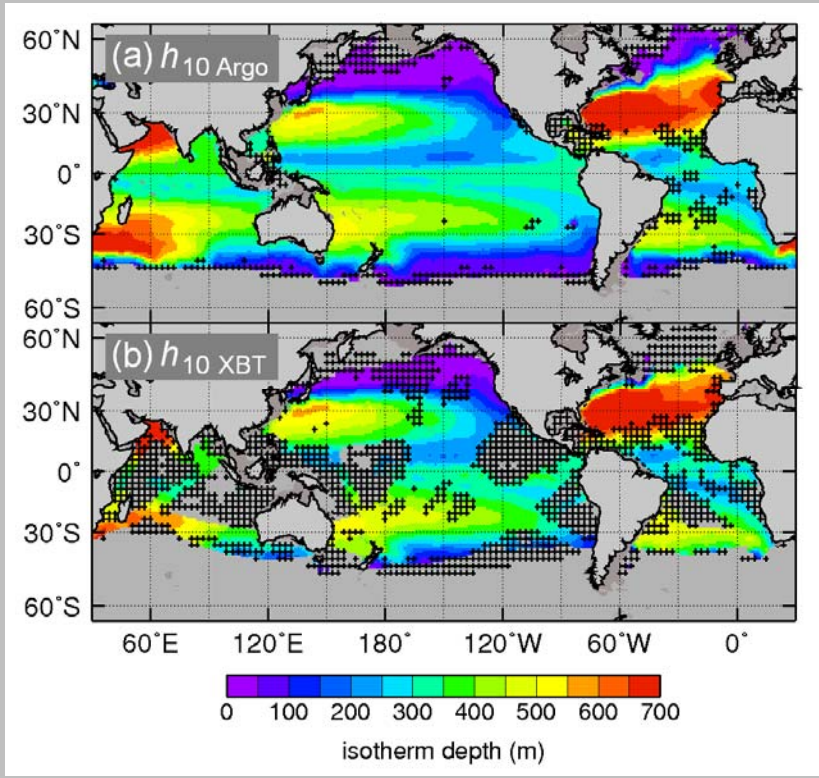
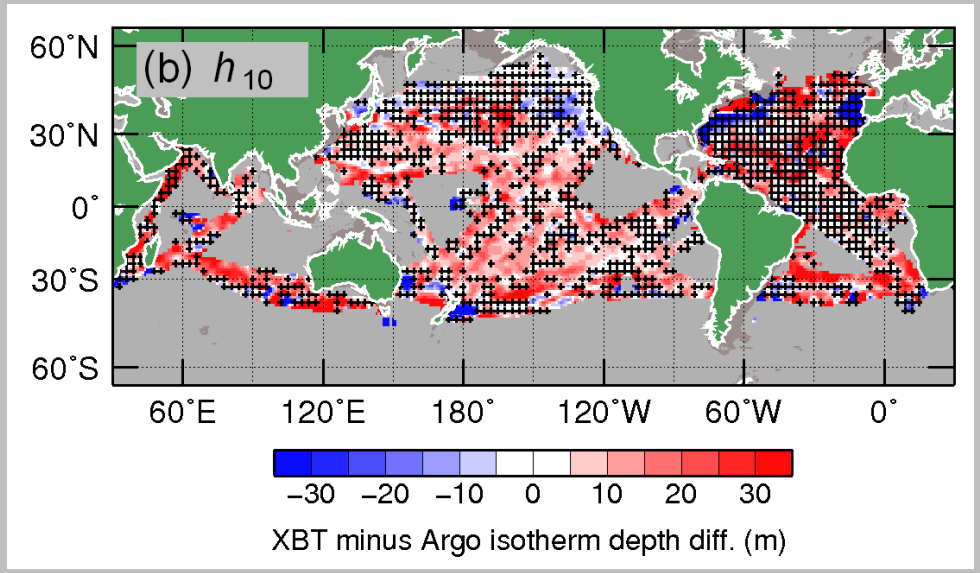
XBT bias and fall-rate workshop

Hamburg, August 2010

DiNezio, P.N., and G. Goni, 2010: Identifying and Estimating Biases between XBT and Argo Observations Using Satellite Altimetry. *J. Atmos. Ocean. Technol.*, 27, 226-240.

XBT minus Argo isotherm depth differences

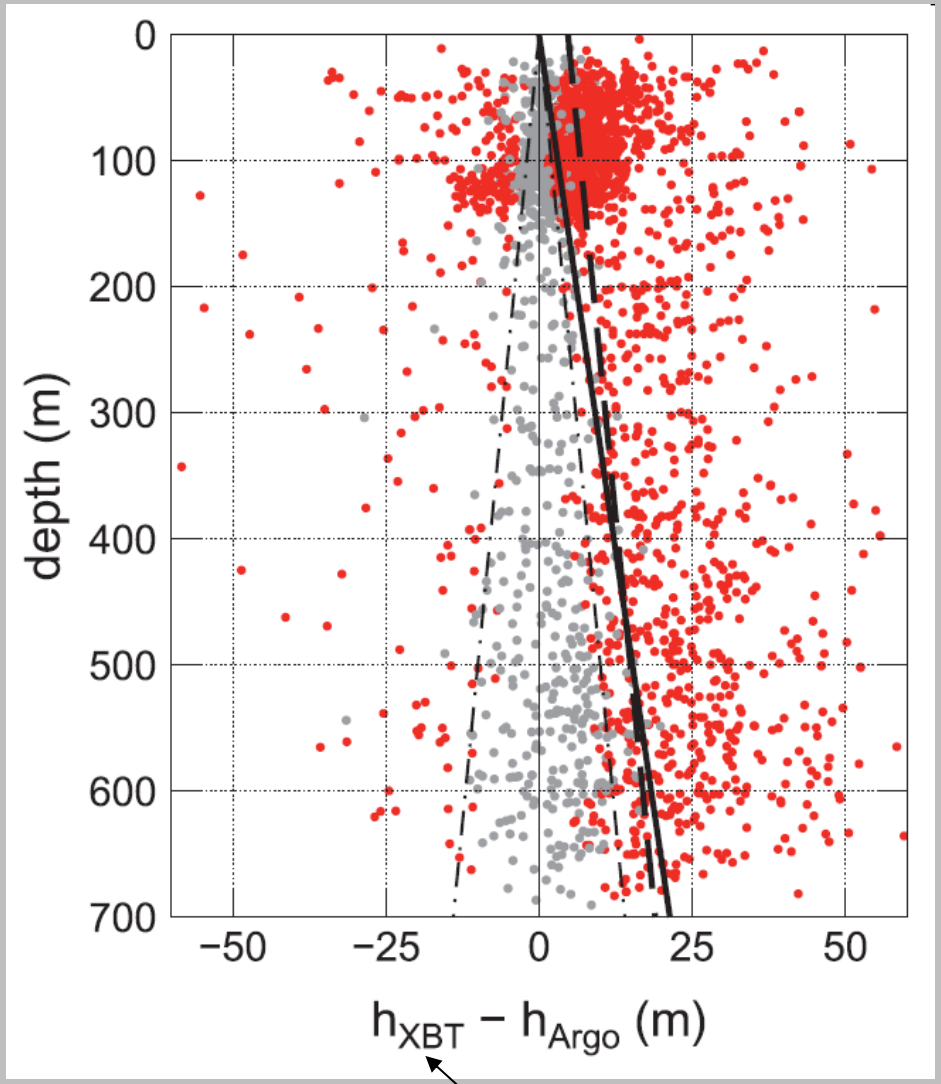




global and **positive** 1σ-significant depth differences

DiNezio and Goni 2010

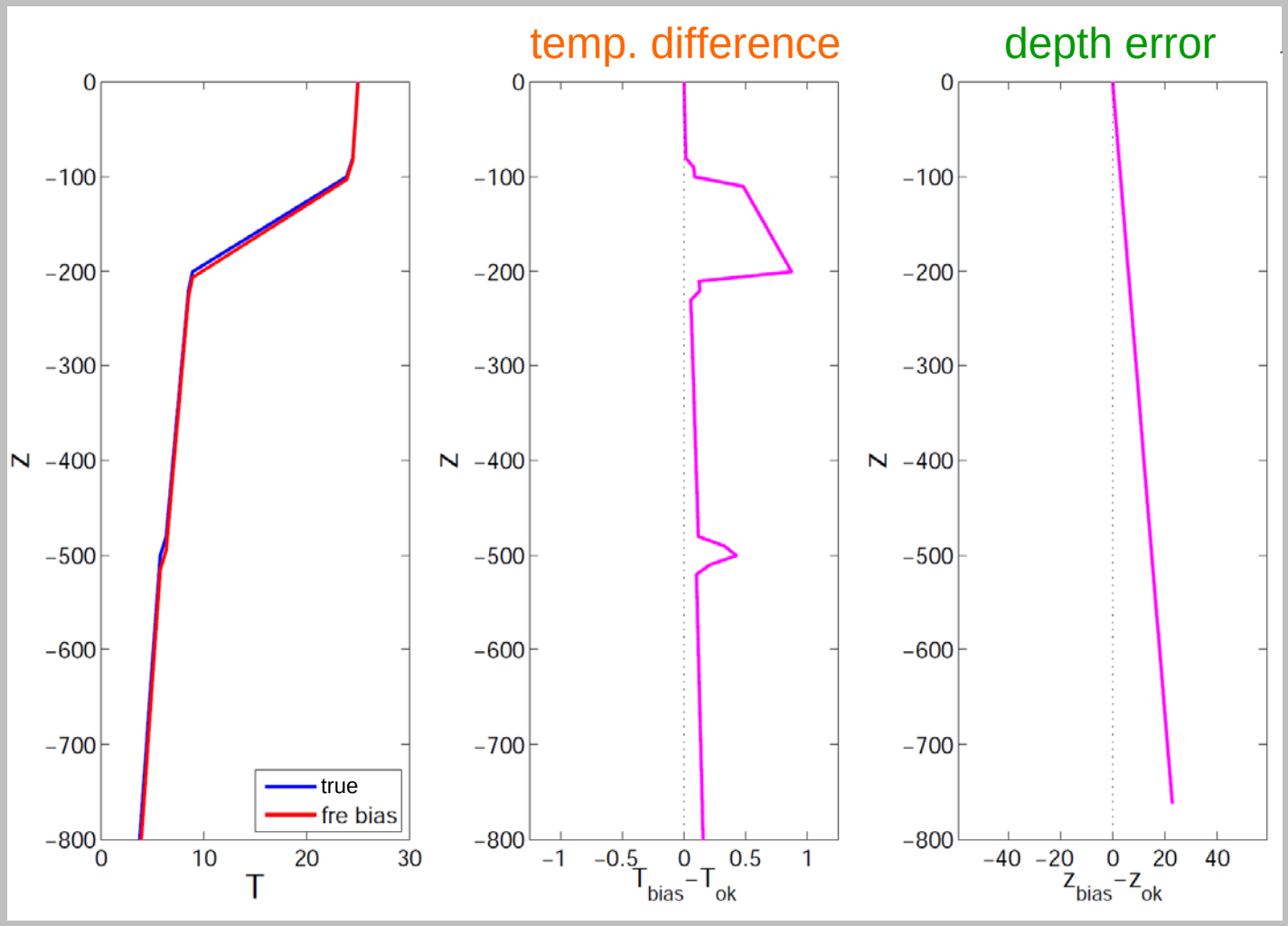
XBT minus Argo isotherm depth differences



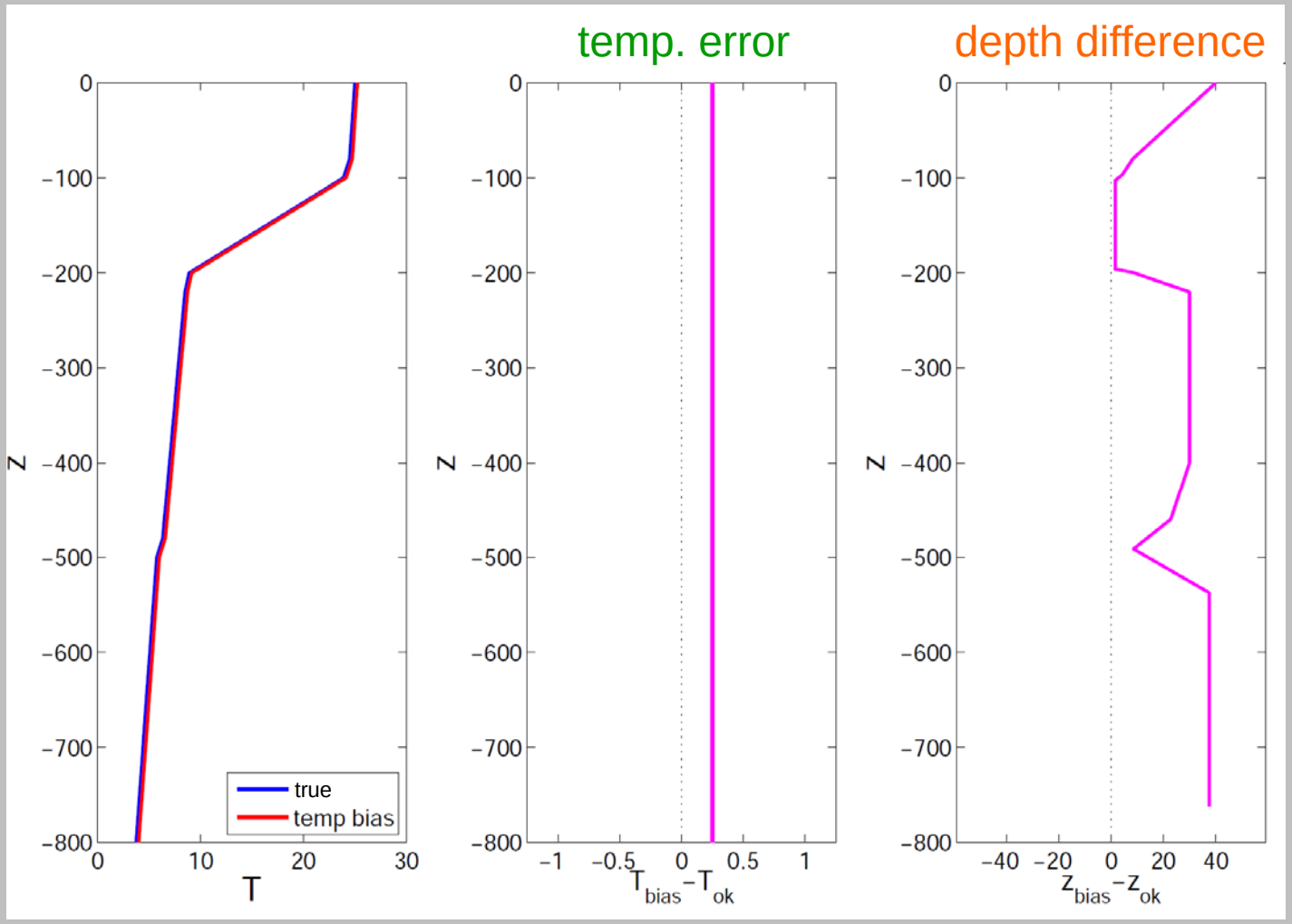
- depth differences are **~3%** of Argo depth
- H95 no longer necessary during 2000-2009?

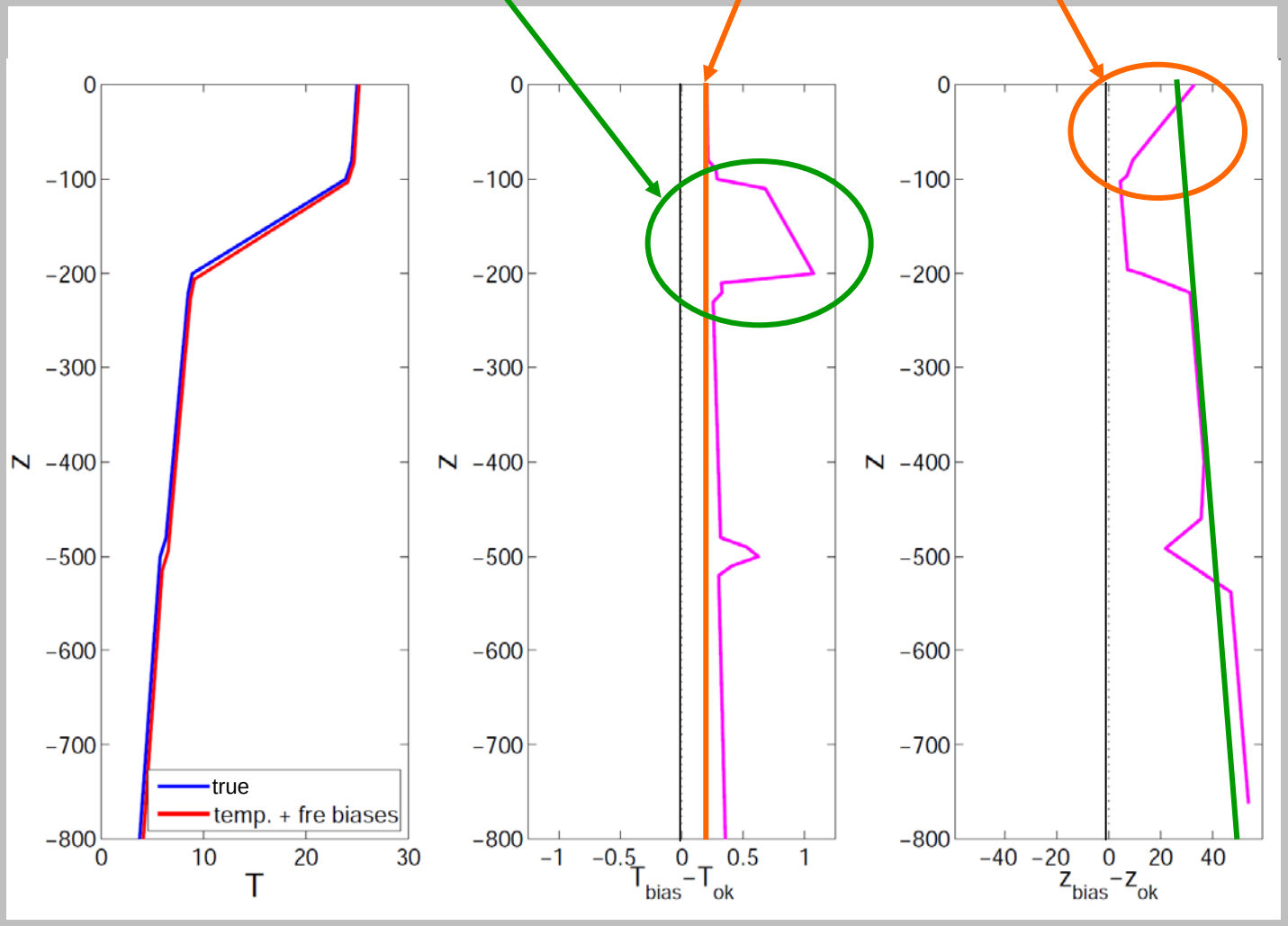
DiNezio and Goni 2010

Effect of depth error on temp. differences

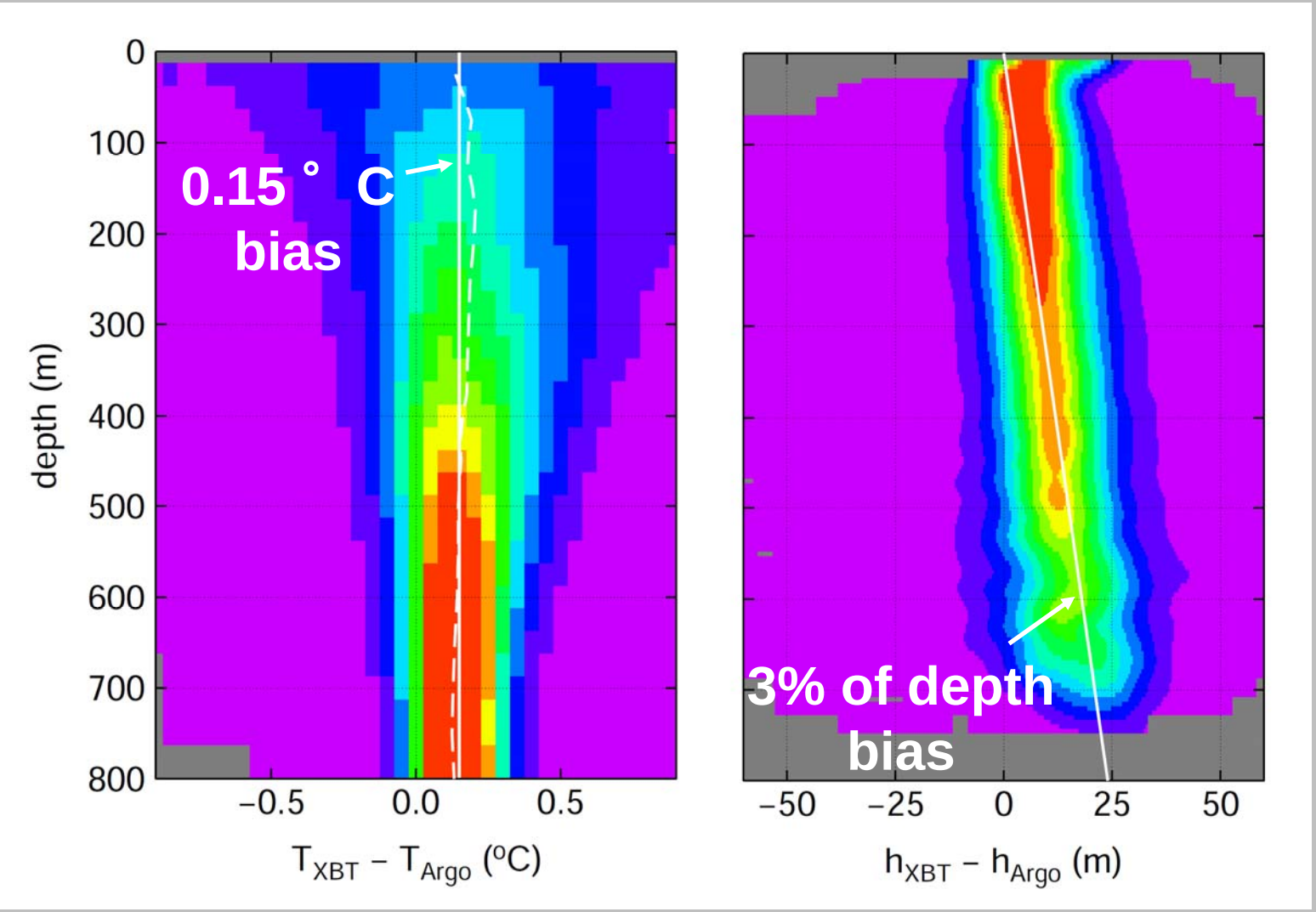


Effect of temp. error on depth differences

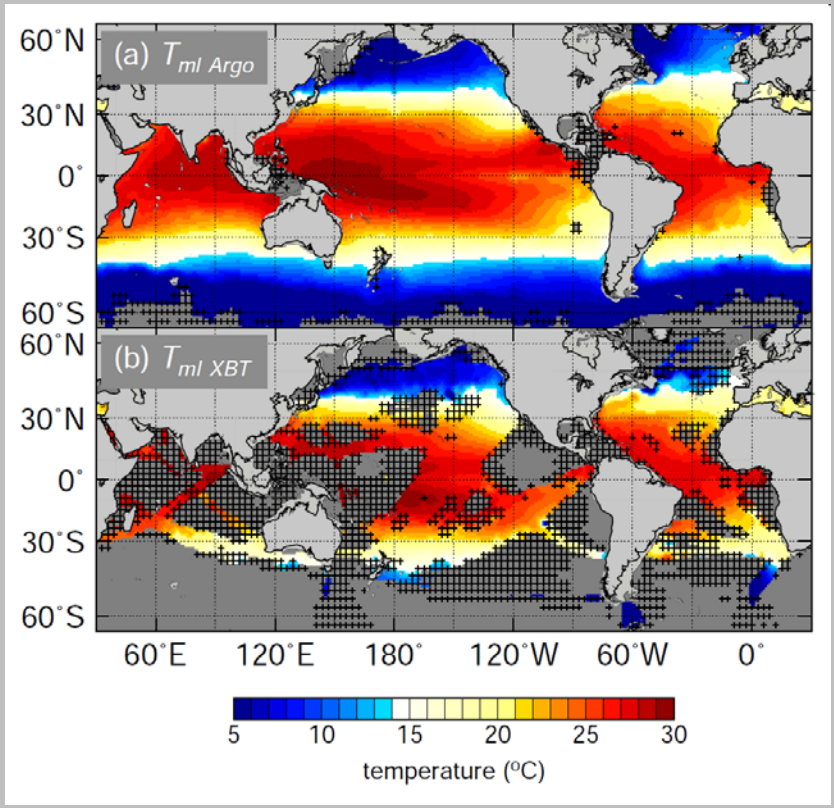


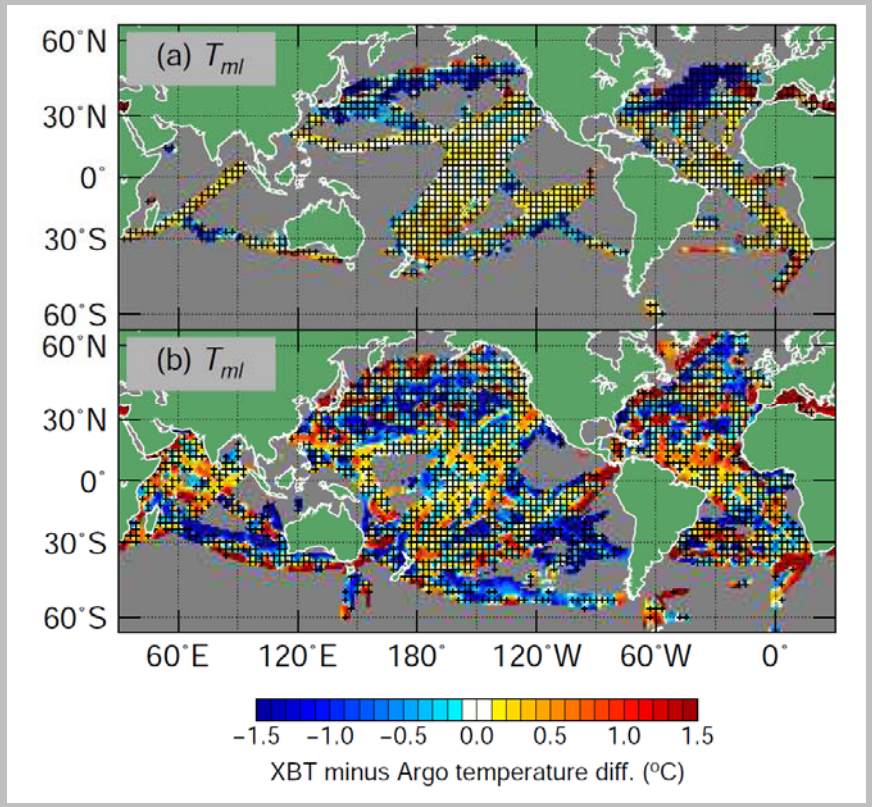

depth error
temperature error
0
−100
−200
−300
−400
−500
−600
−700
−800
z
0
10
20
30
T
true
temp. + fre biases
−1
−0.5
0
0.5
1
T_bias − T_ok
−40
−20
0
20
40
z_bias − z_ok

Depth vs. temperature differences



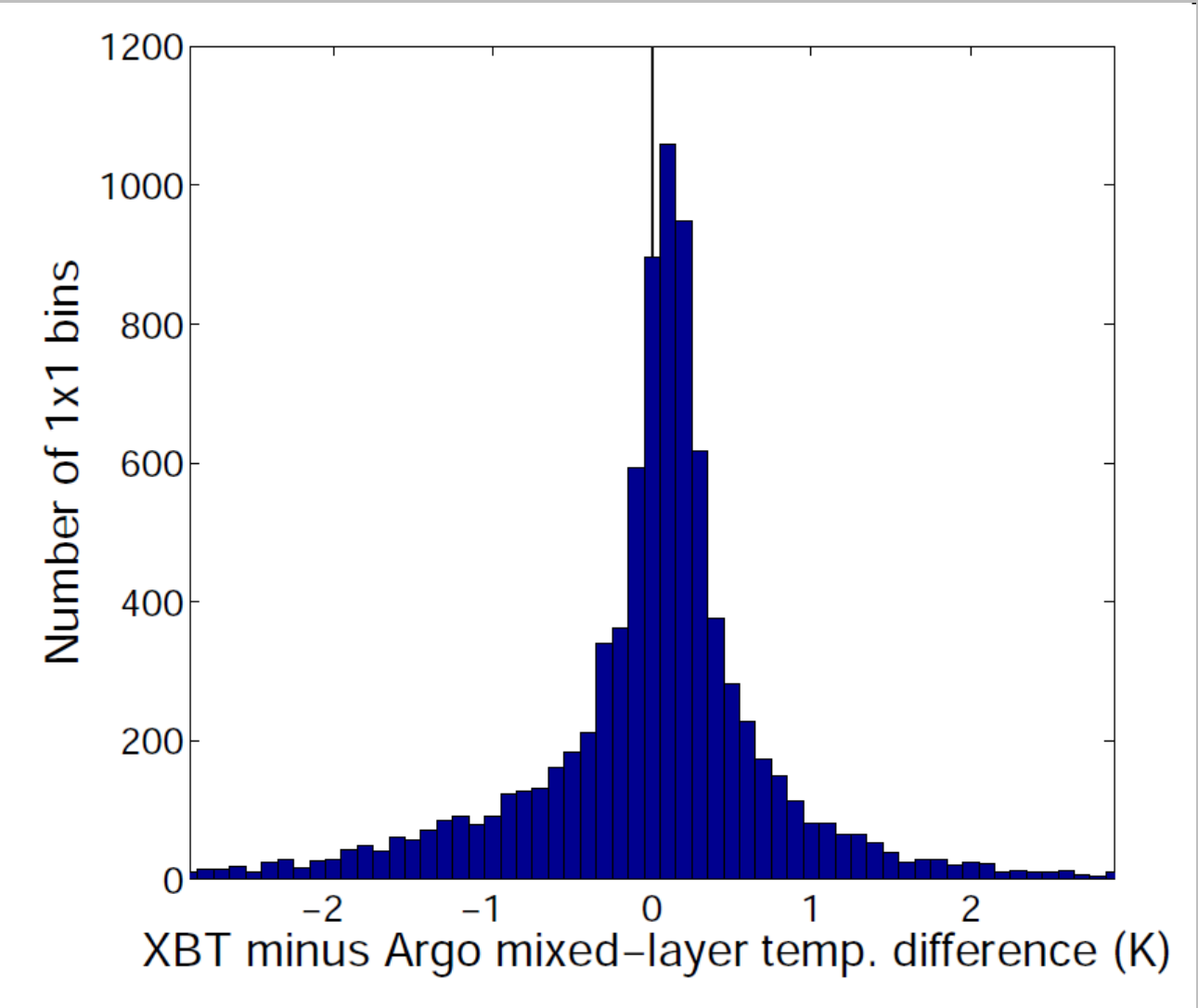
Signature of temp. error on XBT-Argo diff.



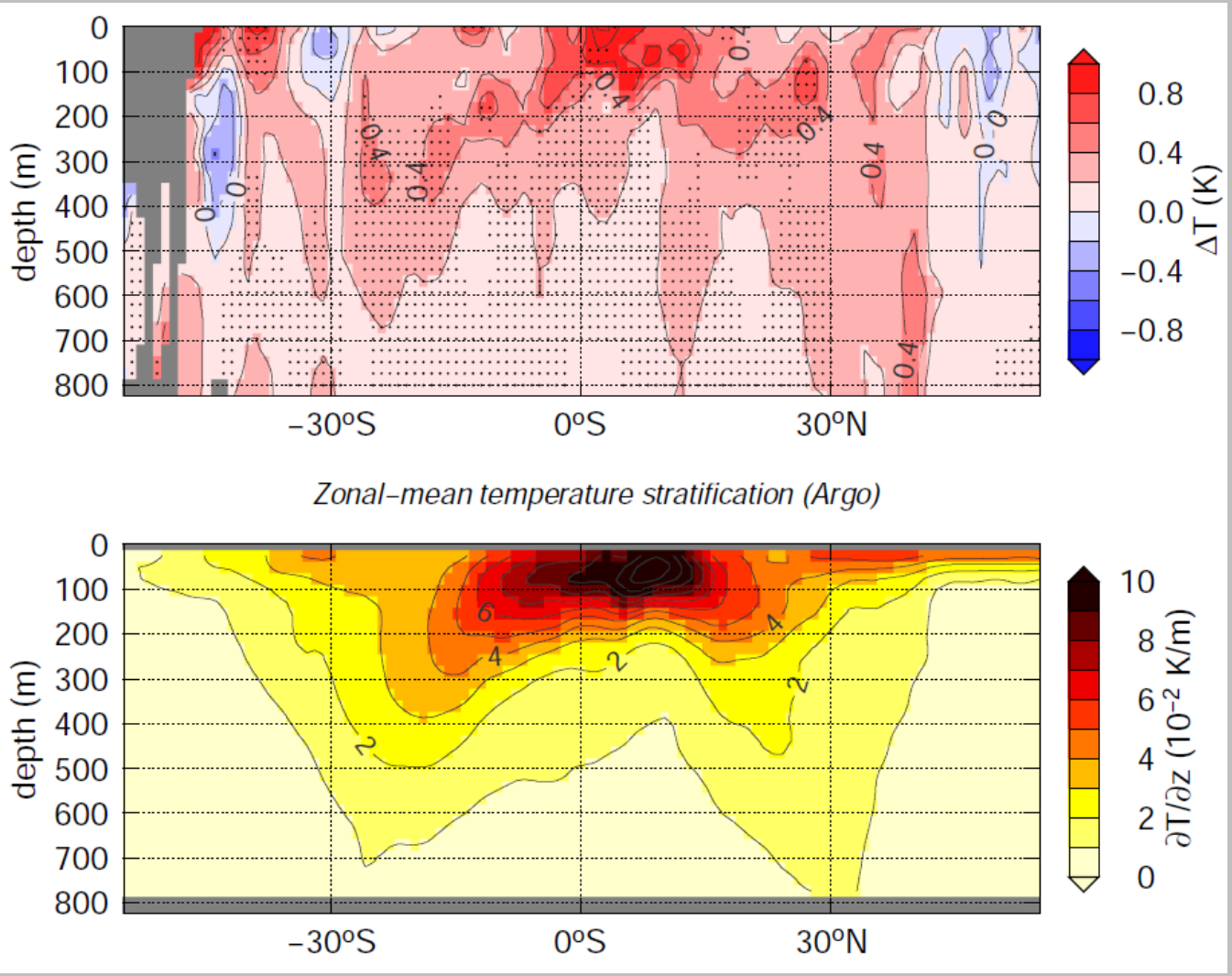


ML : ∂ T/ ∂ z < -0.02 K/m

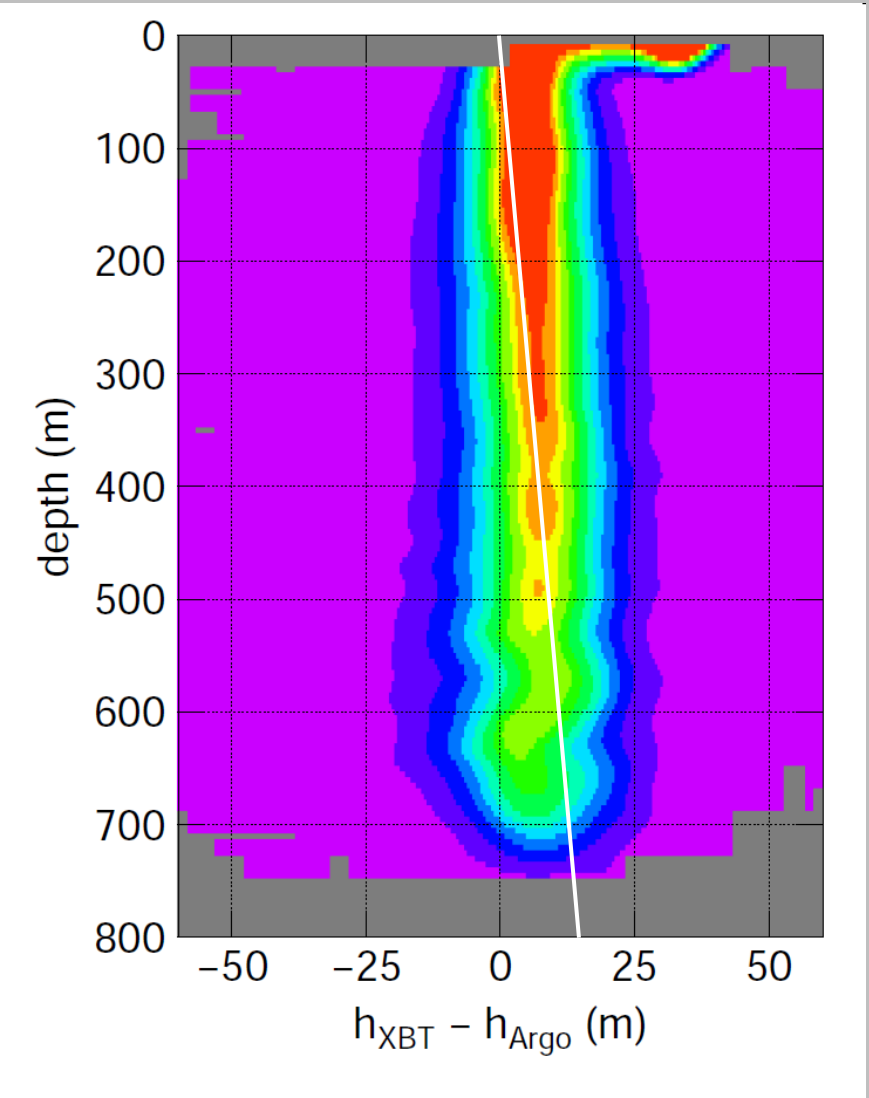
Median XBT minus Argo temp. = 0.07 K



Spatial structure of temp. differences



z differences when temp. error is removed.



- depth differences are **~1.5%** of Argo depth when 0.07K temp. error is removed.

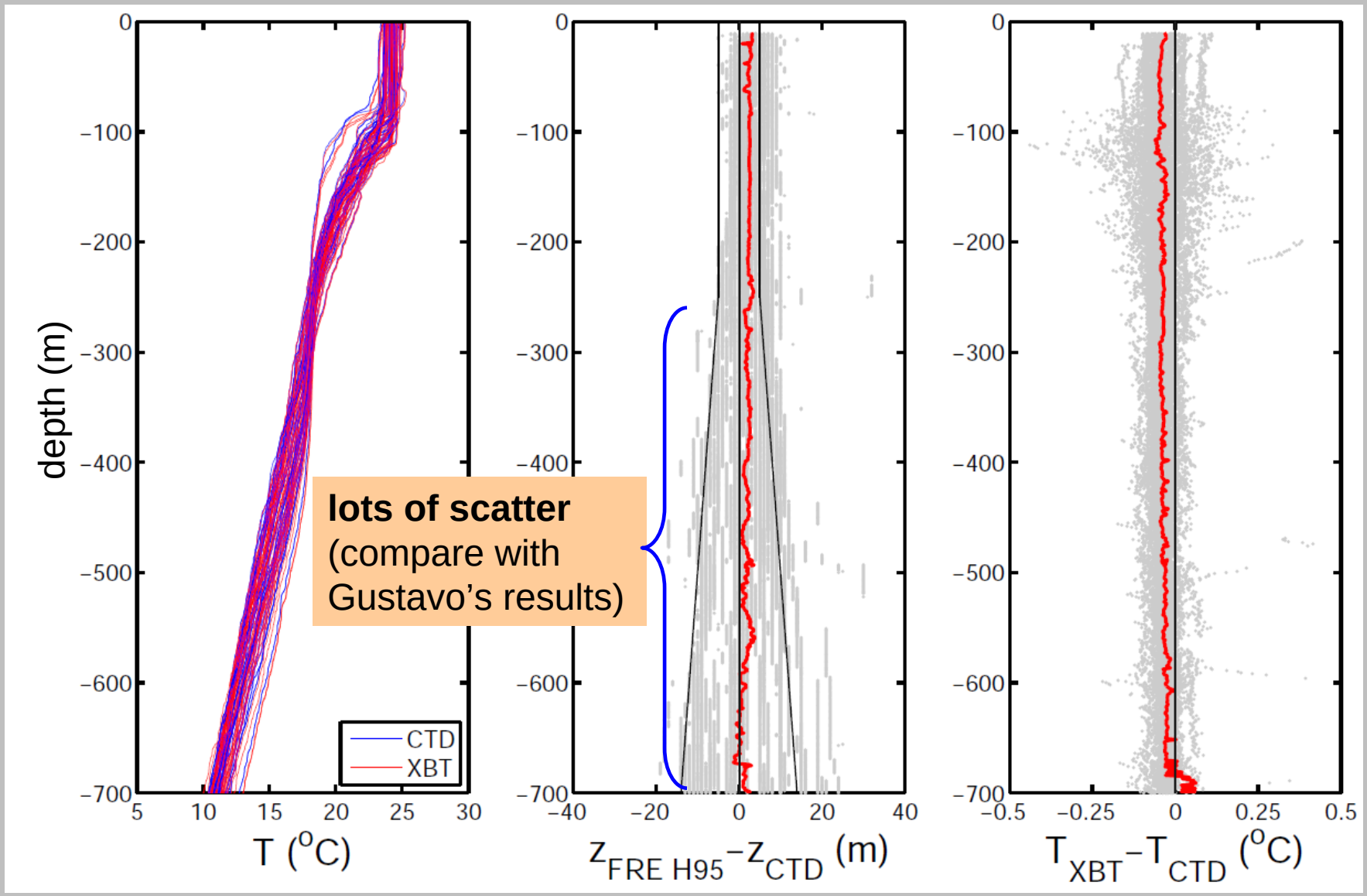
Conclusion 1

- H95 FRE not adequate during Argo period (2000-2009).
- Temperature error of ~0.1 K

Question 2

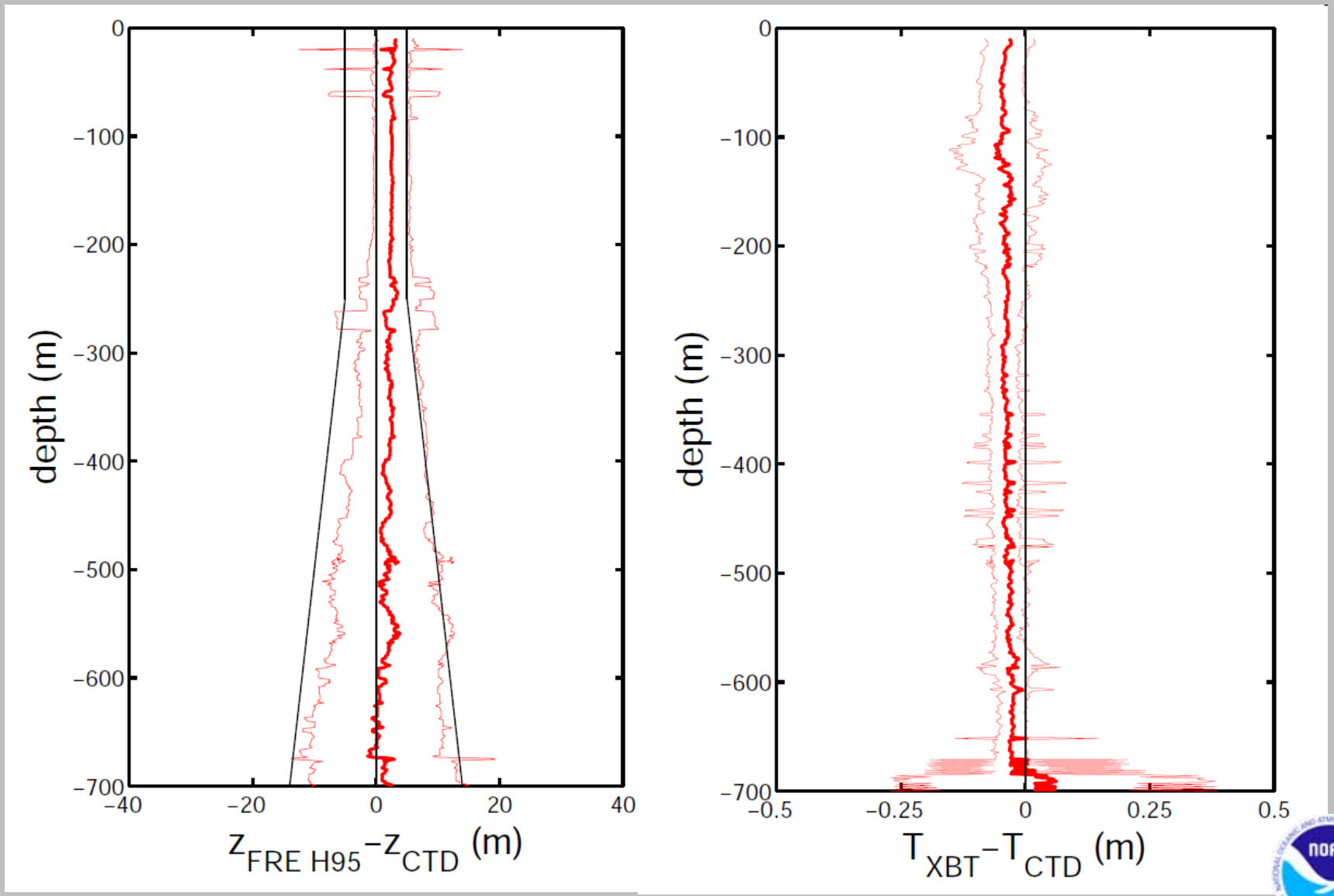
- Until when is H95 valid?

64 CTD-XBT profiles – 1998 24N section

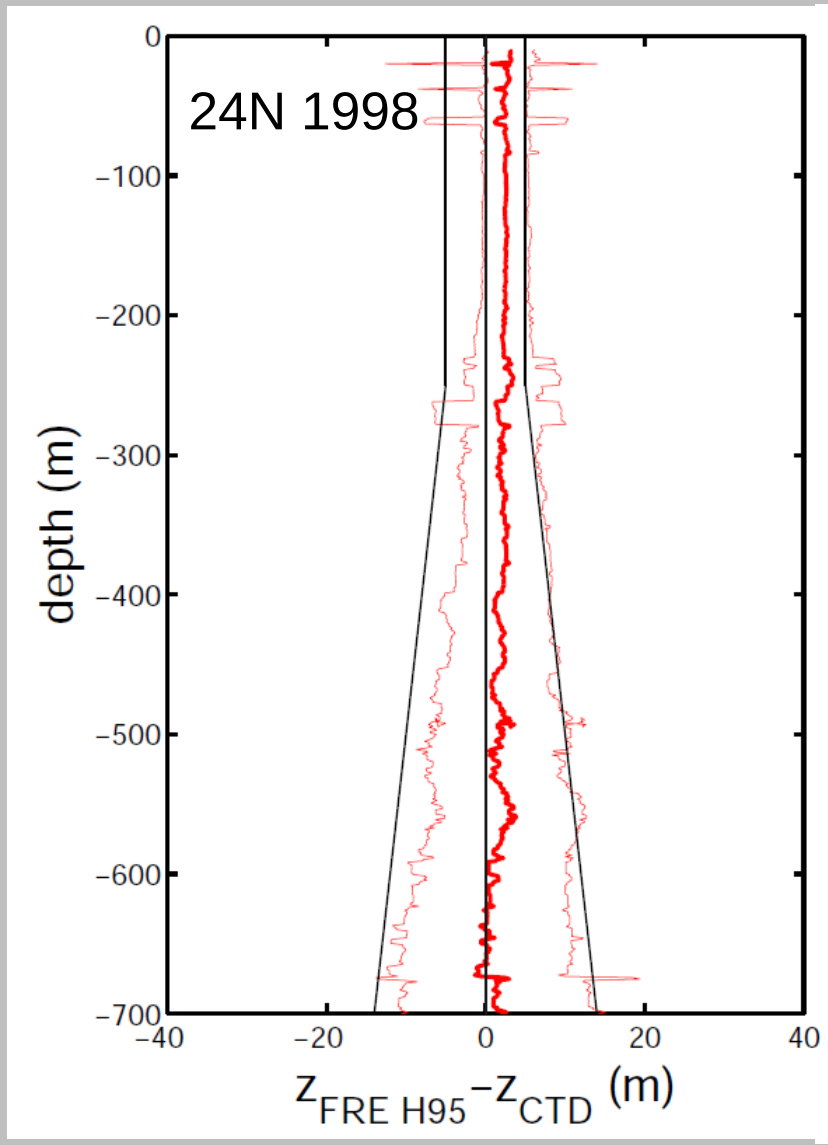


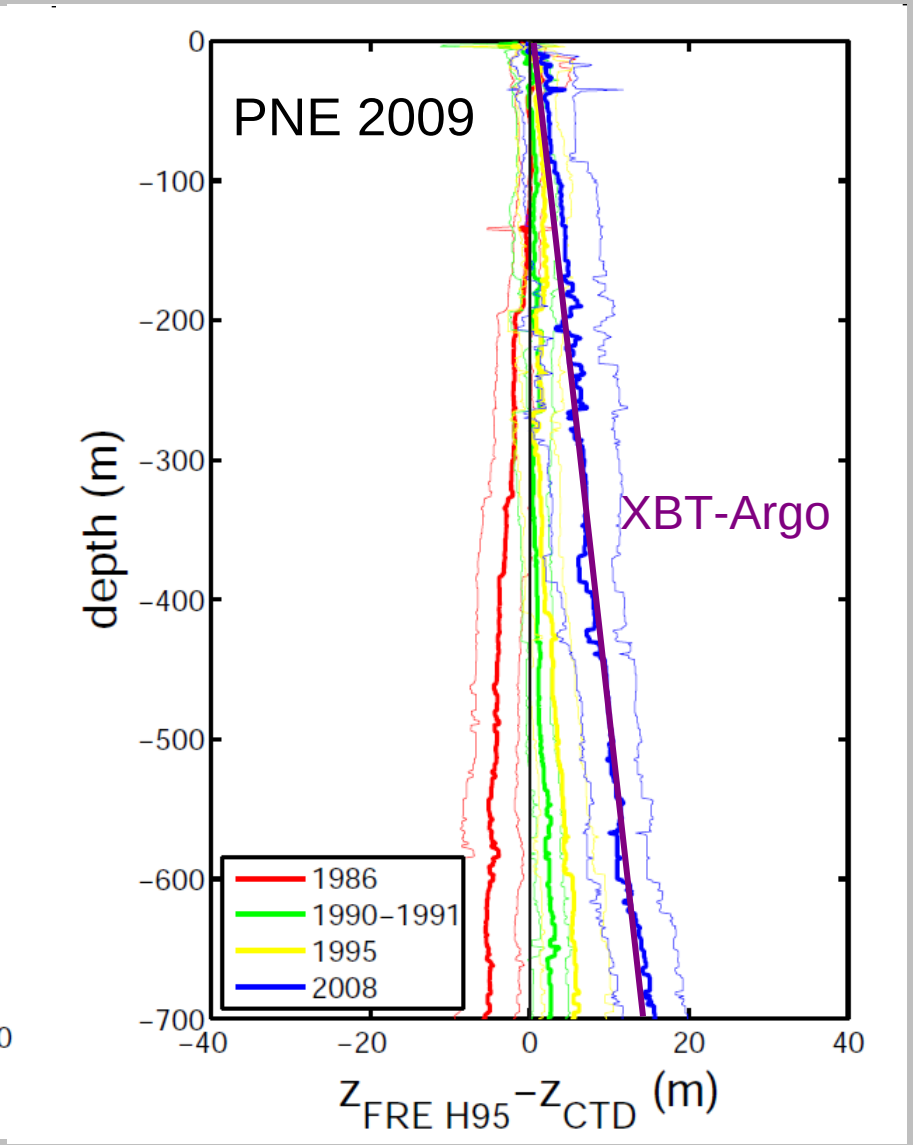
depth error 0.29 ± 0.02 %

temp. error -0.03 ± 0.03 ºC



Until when is H95 valid?





Conclusions

- Pure temperature bias of 0.07 K during 2000-2009.
- H95 FRE adequate until 1998, but not during Argo period (2000-2009).
- Hanawa 1995 correction already inadequate by 1998?
- XBT-Argo differences consistent with side-by-side experiment in tropical Atlantic, but small compared with prev. experiment.