USING ALTIMETRY, GRACE AND ARGO TO ASSESS STATIONARY CIRCULATION AND TRANSPORTS IN THE NORTH ATLANTIC

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Introduction

- combining an ocean circulation model with measurements could help to reduce the errors in both

- Argo profiling buoys provide a large data set of in-situ temperature (T) and salinity (S) measurements

- the high correlation between steric height (from Argo) and sea surface elevation (from altimetry) is shown in different studies (e.g., Guinehut et al., 2006, 2009 or Ivchenko et al., 2007) and due to the consistency in information content the combination of these two data sets is recommended

- the combination of Argo and altimetry within the ocean circulation model allows the analyses of measured (T, S, SSH) and dynamical consistently derived properties (u, v, w)
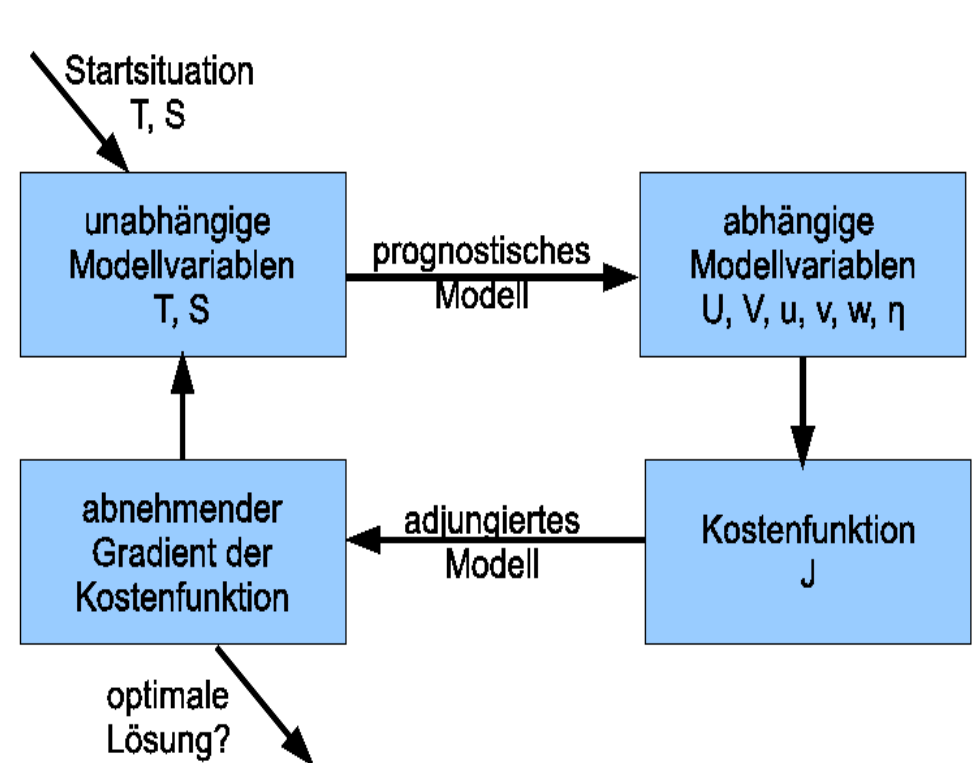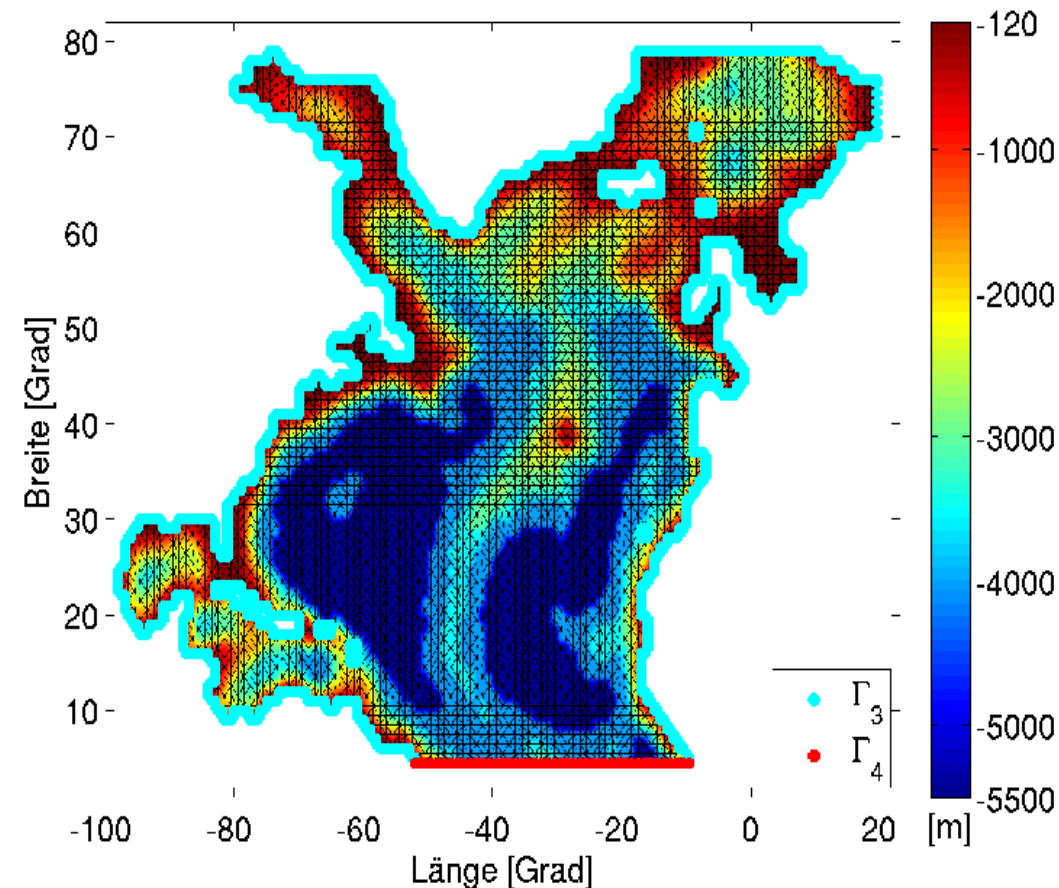
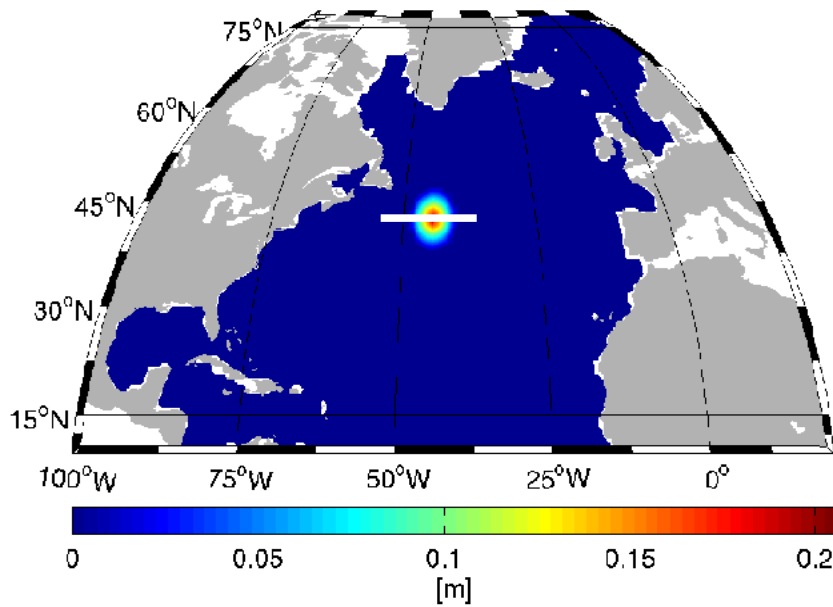# Argo data
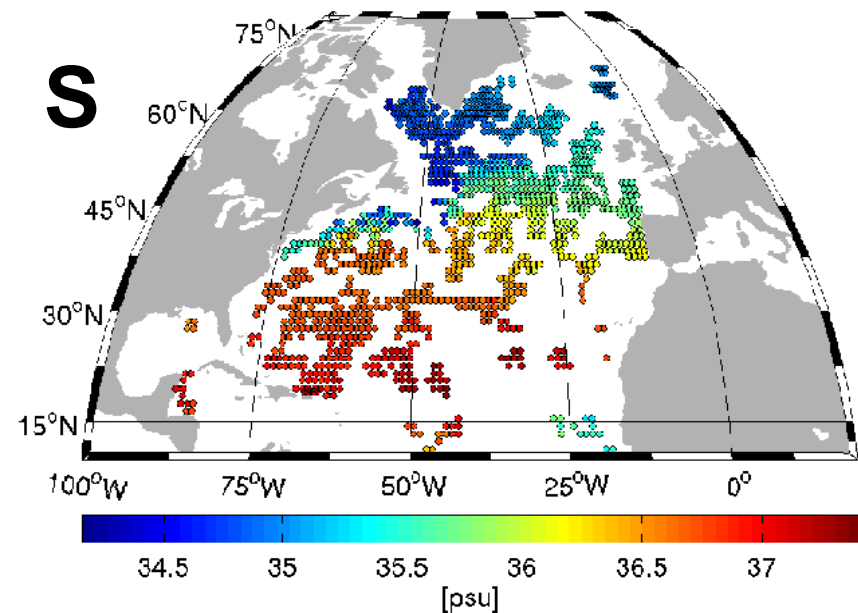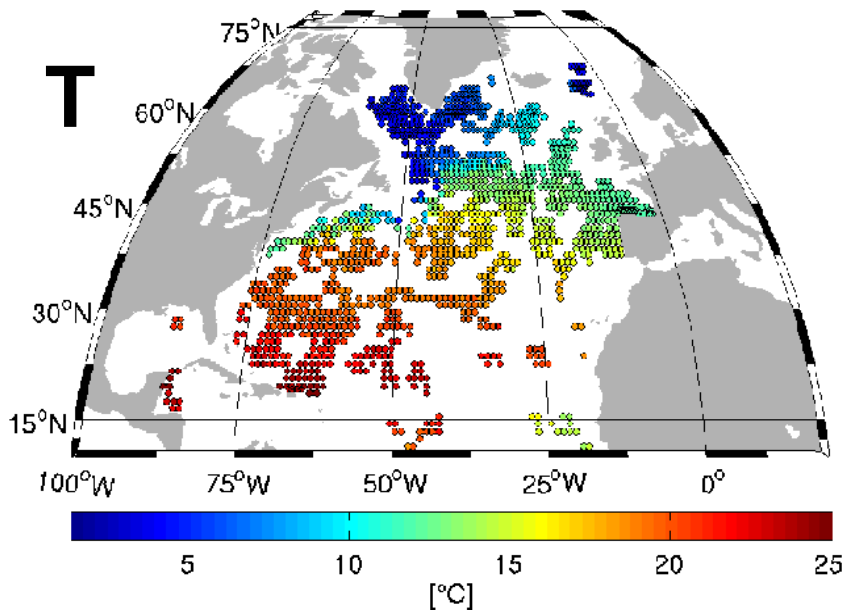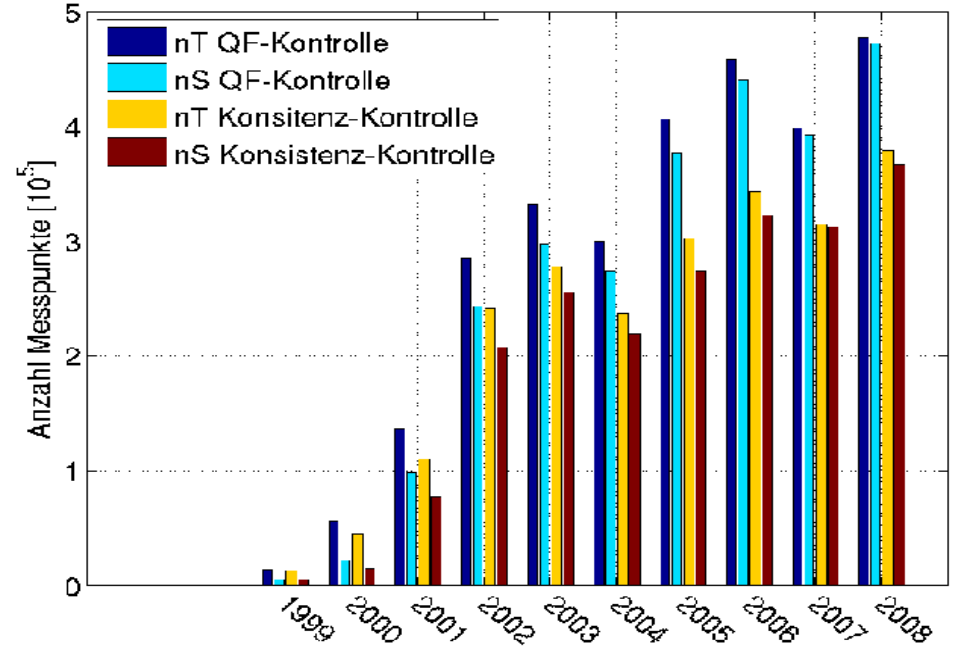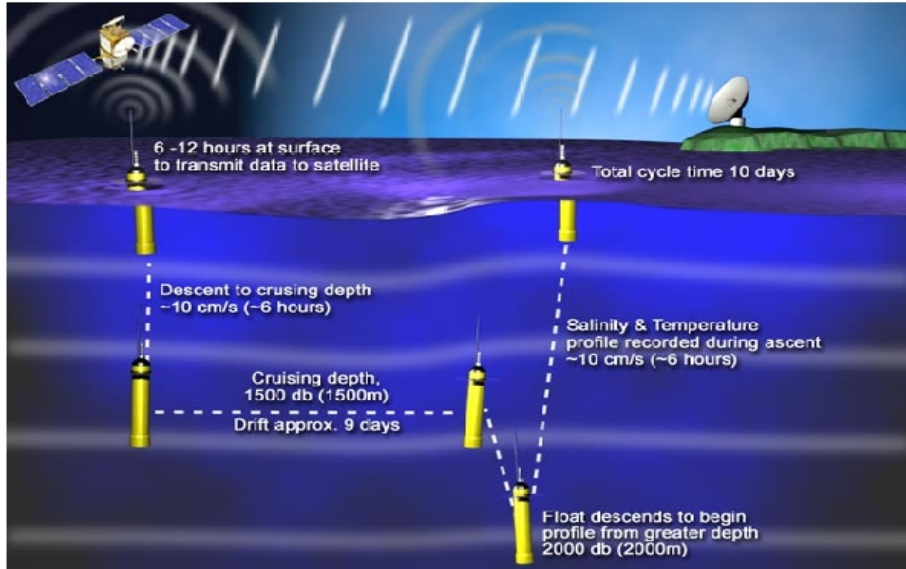
Aviso altimetry
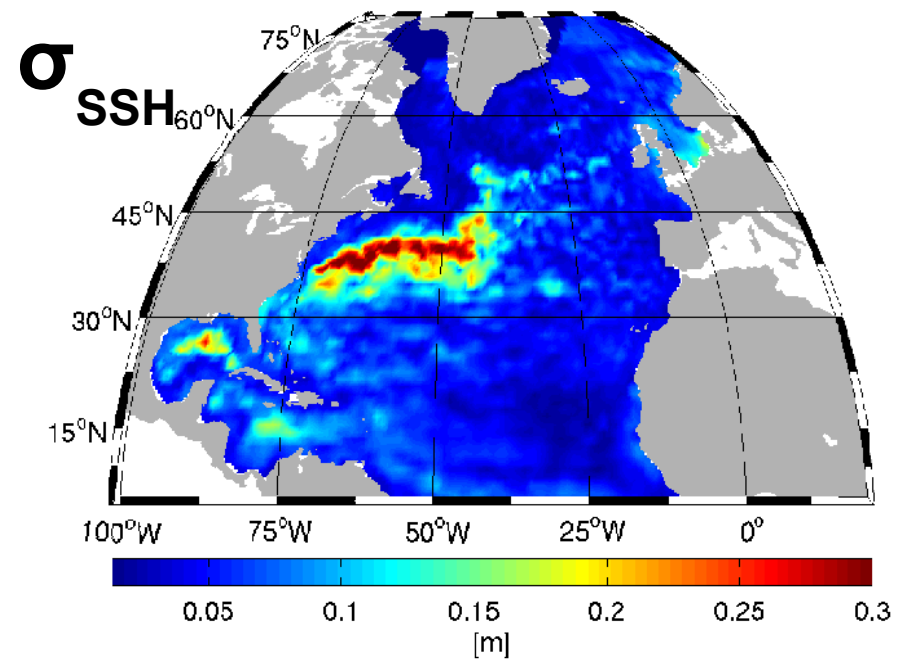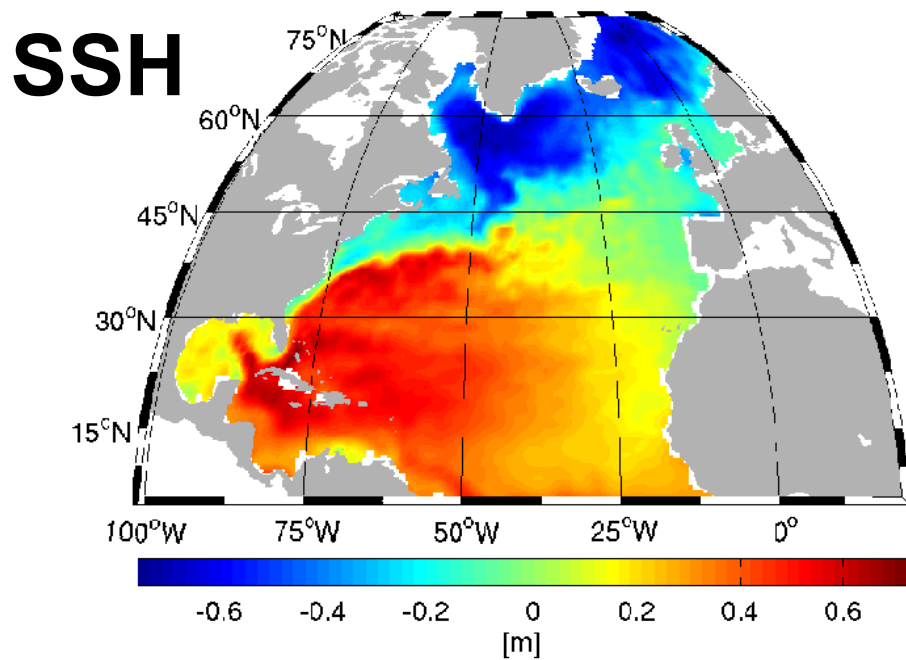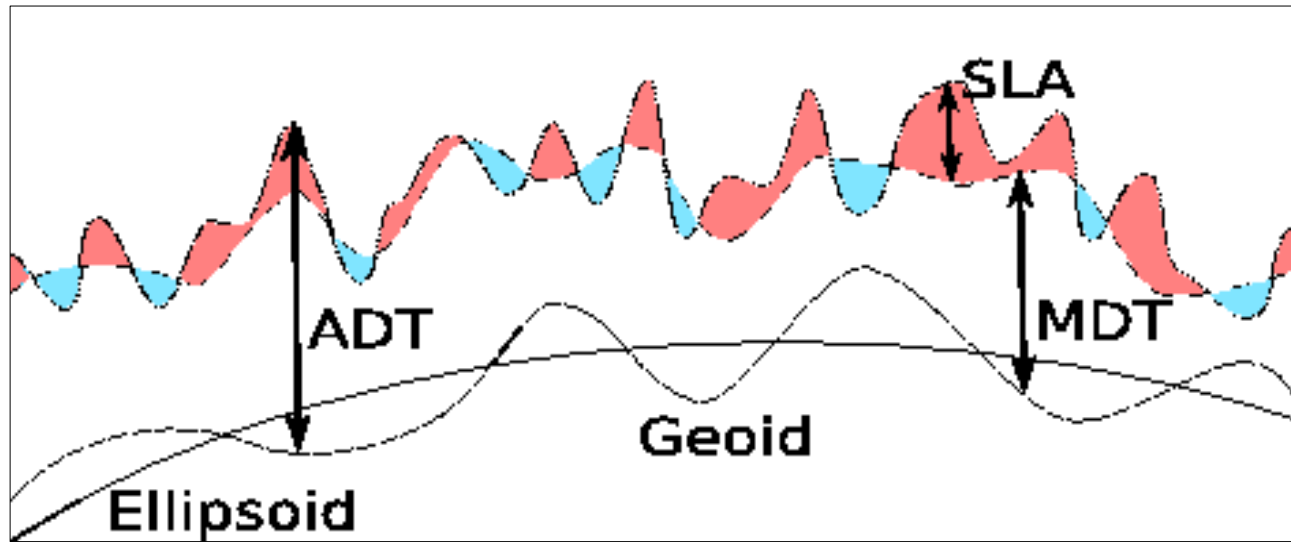
Model

The Inverse Finite Element Ocean model (IFEOM, Sidorenko 2005) solves for T and S that are close to measurements, respects stationary dynamical balances, and simultaneously produces estimates of the circulation.

Why we need altimetry?

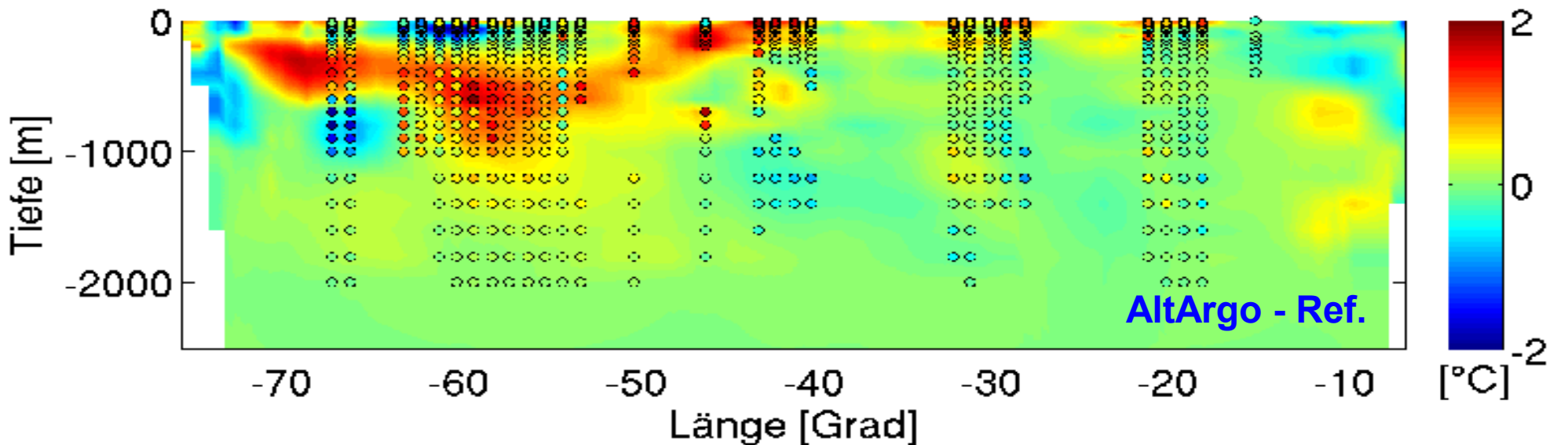
temperature sections — Argo only
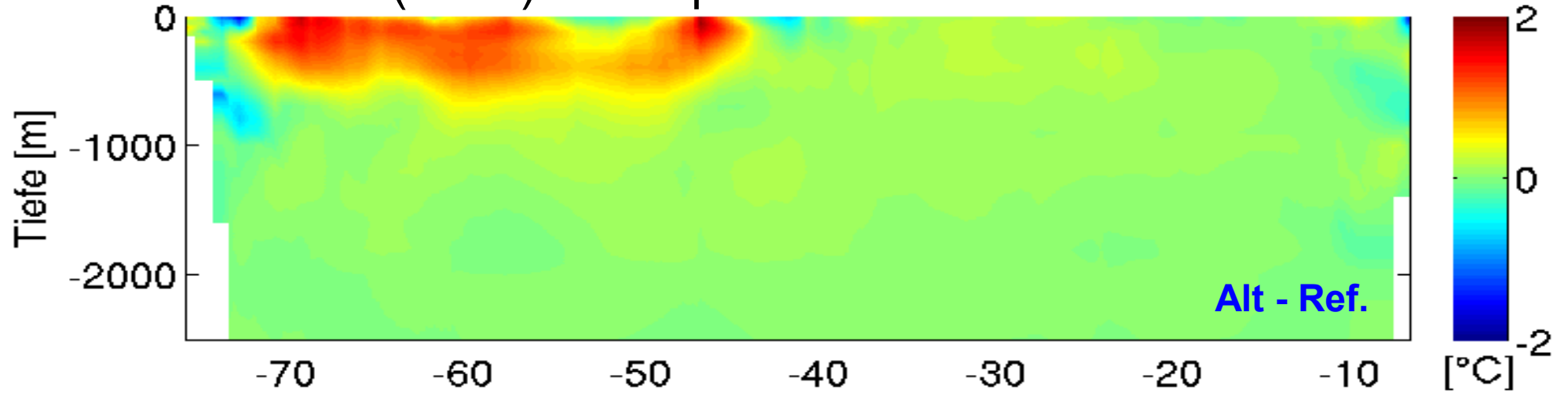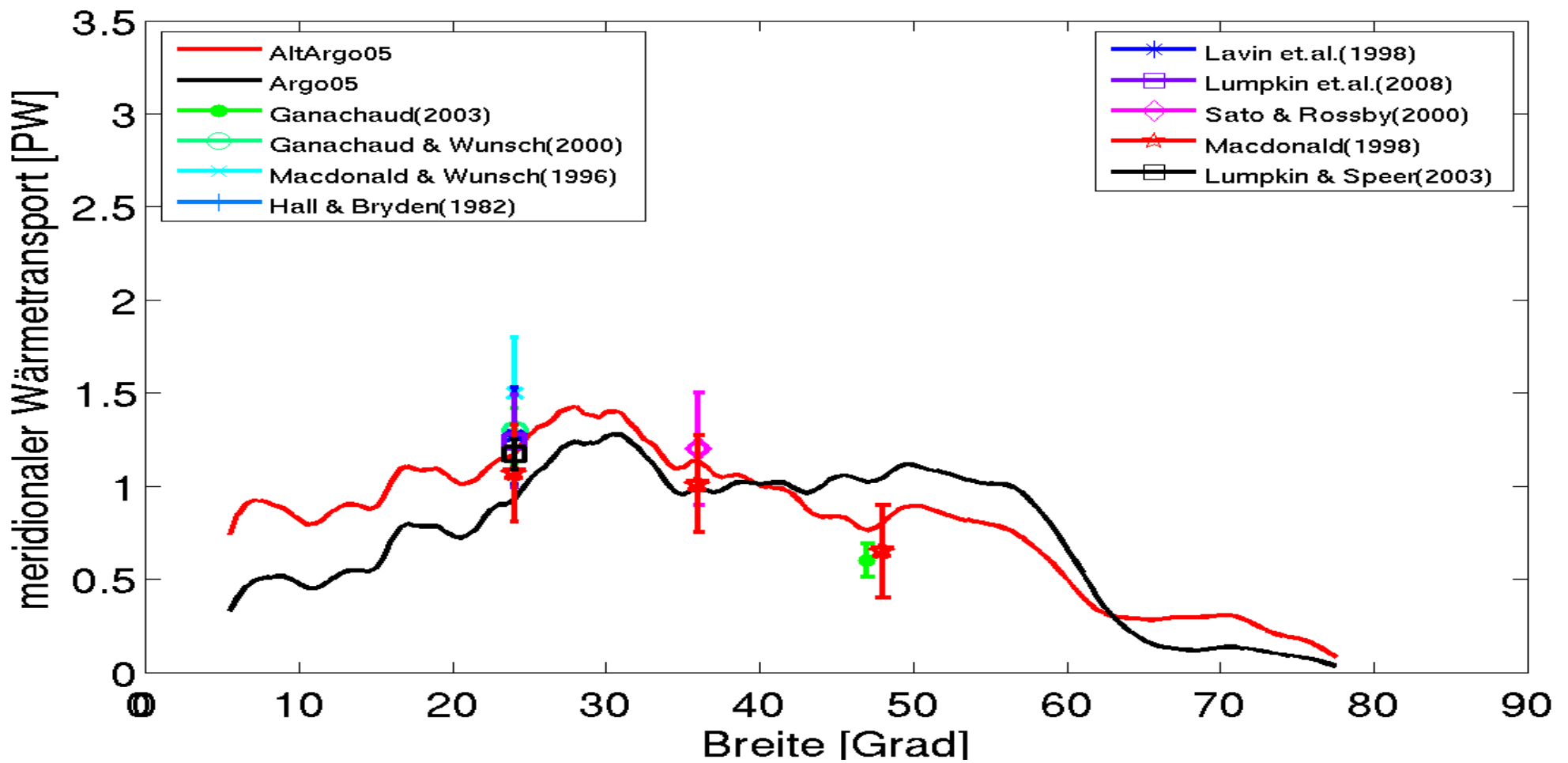

temperature sections — altimetry + Argo

• altimetry helps to spread the Argo point measurement horizontally in the model domain
•Argo provides the vertical information on how to change T and S to fit altimetry
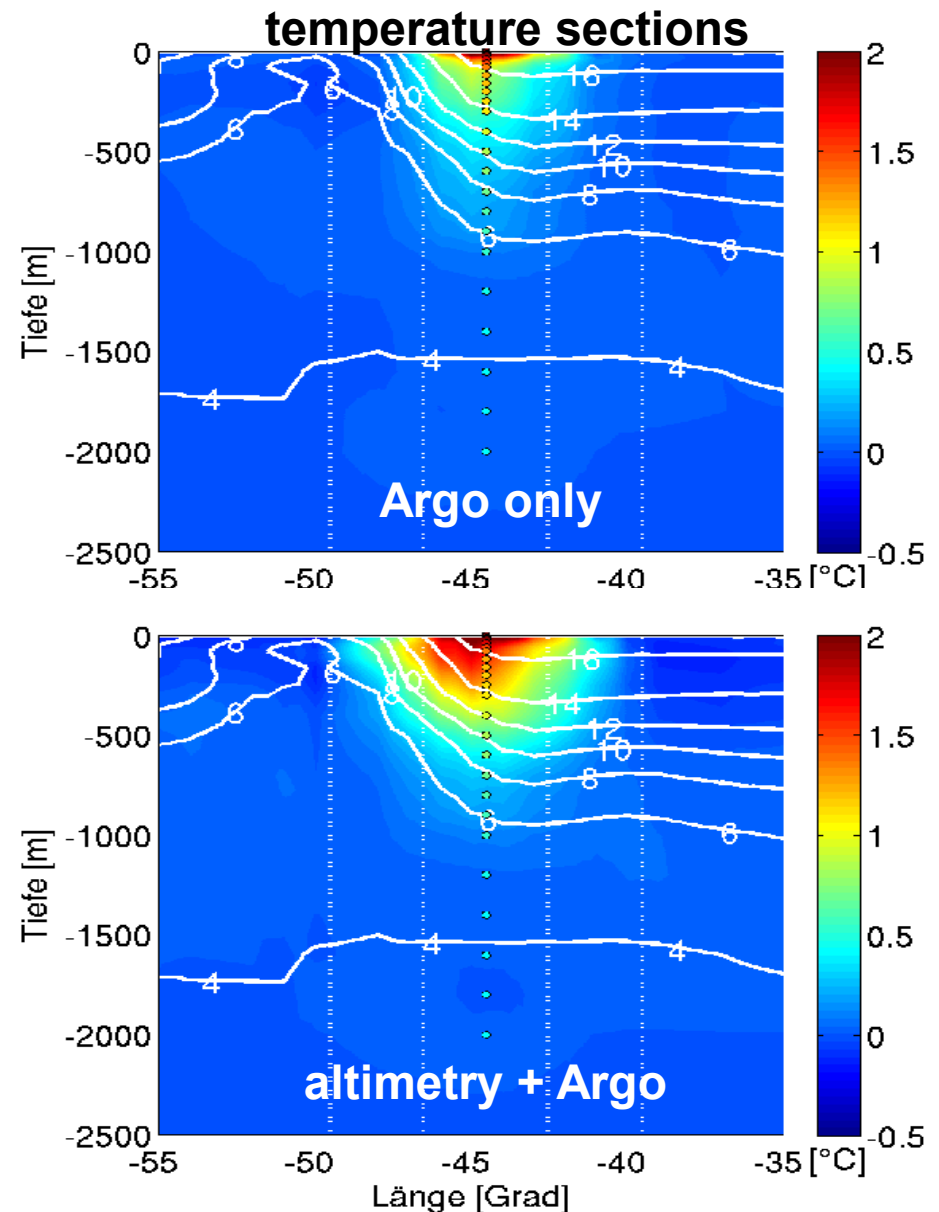
vertical T and S profile from Argo

section (36°N) of temperature difference

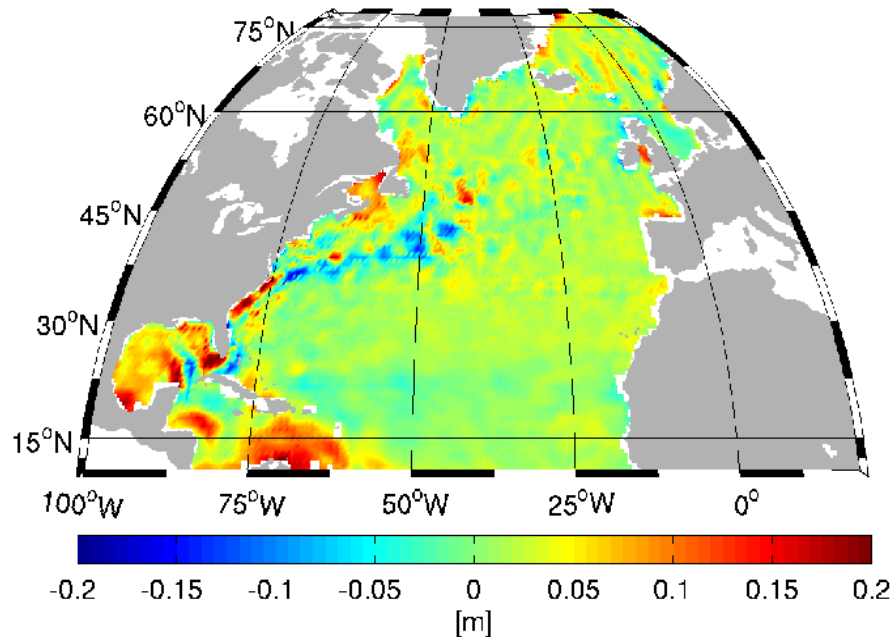Meridonal heat-transport across section 24°N:

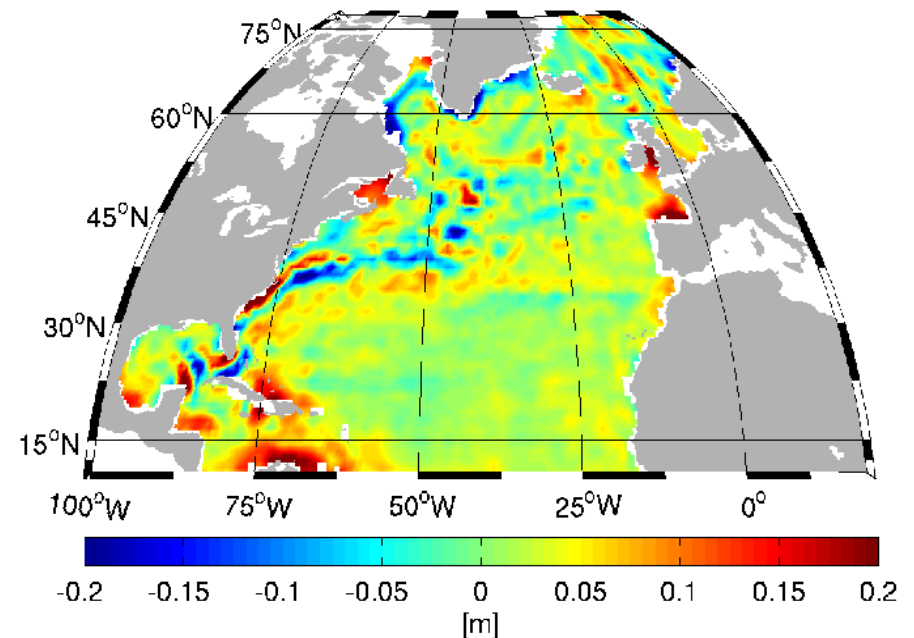|	
Referenzlauf	0.92 PW
Argo	0.92 PW
AltArgo	1.19 PW
Lumpkin und Speer (2003)	1.17 PW
Lumpkin et al. (2008)	1.24 PW
Ganachaud und Wunsch (2000)	1.26 PW (1 PW=10^{15} W)

Changes in SSH due to inversion

Difference of time-averaged SSH (2004-2007)

AltArgo - aviso

"Bosch and Savcenko" - aviso

- the inversion changes the Aviso dynamic topography towards the product presented by Wolfgang Bosch (Bosch W. and Savcenko R. (200[89]), accepted)
- a new dynamic topography was recently presented by Aviso, an inversion with this product will be done

key - results

- Argo and altimetry provide consistent information

  - altimetry improves the estimates of circulation and transports

  - Argo contributes the vertical profile of how to change steric component necessary to fit altimetry

- altimetry data helps to propagate Argo T and S profile measurements (spreading Argo information)