Topographic Control of the Gulf Stream

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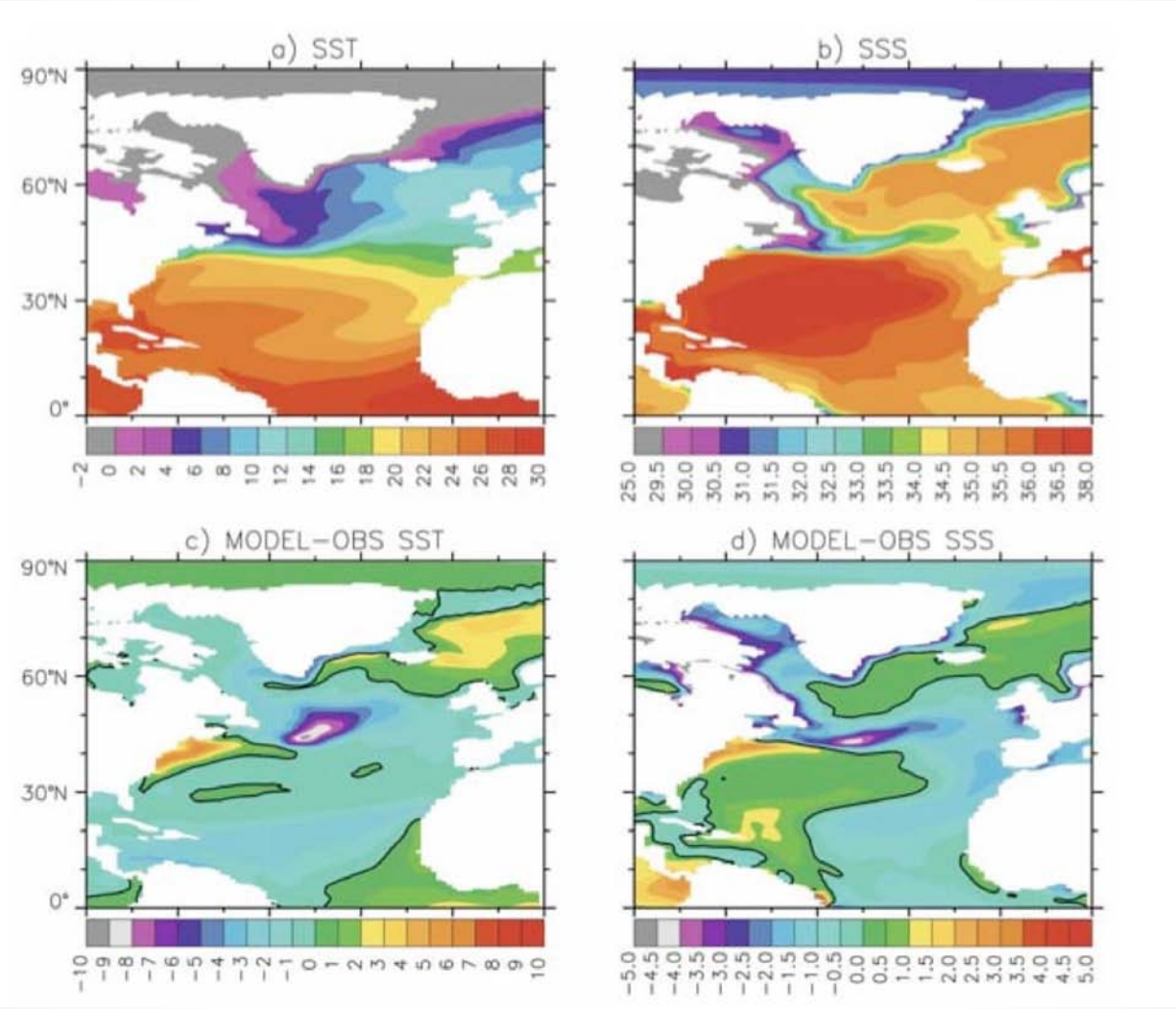
SST and SSS Biases



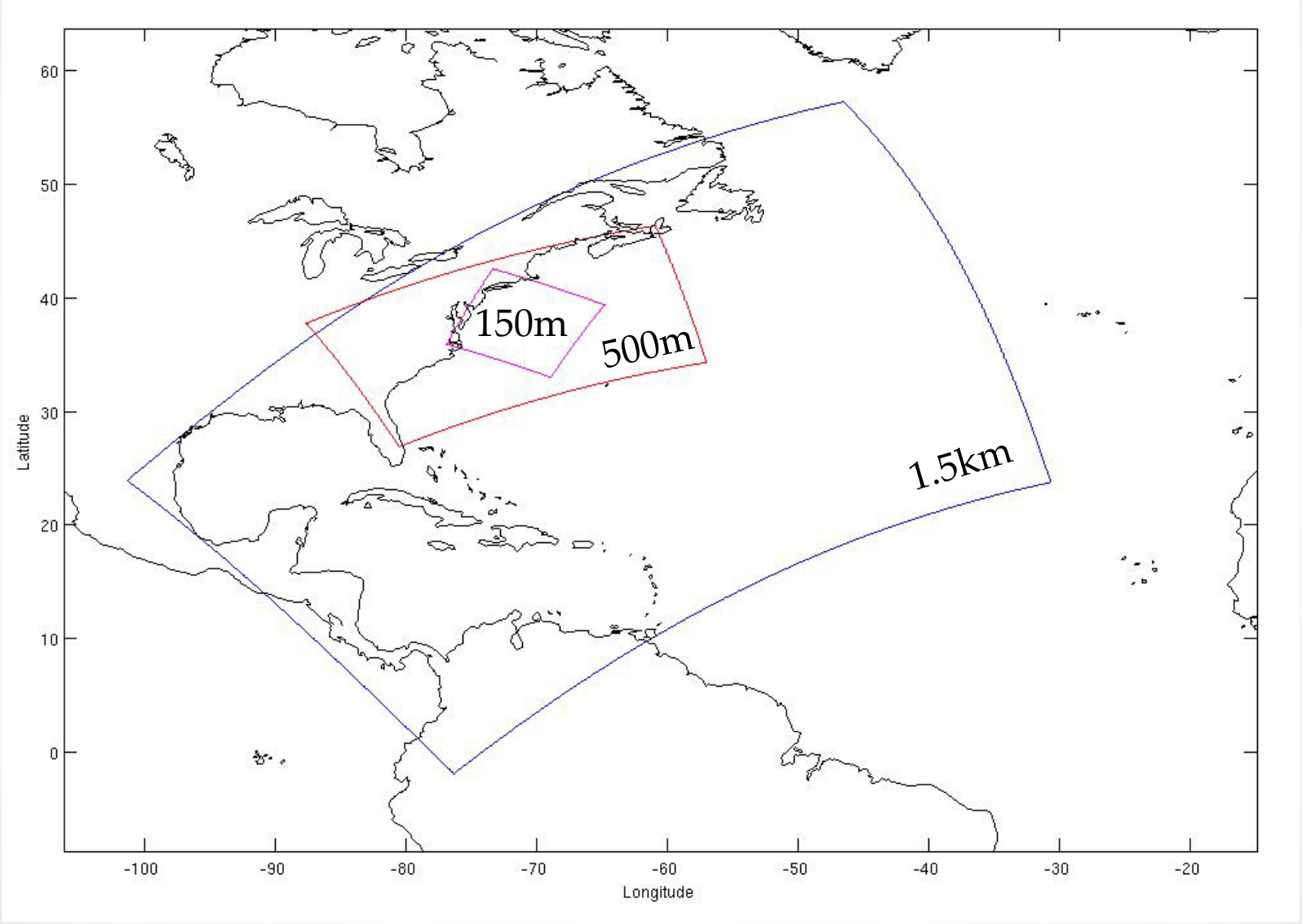
Project Focus

- Main Hypothesis: Processes at the western boundary of the North Atlantic are the primary control of Gulf Stream separation and North Atlantic Current path.
  - Potential vorticity and/or lateral momentum stress at the boundary are the ultimate control on these features.
- Research Focus: The impacts of topographic and boundary physics. Focus on lateral form stress and potential vorticity generation by lateral and bottom topography.
- End Goal: Potential vorticity generation and lateral drag parameterizations for use in coarse resolution(1deg) climate models.

Models

- High resolution models (ROMS and MITgcm)
  - Process approach in that the structure inside the nested grid will be modified in order to explore the controlling dynamics. “Realistic topography” used as baseline and then modified topography used to test sensitivity.
  - Bottom boundary layer schemes: slip, no-slip, and mixed will allow analysis of boundary layer turbulent input
- Coarse resolution model (CCSM)
  - sensitivity to bathymetry
  - Test parameterizations for climate impacts and bias reduction.

UCLA ROMS Nested Model

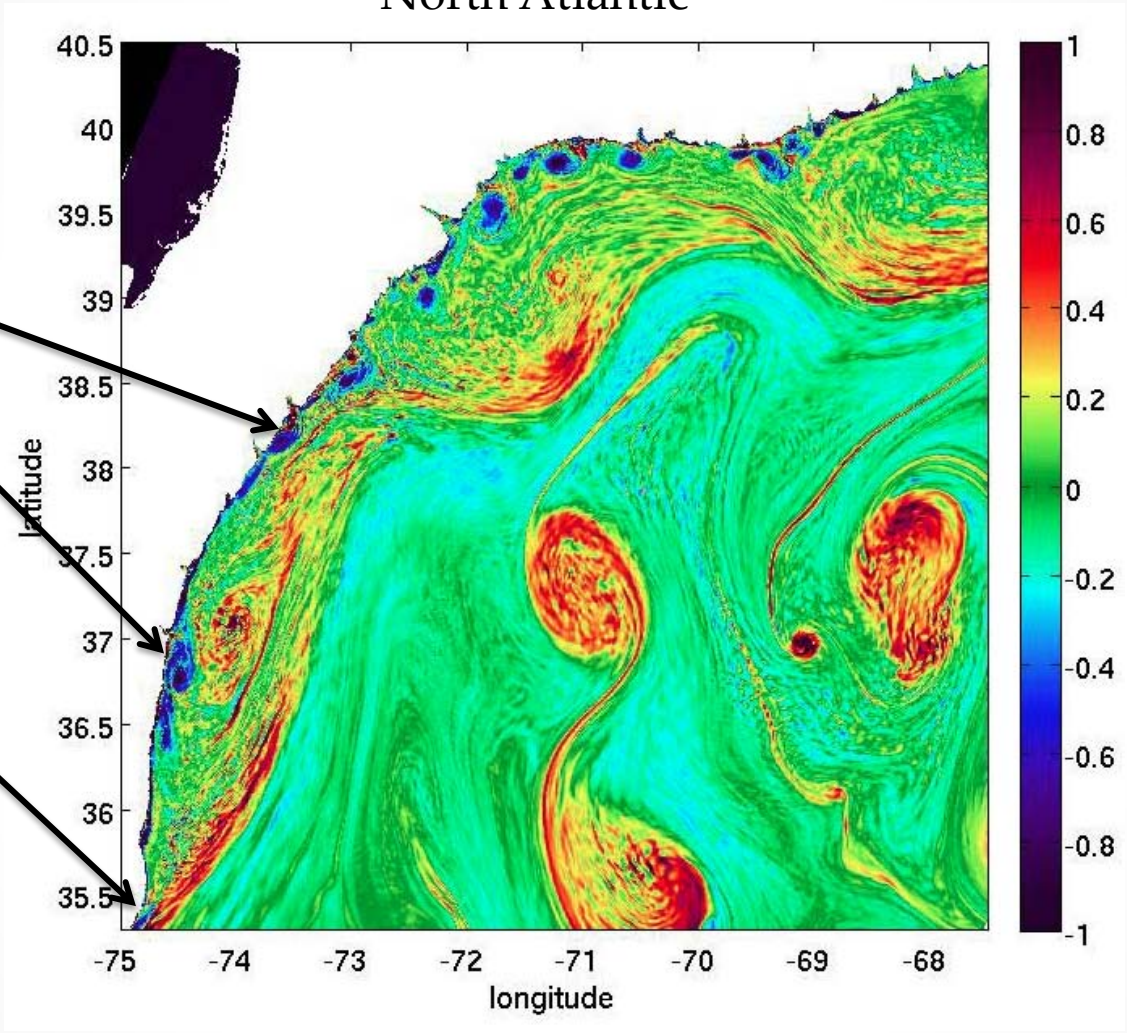


Vorticity in a Nested Model

North Atlantic

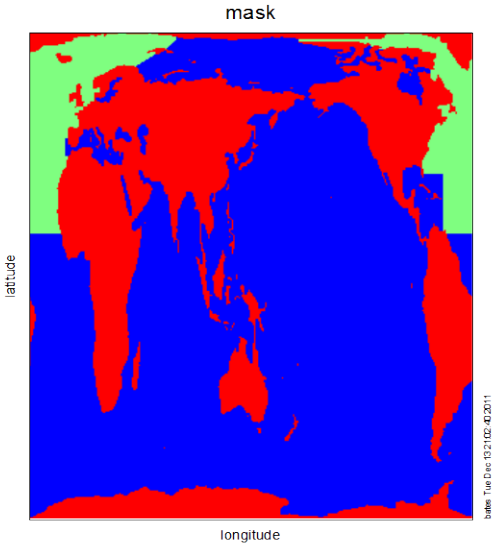
Potentially canyon generated vorticity

Gulf Stream separation



Normalized (by Coriolis) vorticity from ROMS (UCLA model)
150m resolution

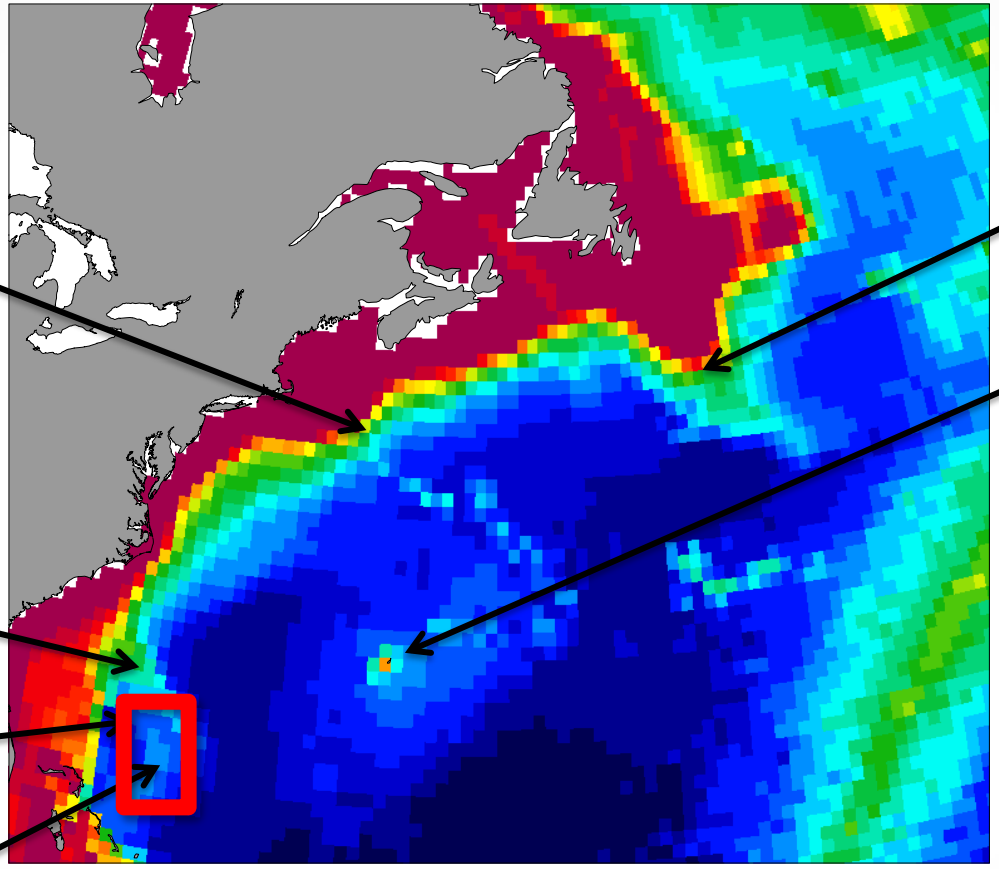
North Atlantic Mask



Range of mask: 0 to 2 (null)
Range of longitude: 0 to 319
Range of latitude: 0 to 383
Frame 178 in File NAmask.nc

North Atlantic Bathymetry

Based on ETOPO 2′ data



Georges Bank

Grand Banks

Bermuda Rise

Blake-Bahama Outer Ridge

Blake Basin

Bahama Ridge

Depth in meters

Summary

- Investigate topographic/boundary influence on the Gulf Stream path with hope of obtaining parameterizations for the nominal 1° POP.
- Results will hopefully be general enough to apply to all boundary currents (though topography is complex and therefore some aspects may be region specific).

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