Hydrostatic Data Assimilative Model (ROMS-ESPreSSO)

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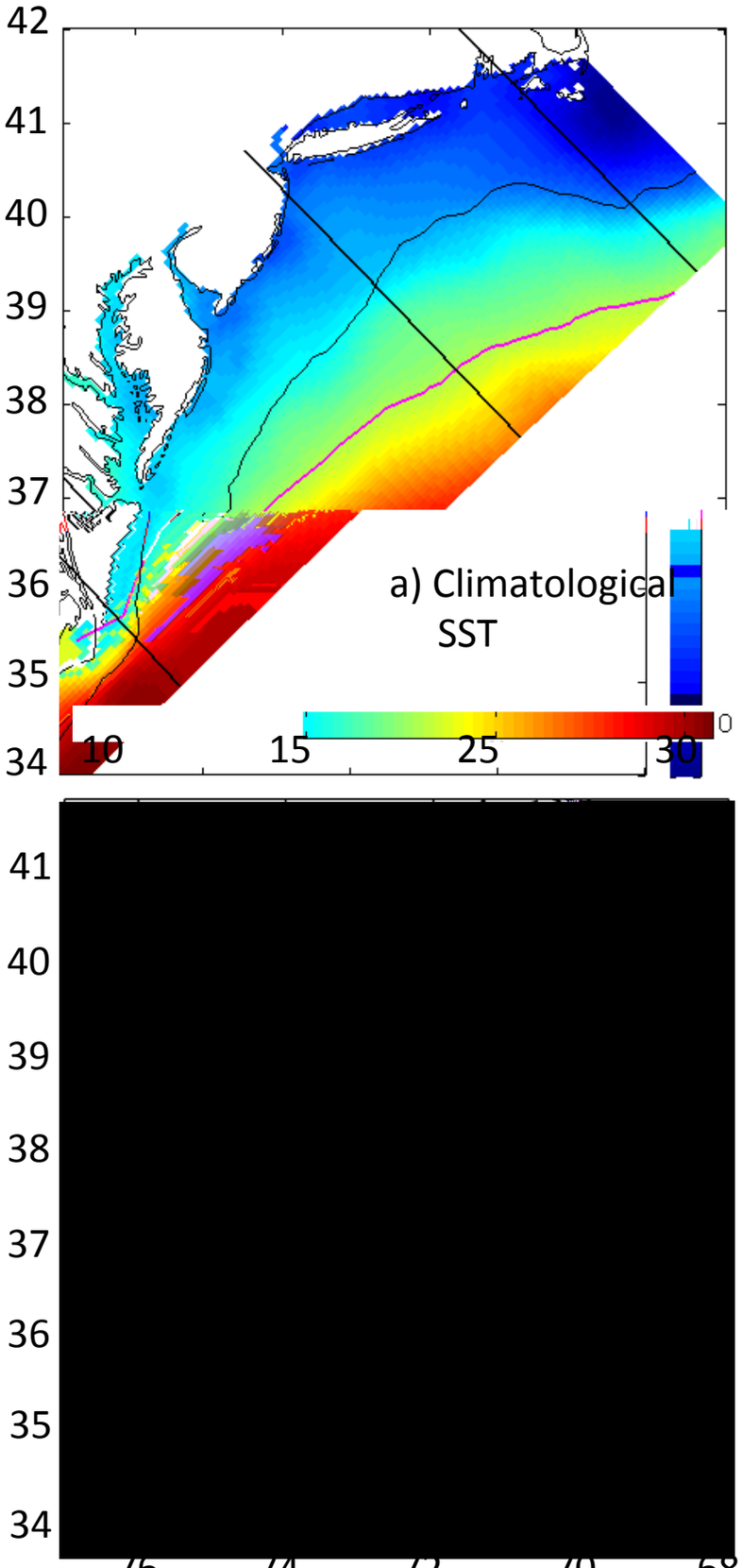
Outline

- ESPreSSO model. Improvements in data assimilation
    - Climatological DA to improve seasonal mean and MDT
    - Better bias reduction of HYCOM boundary conditions
    - Good representation of meso-scale activity
- IODA v1 results (1-way nested in Espresso DA model)
    - Internal tide
- Plans for Doppio domain (include Gulf of Maine)
    - DA assimilation to drive IODA via 1-way nesting
    - 2-way nesting without DA, from 7 km down to 800 m resolution



a) Climatological SST

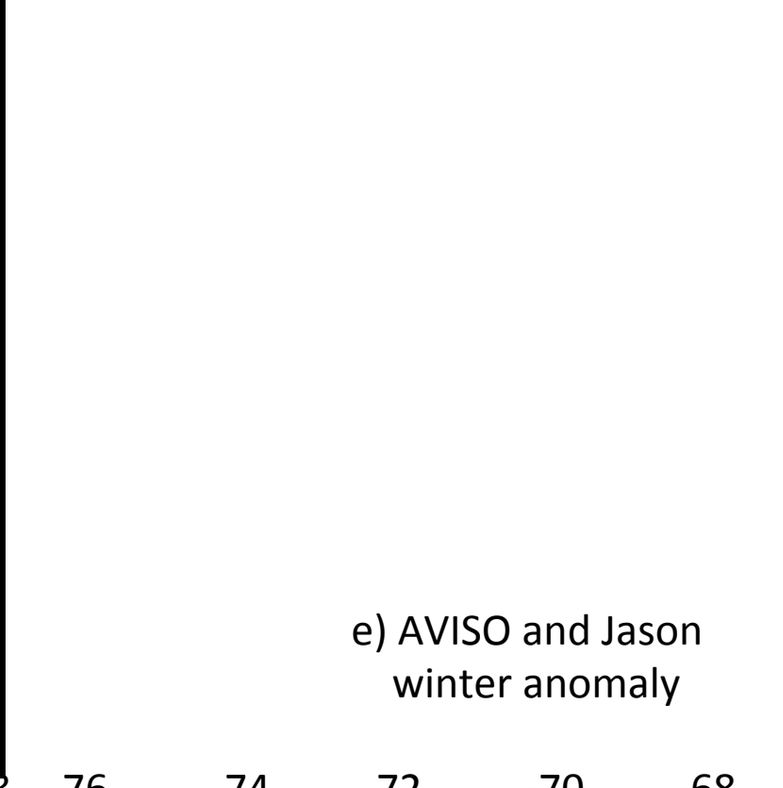
10 cm/s

b) HF Radar velocity

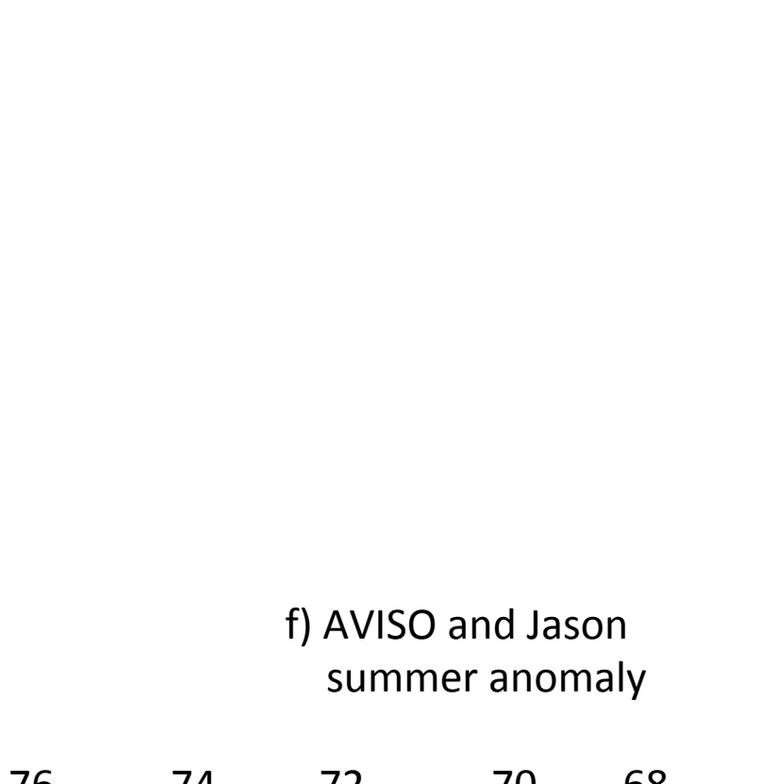
10 cm/s

c) Velocity from CM and ADCP

e) AVISO and Jason winter anomaly



f) AVISO and Jason summer anomaly



Global models have biases, which propagate to the regional model.

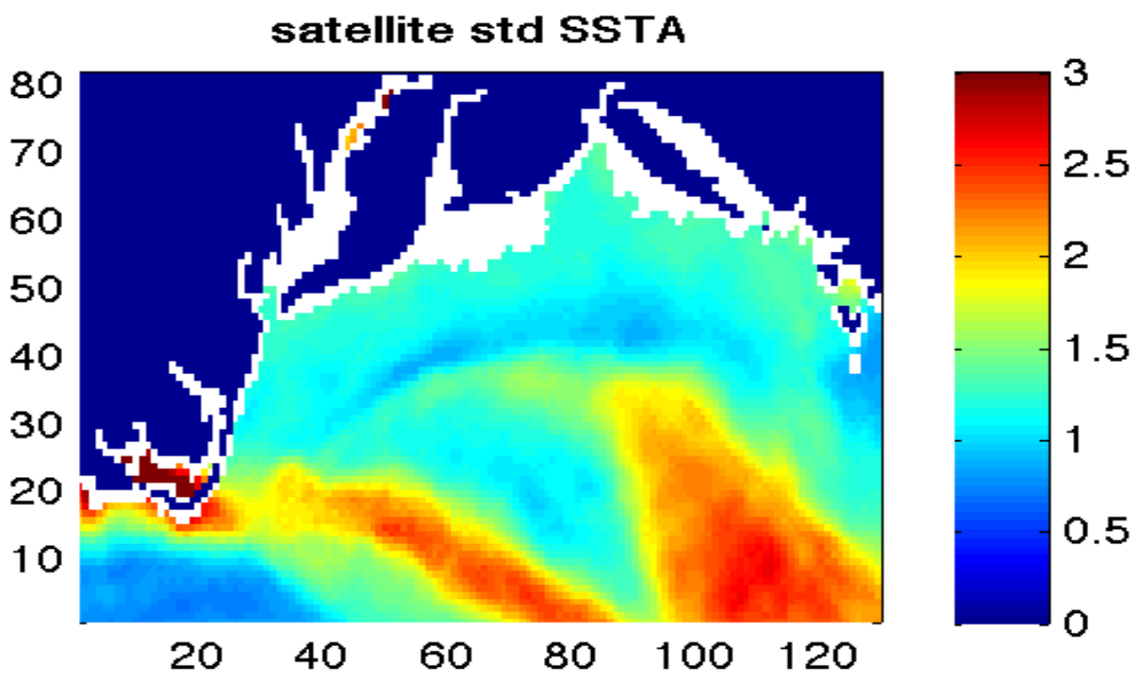
Before using data assimilation one should reduce as much as possible such biases in the regional model

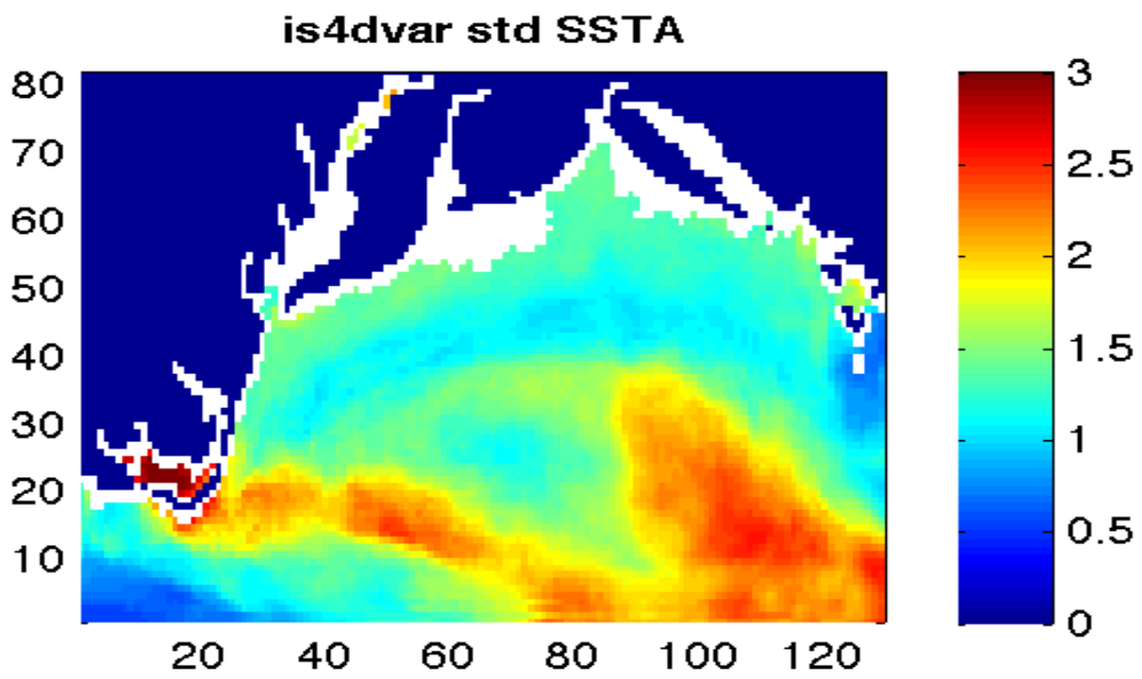
Replaced the seasonal climatology of temperature and salinity from HYCOM by that derived from climatological assimilation described above before using it to force ROMS.

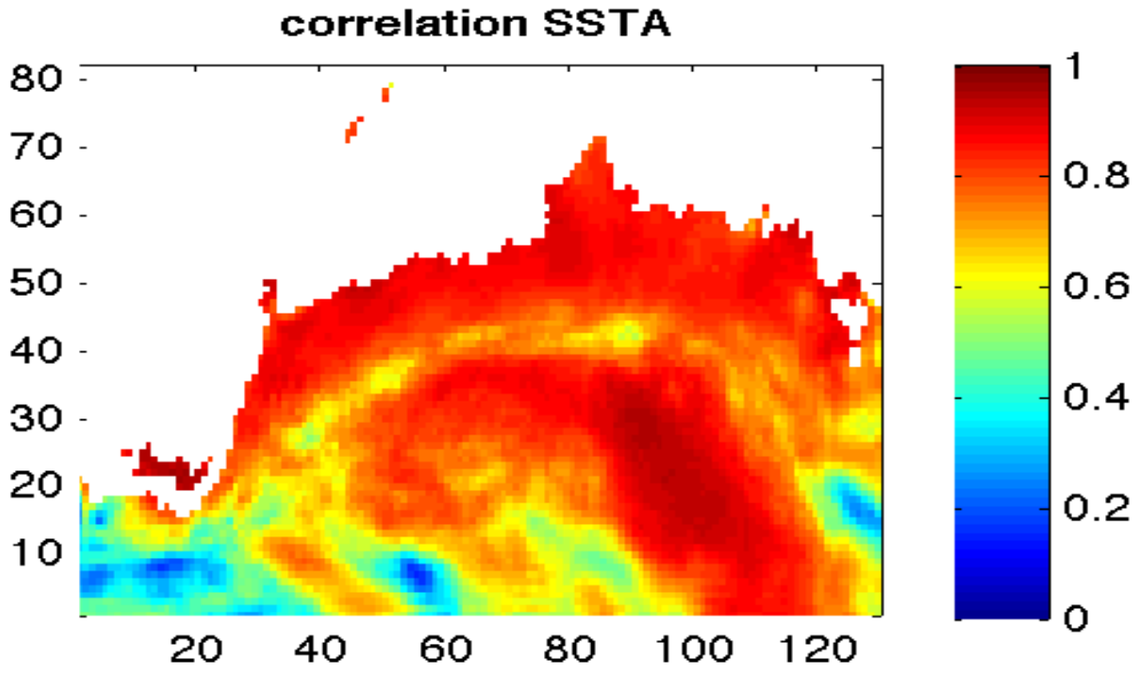
Background error covariance scaled by an standard deviation file.

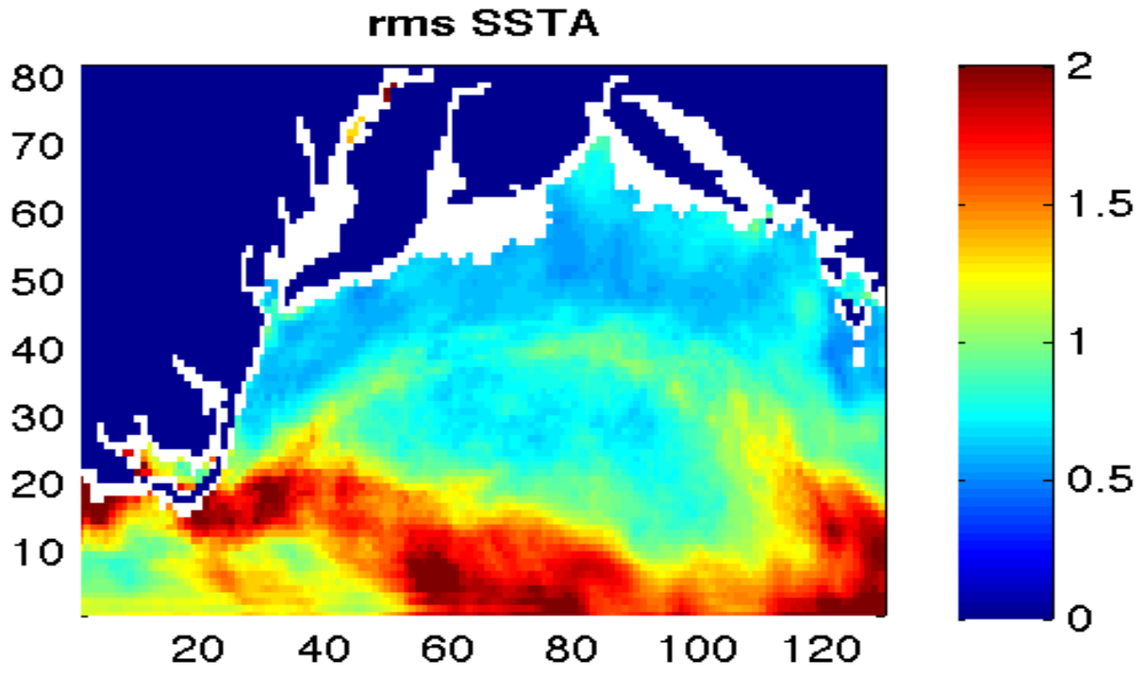
Strong seasonality in the MAB shelf background field -> Strong seasonality in the standard deviations.

Skill in hindcasting mesoscale SST by the assimilation system

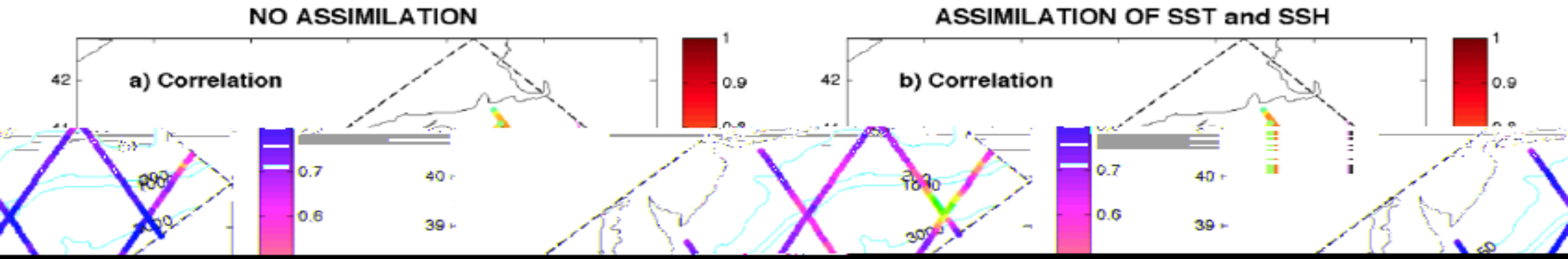




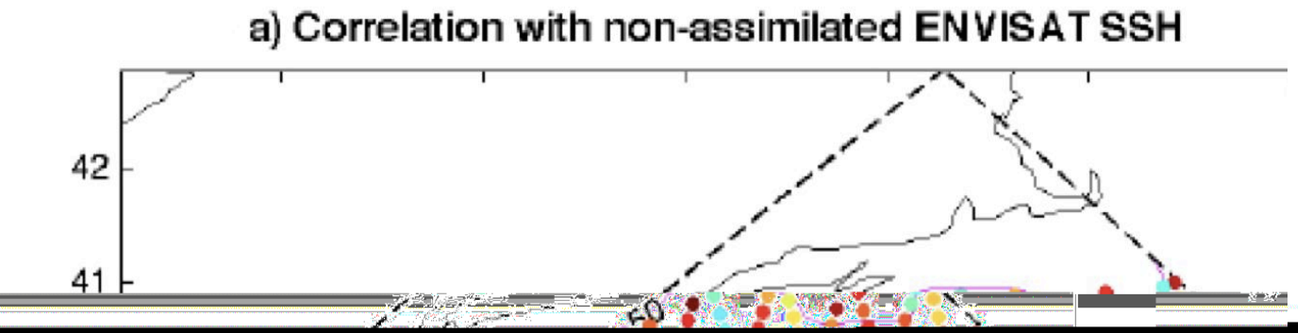


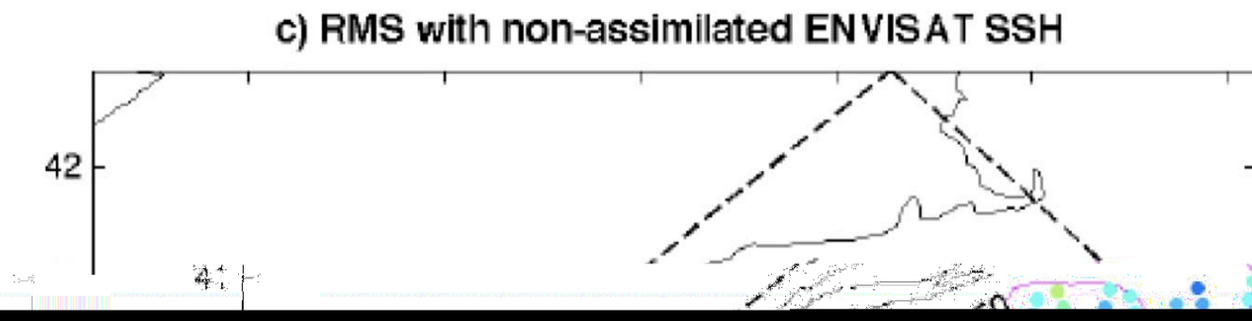


Correlation and RMS error between Jason along-track data and model SSHA before and after data assimilation

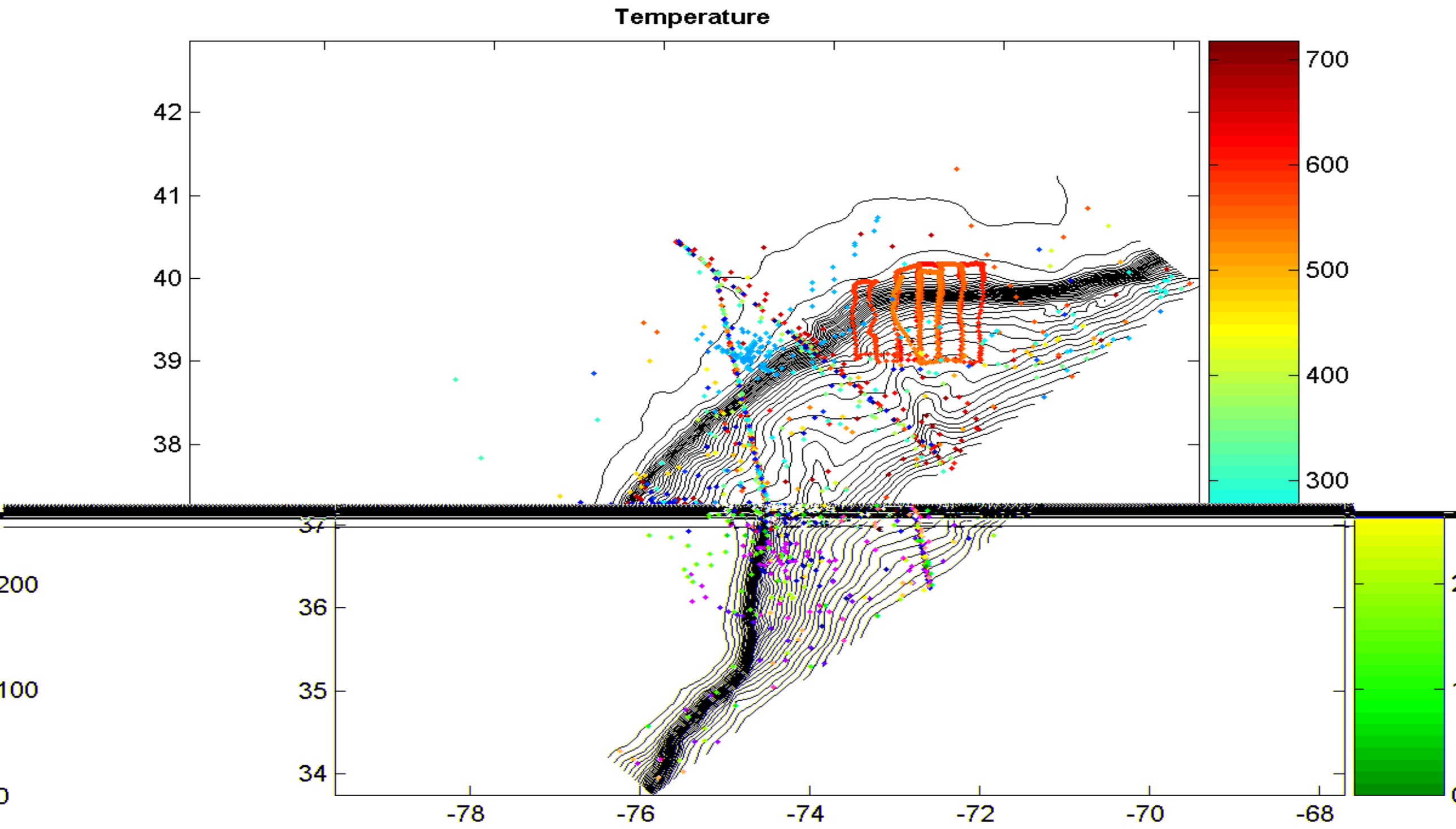


Correlation and RMS error between NOT ASSIMILATED ENVISAT along-track data and model SSHA and vertical skill in temperature

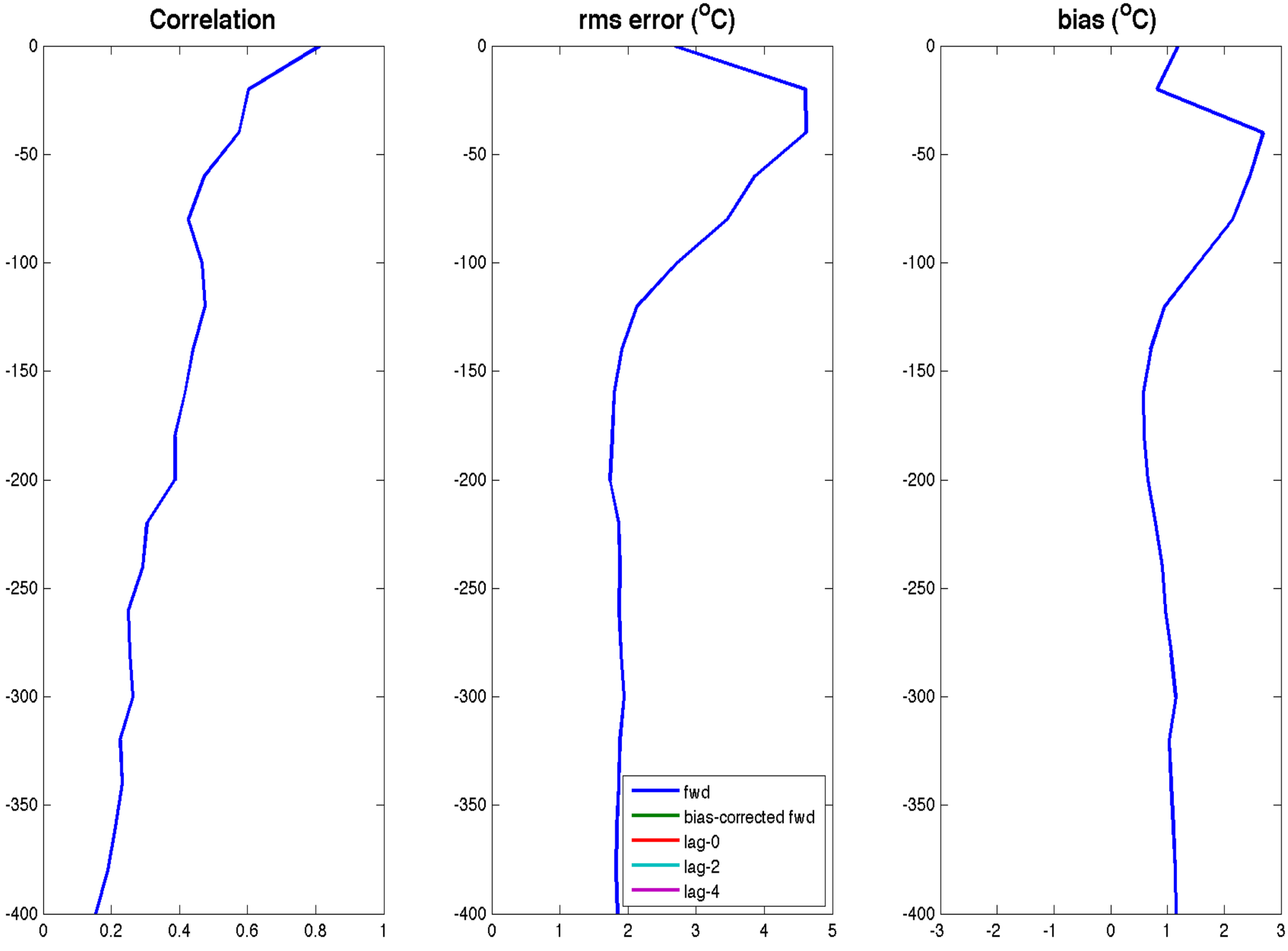




Large set of T and S observations from CTD, gliders, XBTs for 2006 (SW06) and 2007



Skill in hindcasting/forecasting NOT ASSIMILATED subsurface temperature



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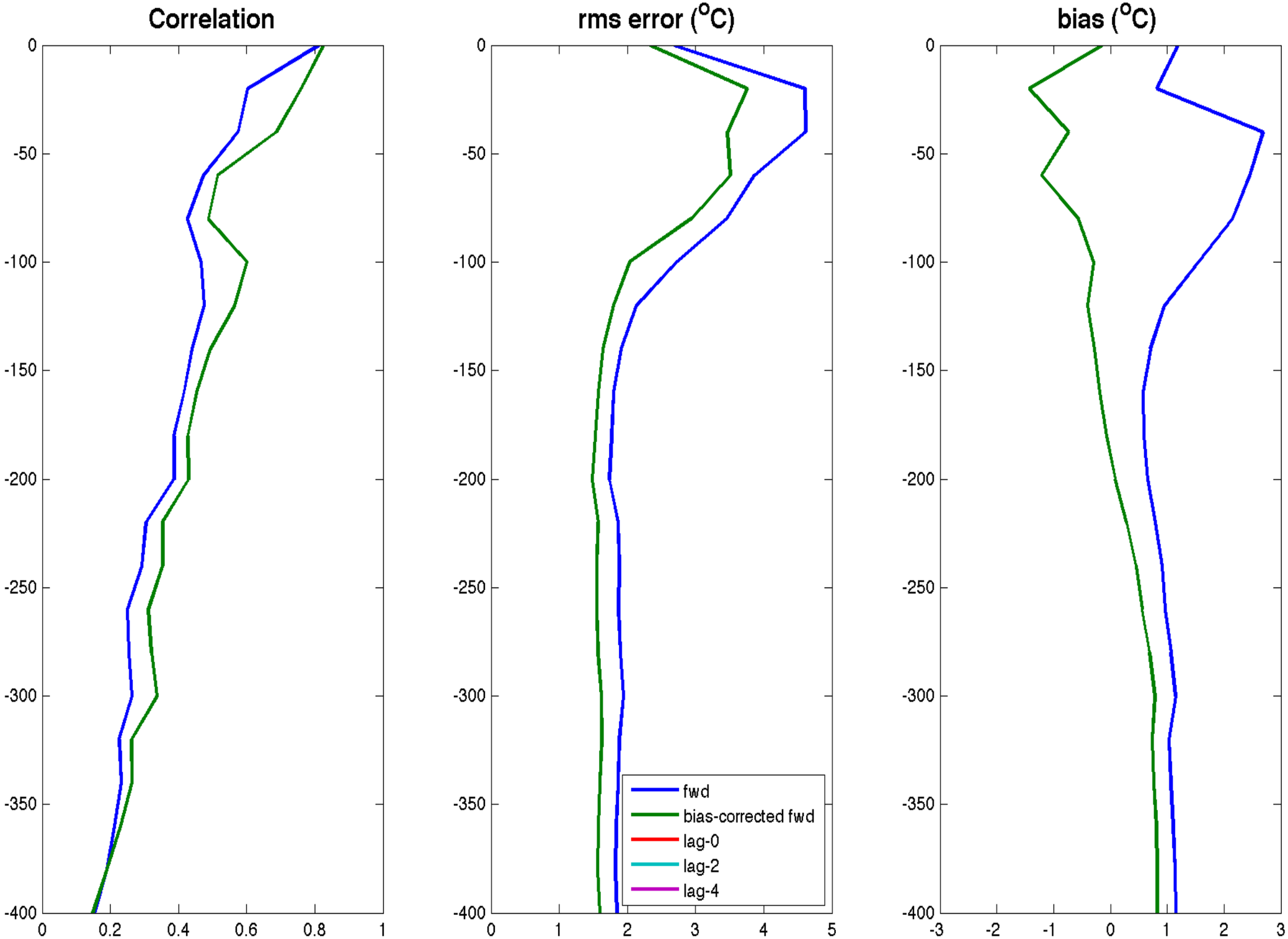

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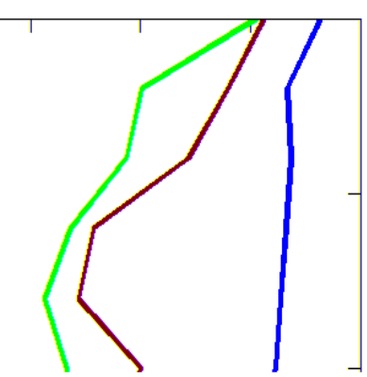
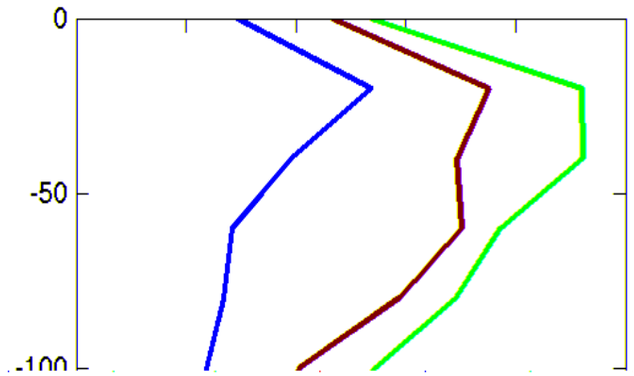
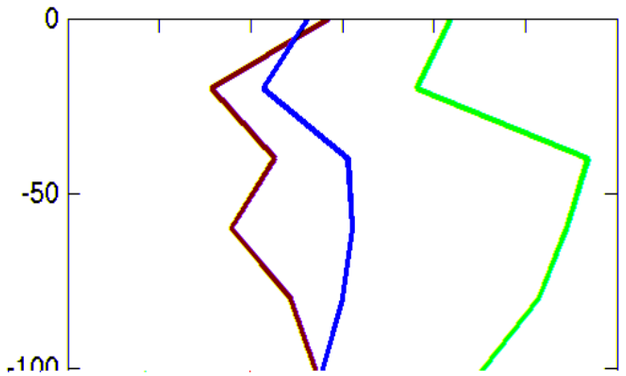
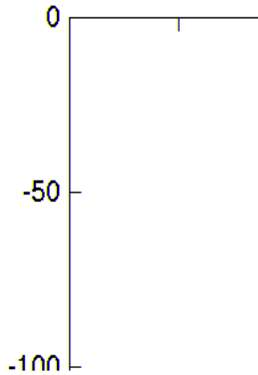
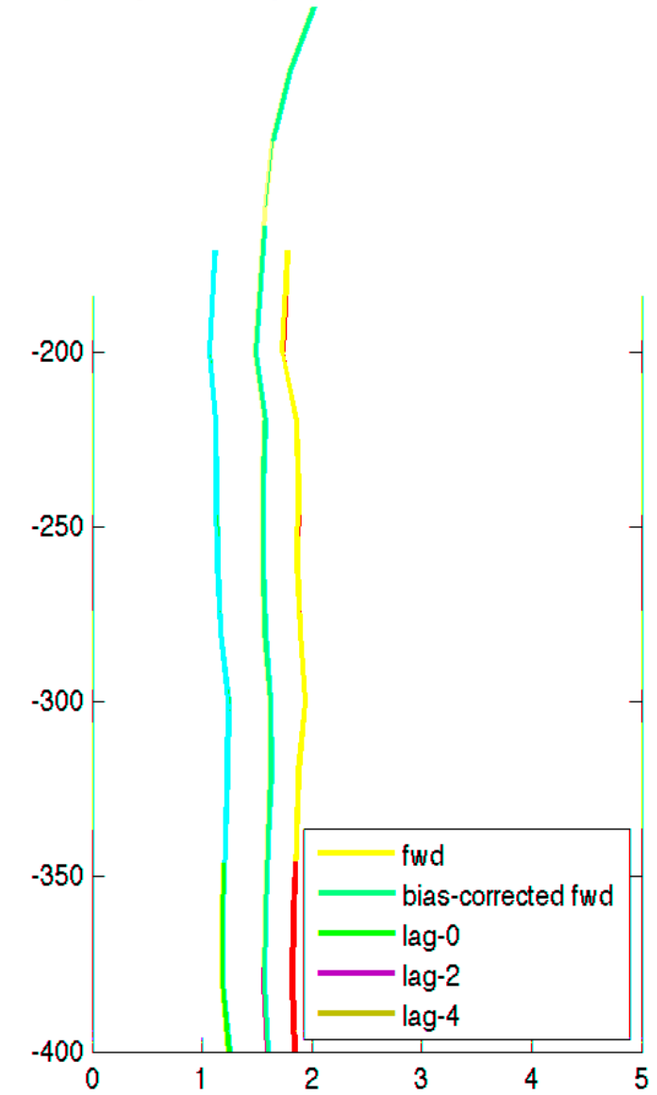
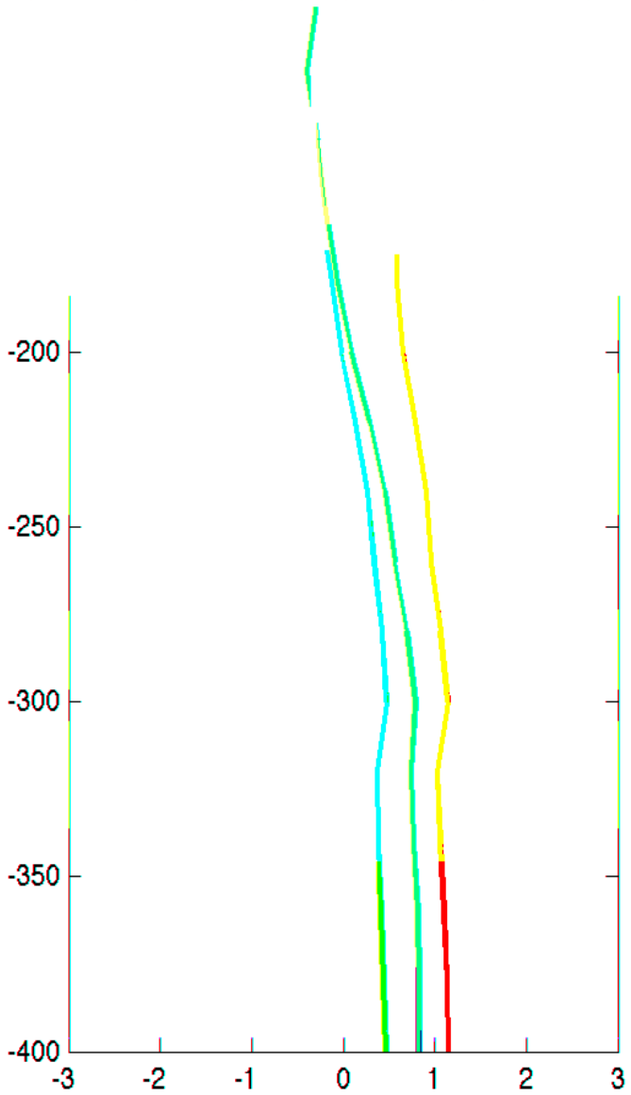


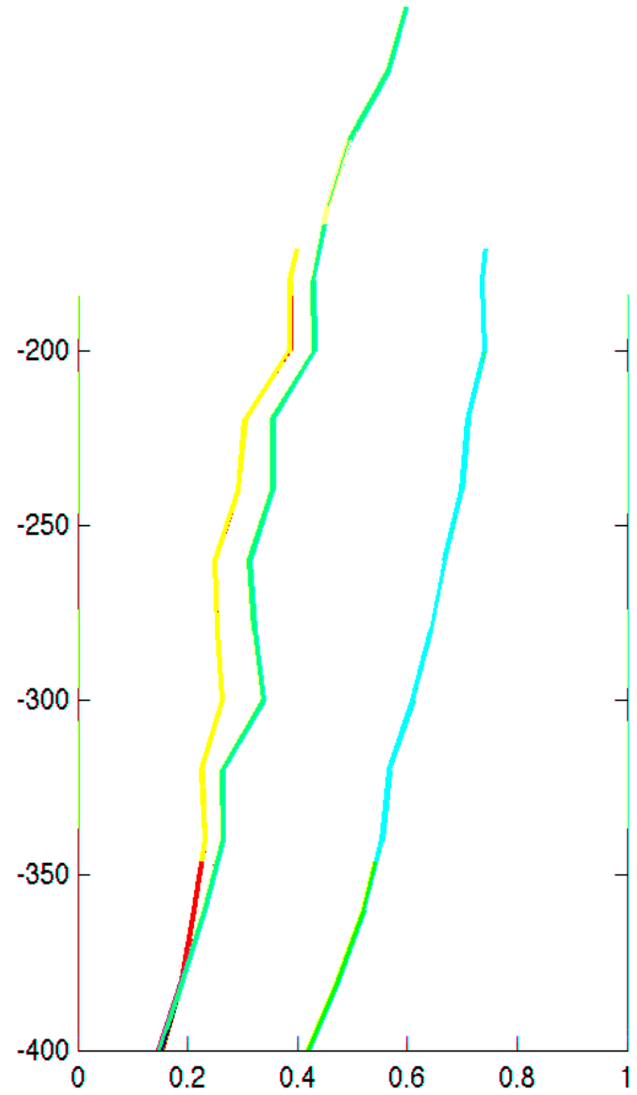




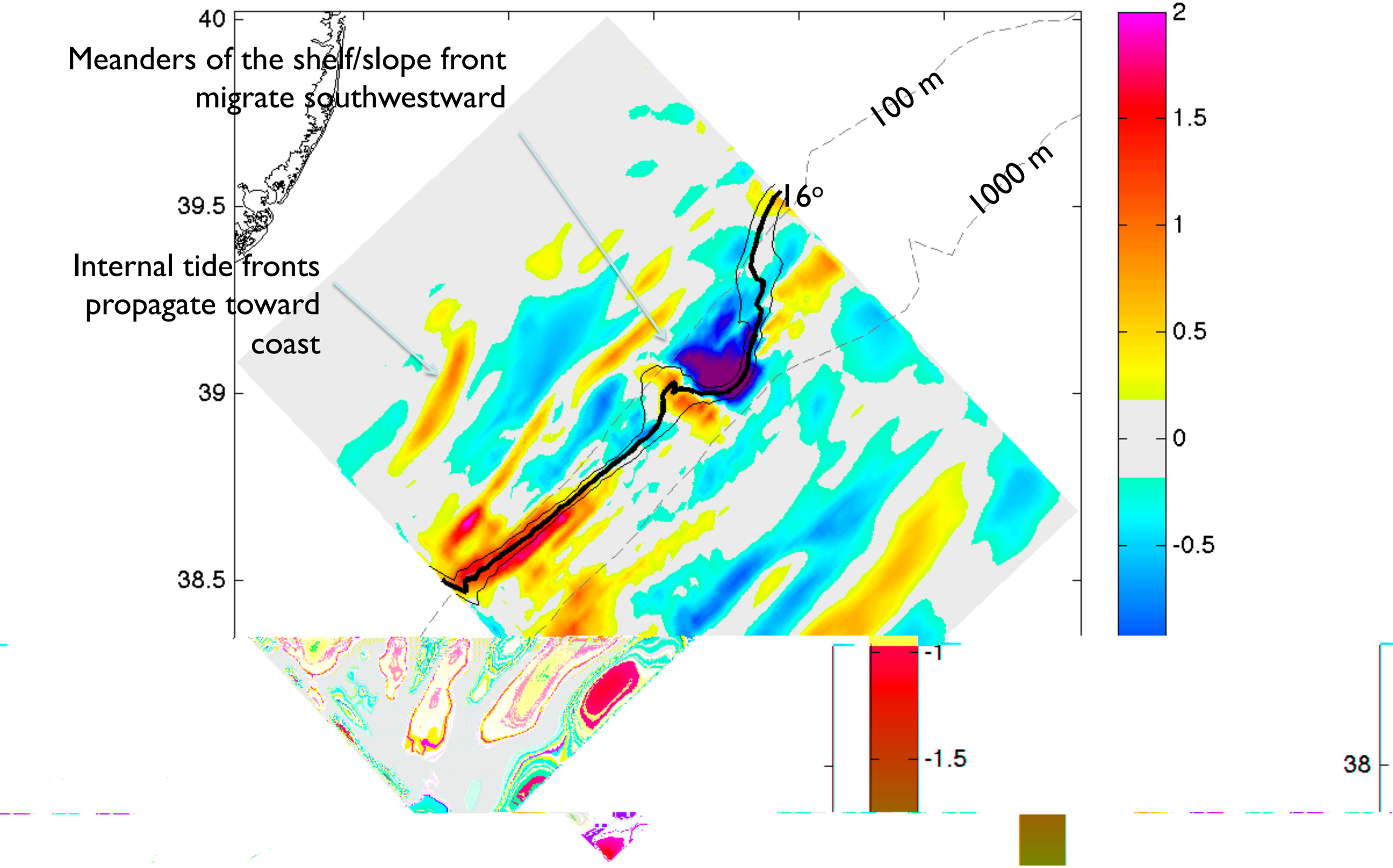








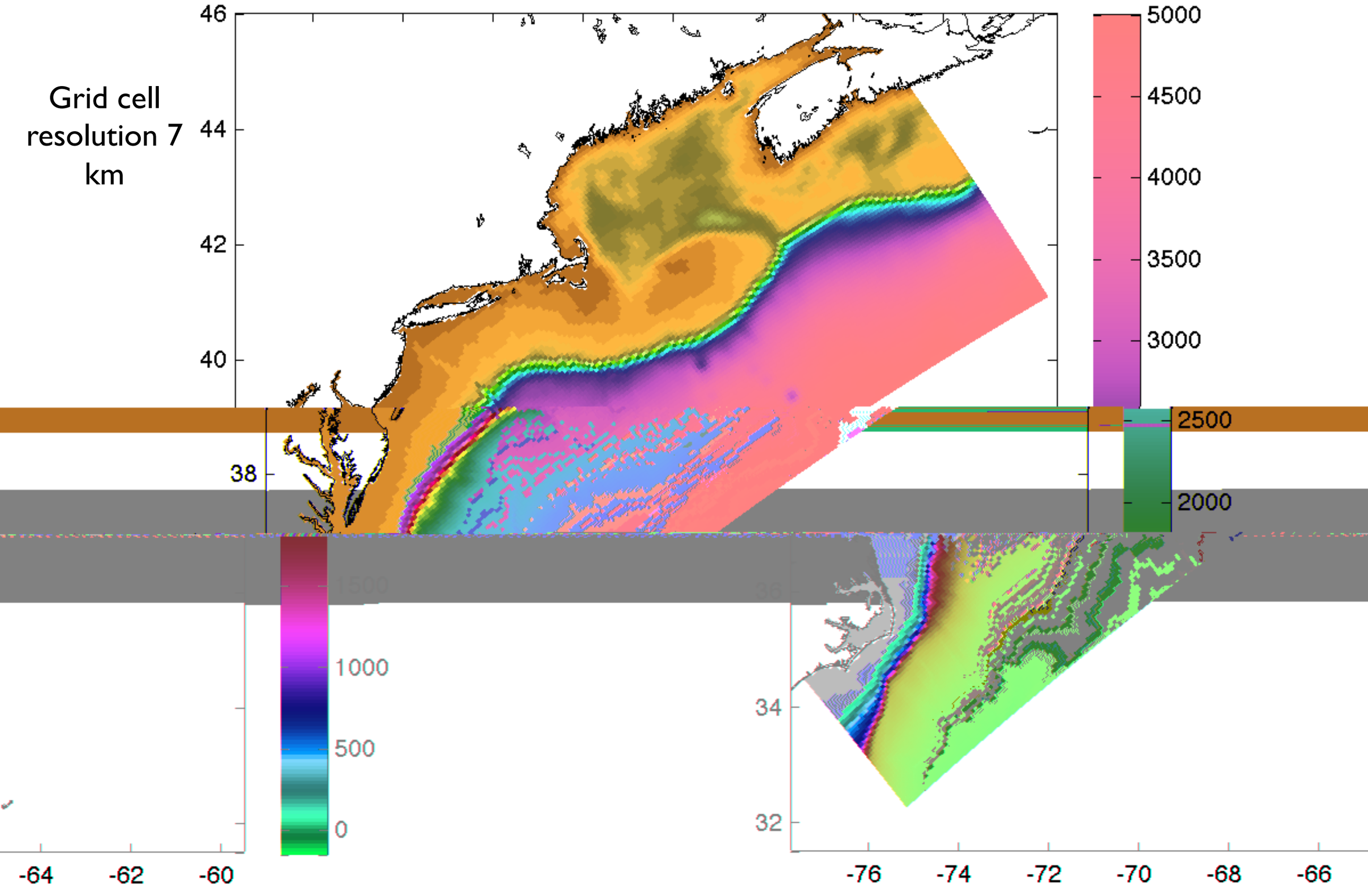
IODA v1 1-way nested in ESPreSSO: Temperature at 20 m



Colors show high-pass anomaly with respect to a 36-hr cutoff running-mean filter temperature. Solid contours are 14, 16, 18° isotherms

Proposed *Doppio* domain extracted from E. Curchitser Northwest Atlantic (NWA) model

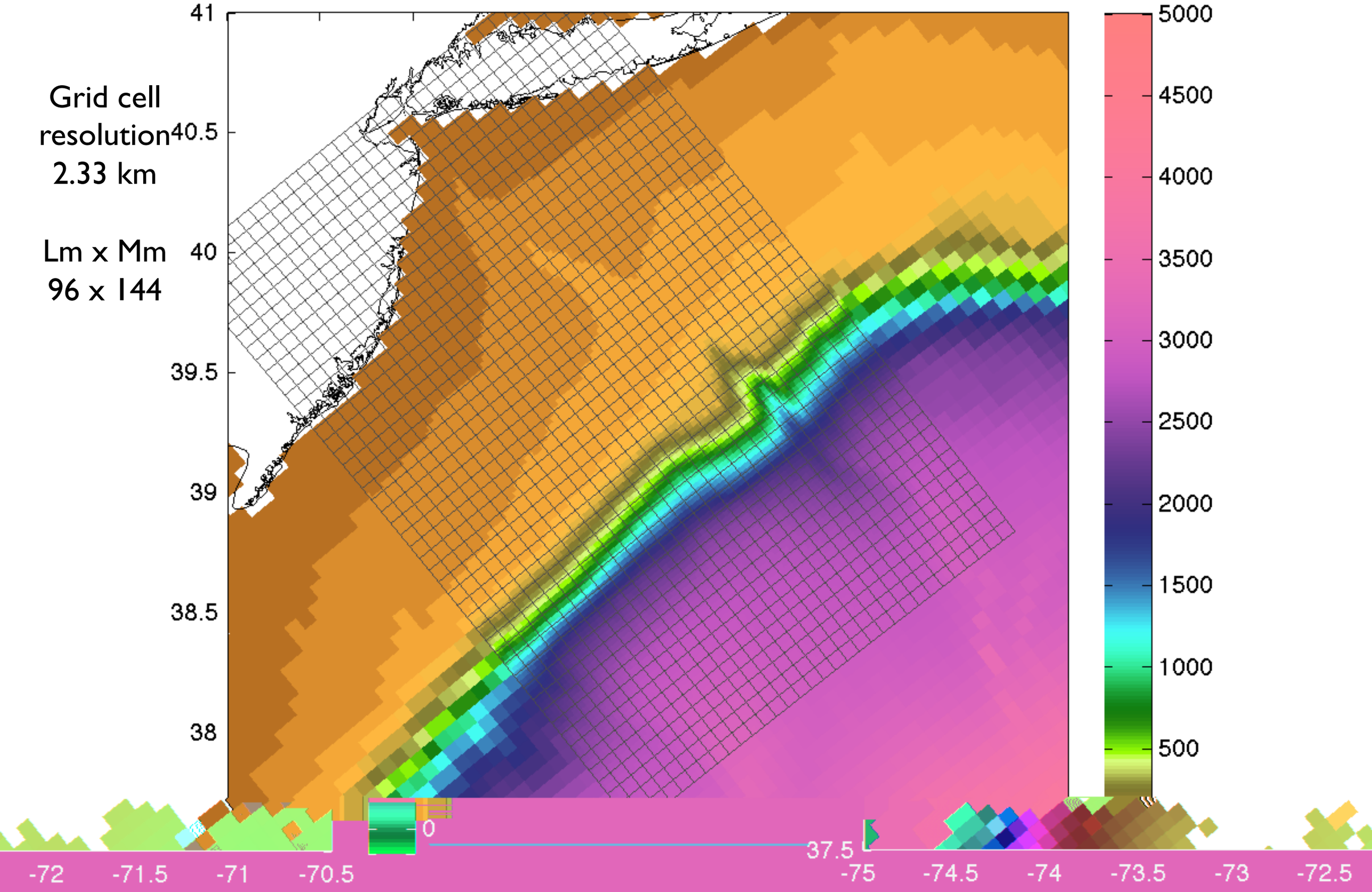
Grid cell resolution 7 km



Proposed *IODA* domain (version 2) (only every 3rd grid cell) to nest within *Doppio*

Grid cell resolution 2.33 km

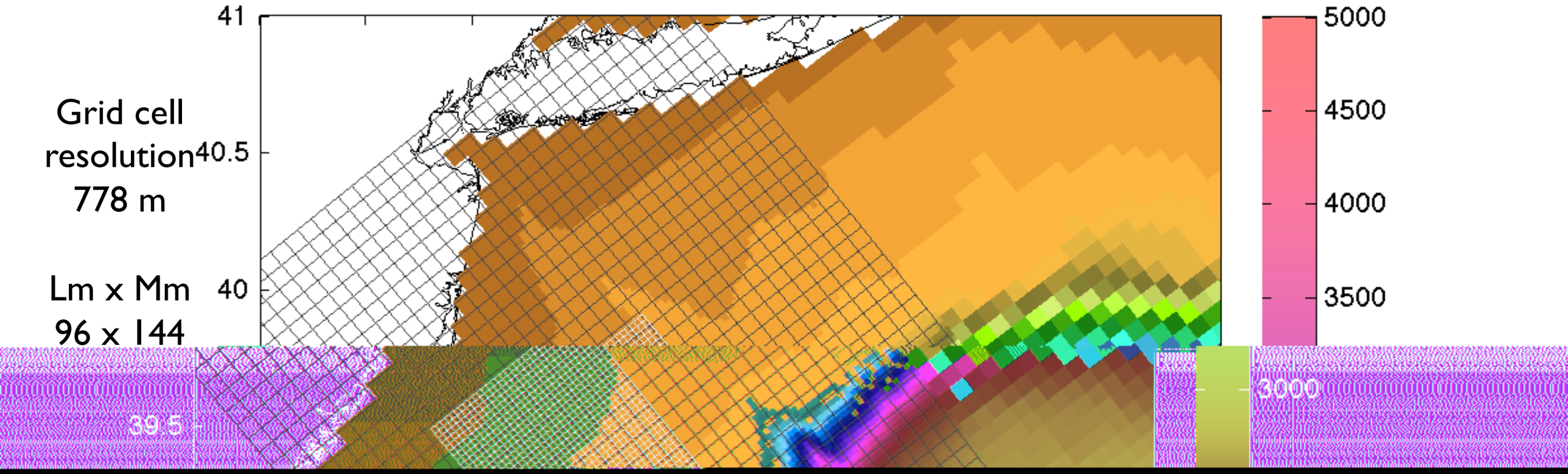
Lm x Mm 96 x 144



Proposed *SW06* domain (only every 3rd grid cell) to nest within *IODA*

Grid cell resolution
778 m

Lm x Mm
96 x 144



Proposed *SW06* domain (only every 3rd grid cell) to nest within *IODA*

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778 m

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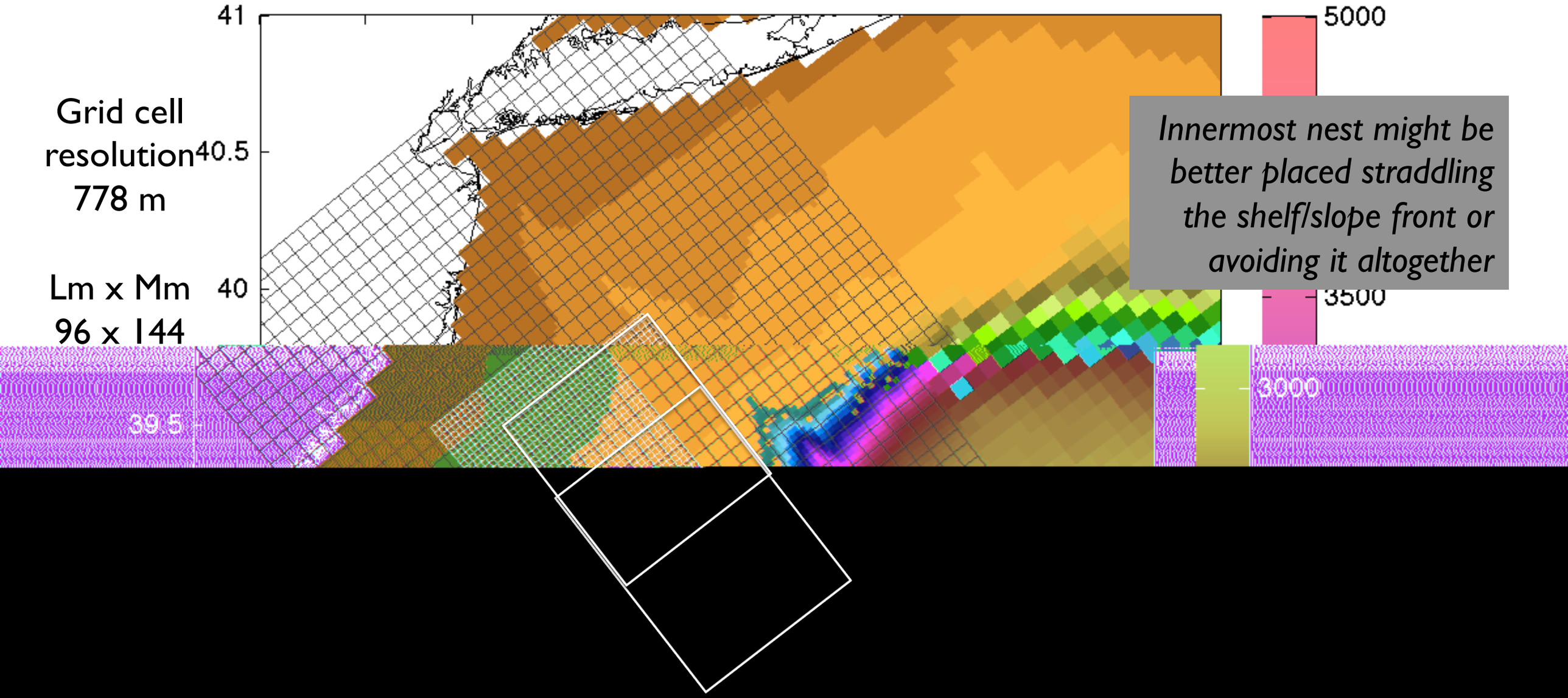

Innermost nest might be better placed straddling the shelf/slope front or avoiding it altogether