atlas

UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS

High-resolution ROMS modelling forced by VIKING20: Results from Rockall Bank and Condor Seamount

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Aims and Scope

- Quantifying hydrodynamic controls of organic matter supply and ecosystem response to changing AMOC in case study areas.
- Applying high resolution models using high-resolution bathymetry, VIKING20 boundary conditions, tidal forcing.
- Analyzing the relative importance of large-scale ocean climate driven signals in areas dominated by tide-driven near-benthic flow dynamics.

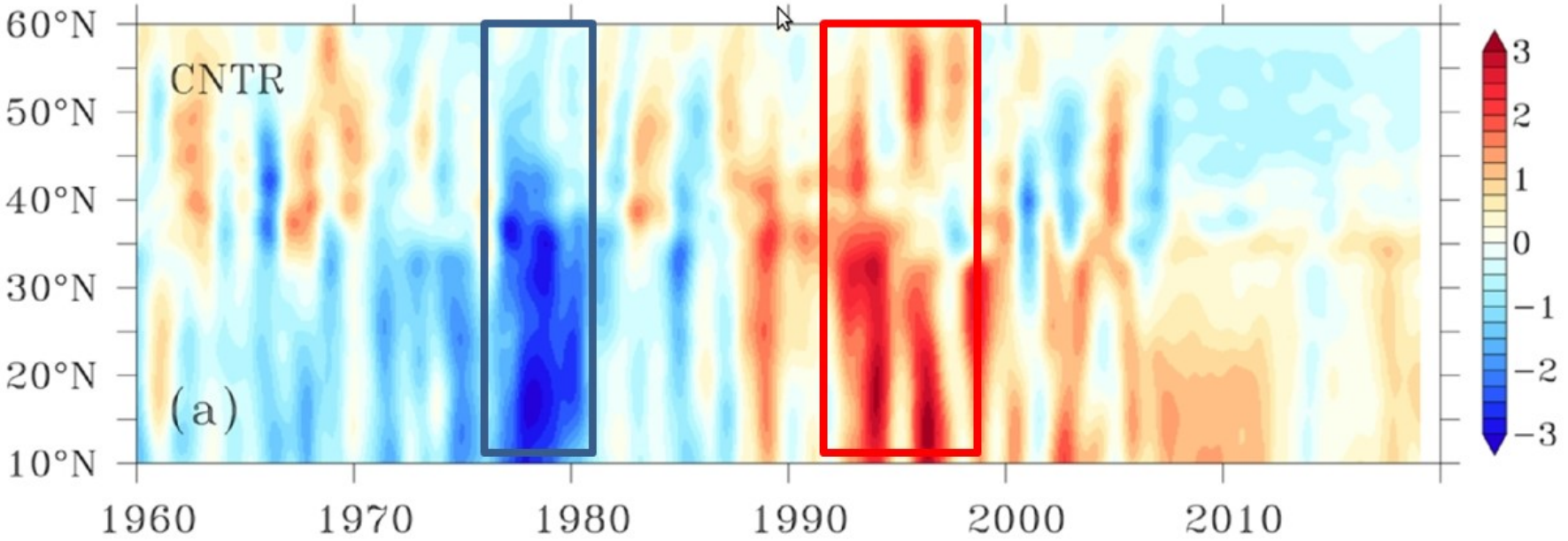
Case Study Areas

NW Labrador Sea / Davis Strait

Rockall Bank

Condor Seamount / Azores

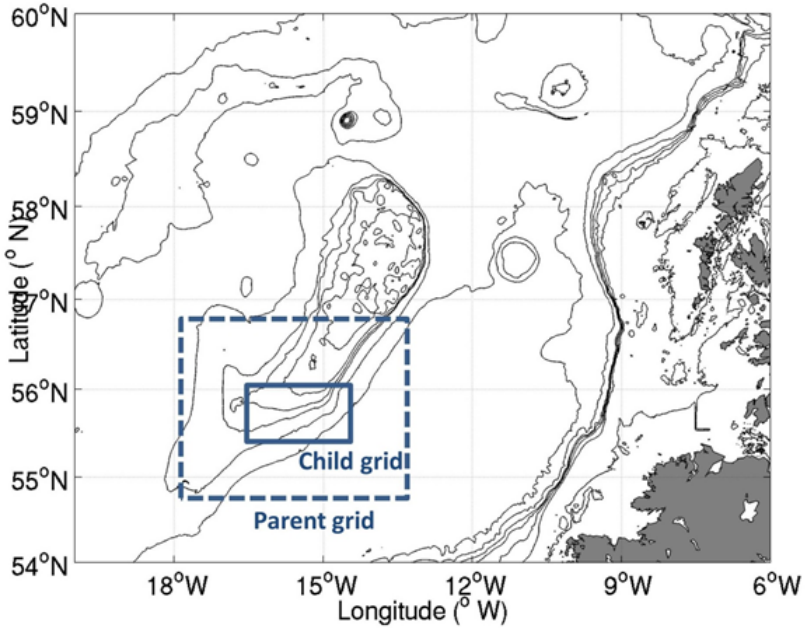
VIKING20 North Atlantic Basin-Wide AMOC anomalies (reproduced from Böning et al 2016)

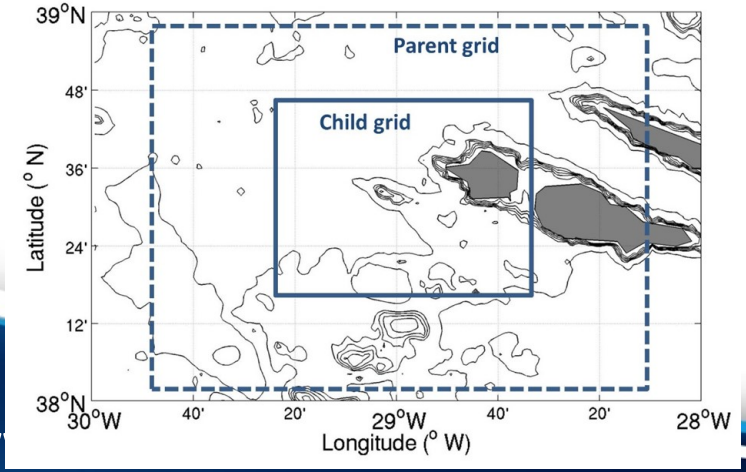


Weak AMOC (1978 – 1980)

Strong AMOC (1992 – 1994)

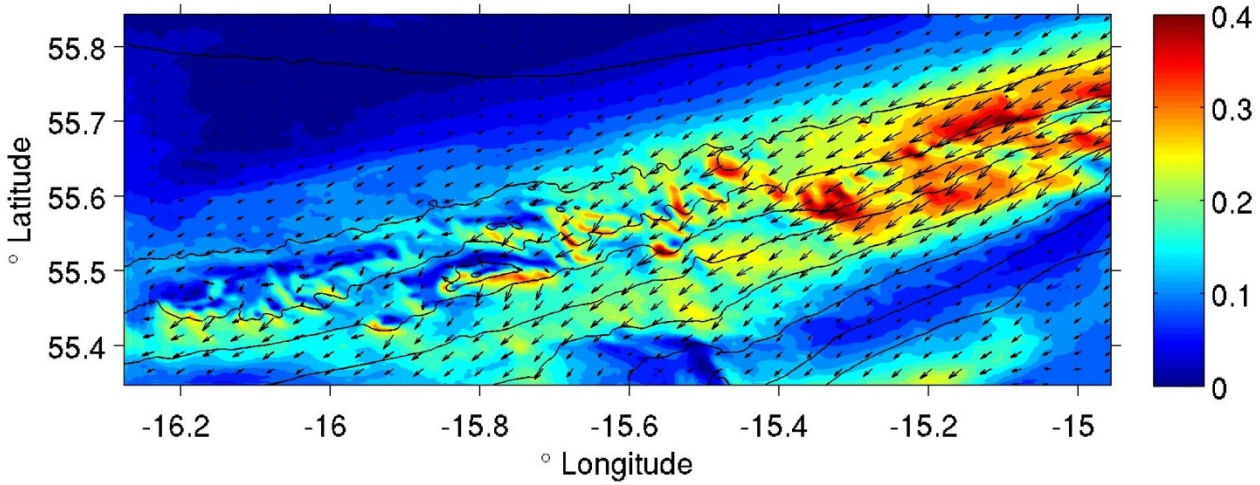
ATLAS case study areas: Rockall Bank, Condor Seamount





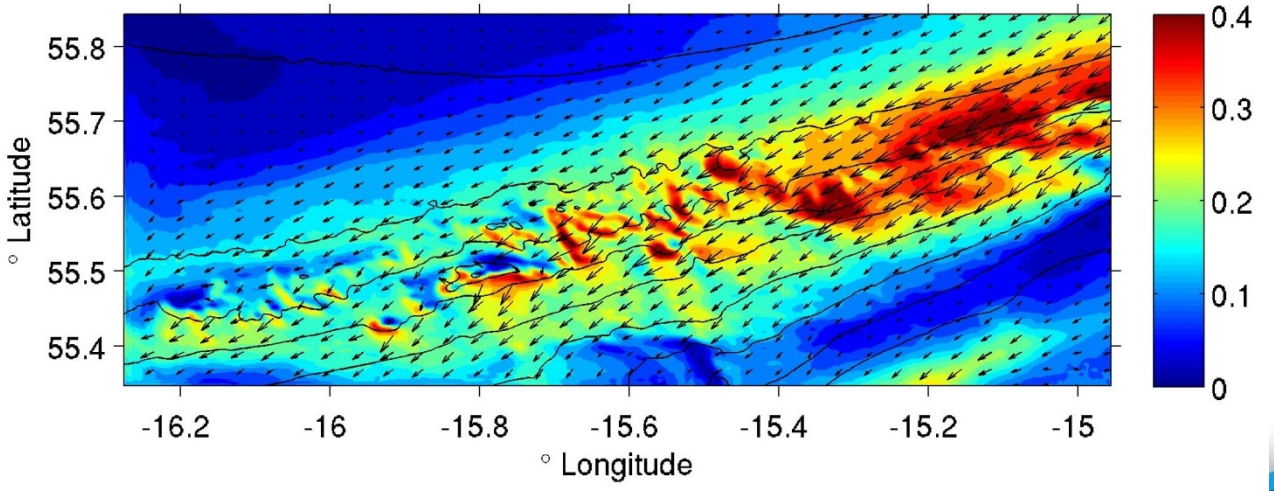
- Model: ROMS-AGRIF
- Parent grid: 750 m spatial resolution, GEBCO 30 arc sec bathymetry, 32 vertical topography-following levels, 120 sec baroclinic time step
- Child grid: 250 m spatial resolution, 100 m resolution INSS bathymetry (Rockall Bank), 32 vertical topography-following levels, 40 sec baroclinic time step
- Model forcing: CORE reanalysis, COADS climatology, OSU TPXO7 inverse tidal model, VIKING20 (5 day averages)
- Model simulation period: 3 years (1978-1980, 1992-1994).
- Model output: 2-D and 3-D physical fields (T, S, u, v, w, ζ)

Examples of model output Rockall Bank: Near-bottom currents (m/s)

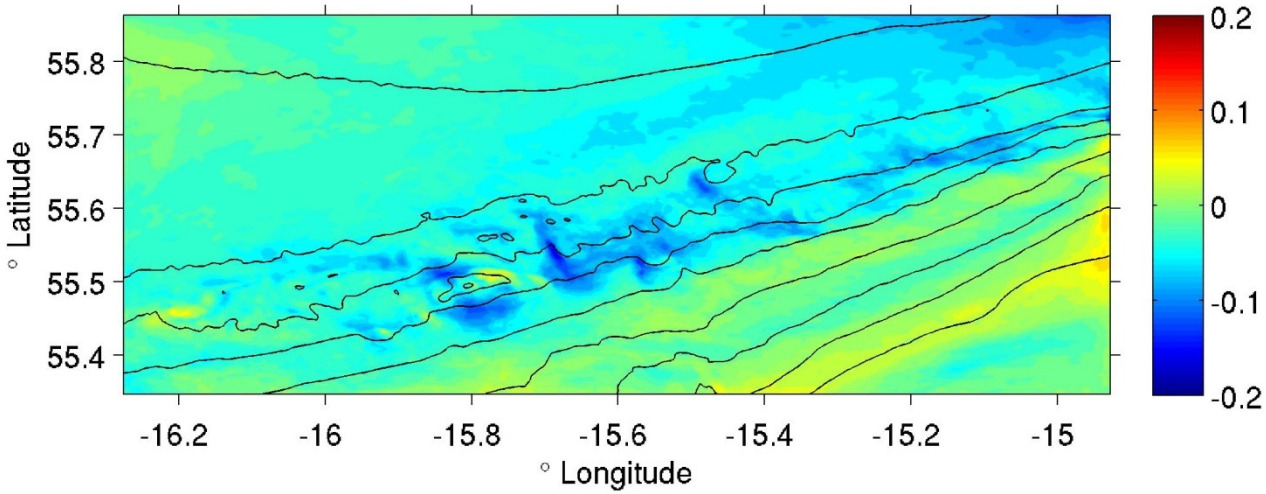


Jul/Aug 1978 average

Jul/Aug 1992 average

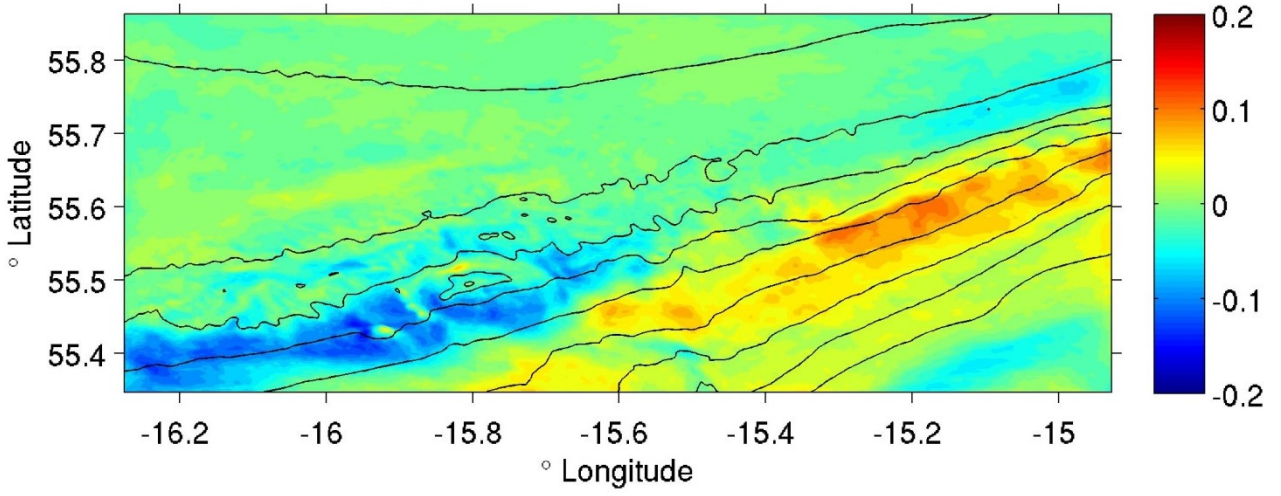


1978-1992 Near-bottom Current Speed Differences (m/s)

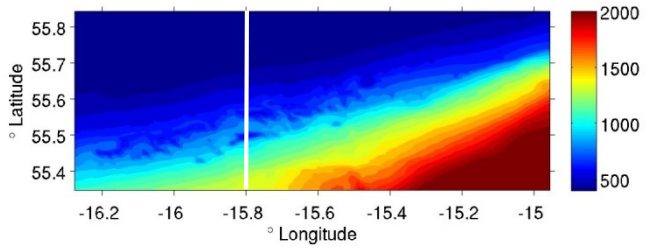


Jul/Aug average

Nov/Dec average

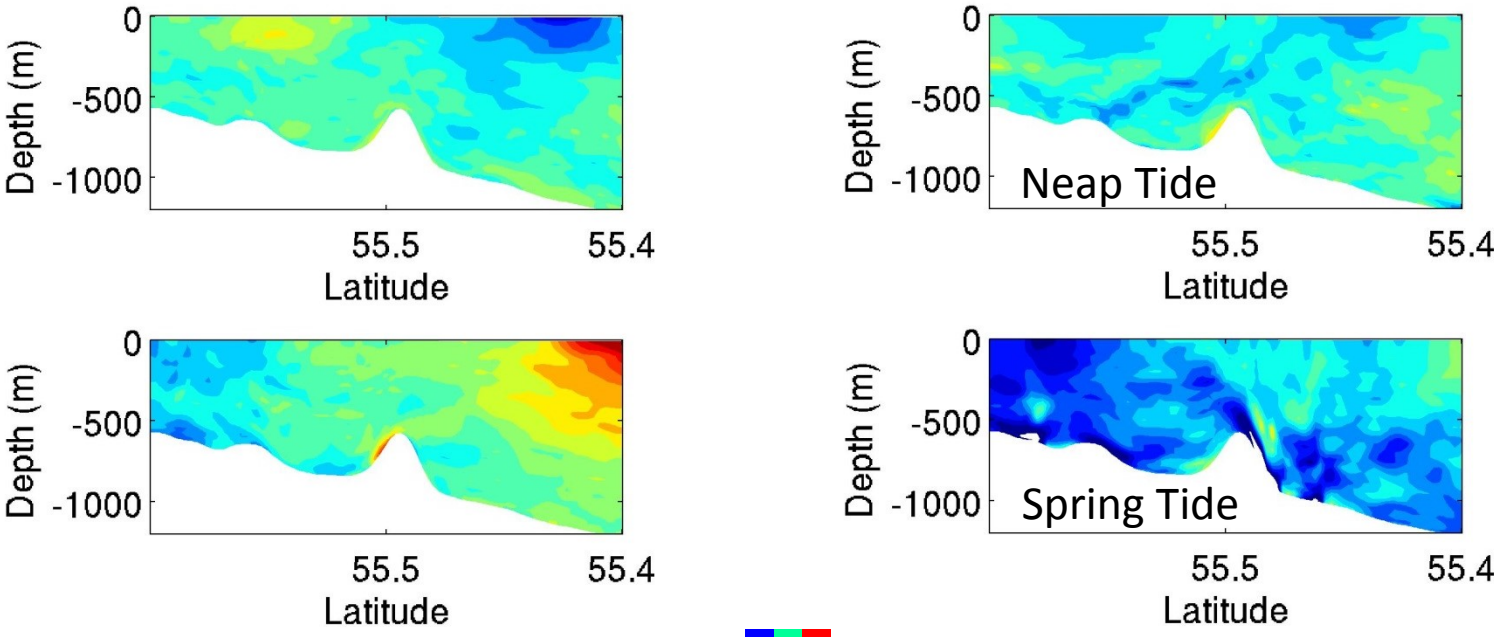


Absence/Presence of Tides: Cross-Slope Velocity (m/s)

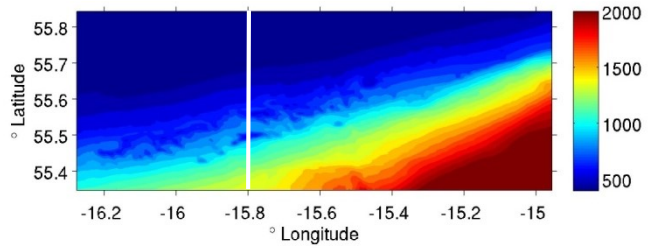


VIKING20

VIKING20 + Tides

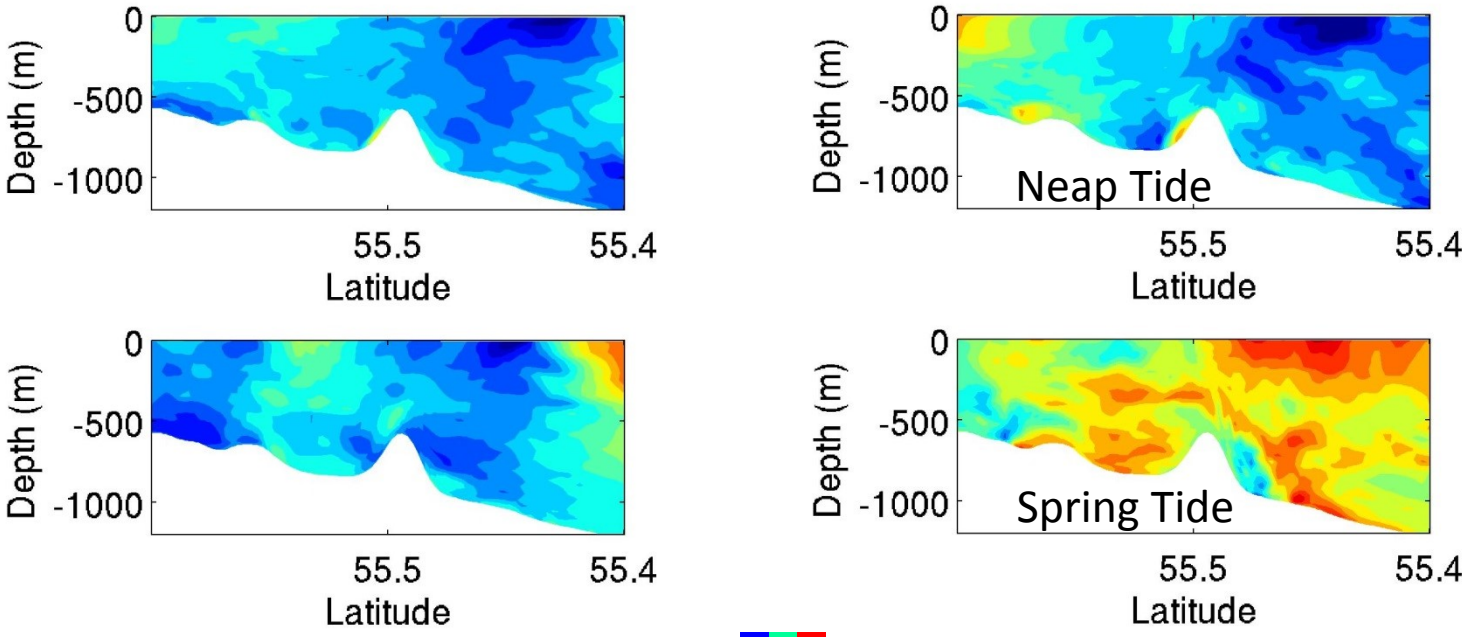


Absence/Presence of Tides: Along-Slope Velocity (m/s)

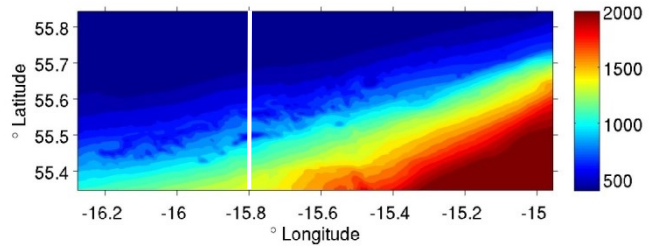


VIKING20

VIKING20 + Tides

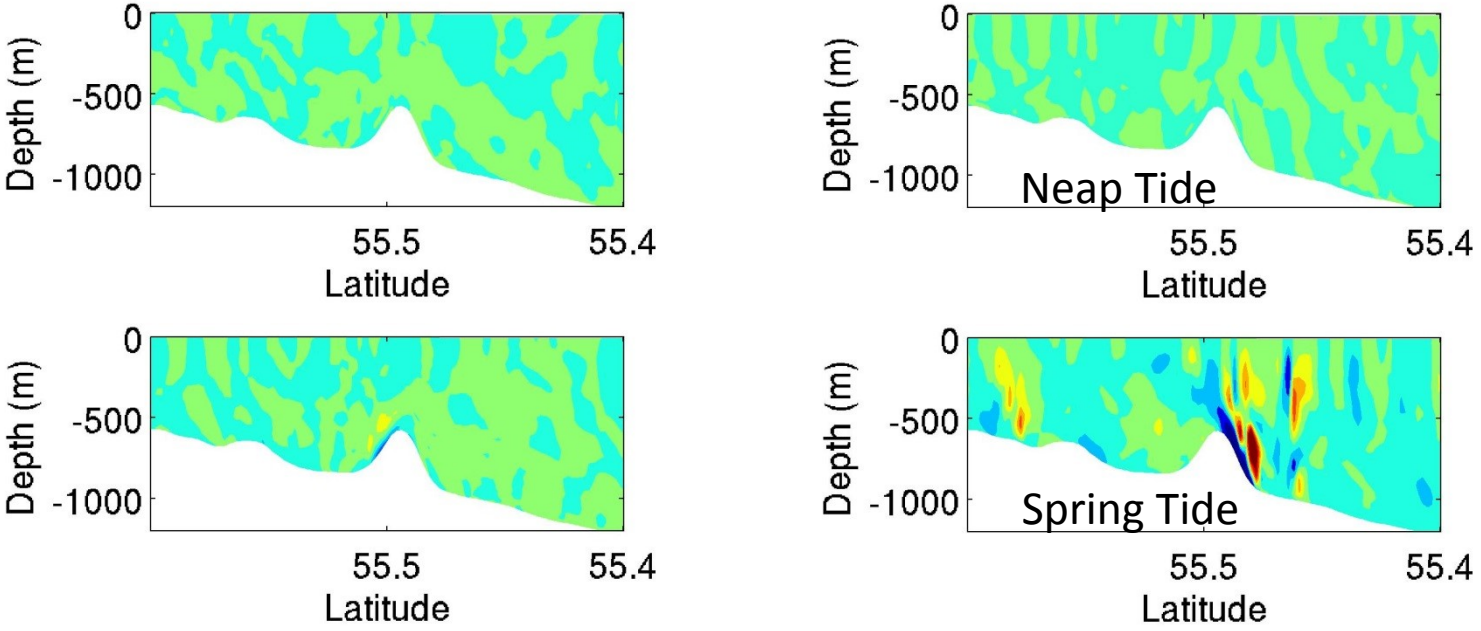


Absence/Presence of Tides: Vertical Velocity (m/s)

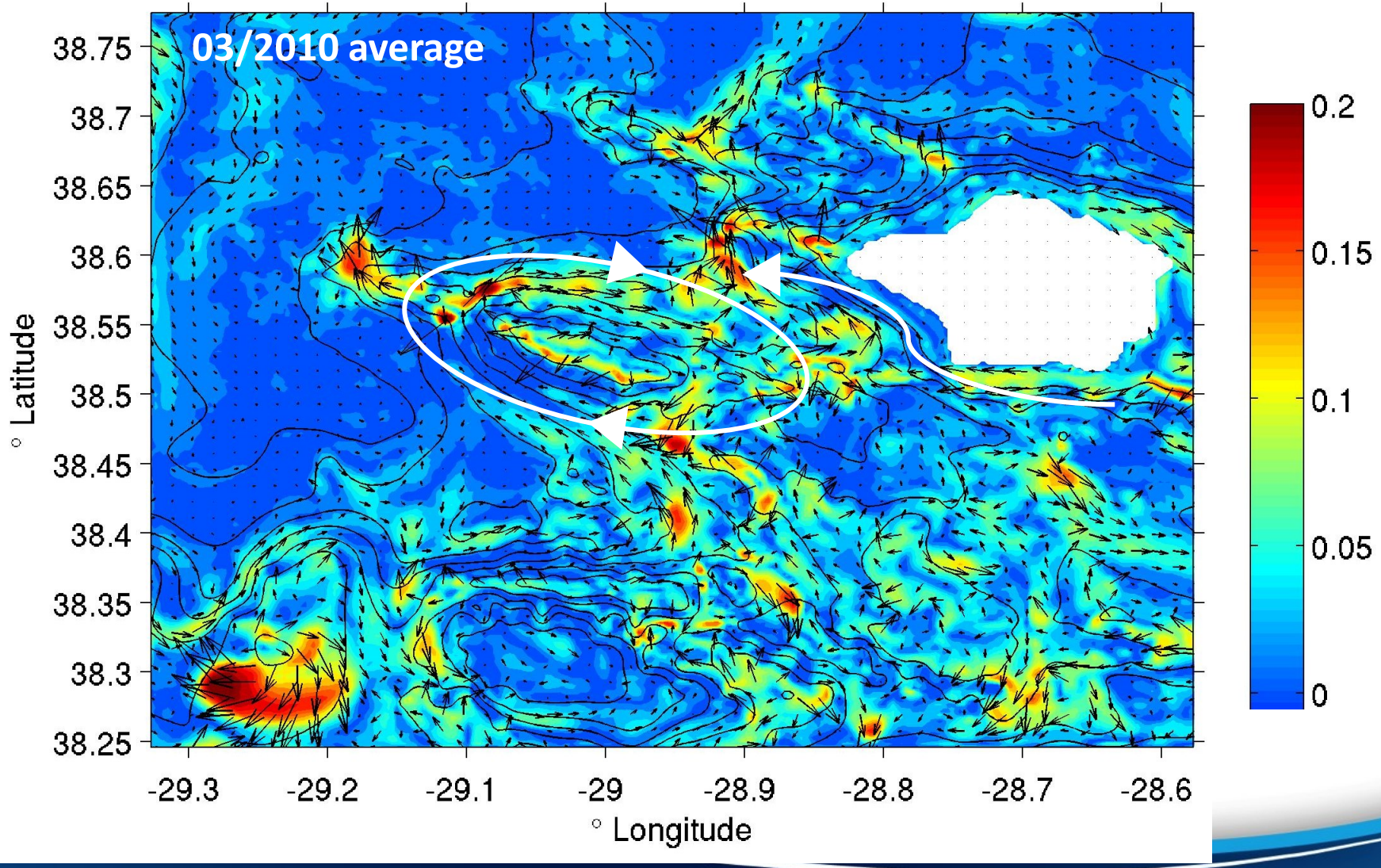


VIKING20

VIKING20 + Tides



Examples of model output Condor Seamount: Near-bottom currents (m/s) – 2010 tidal forcing, WOCE climatology



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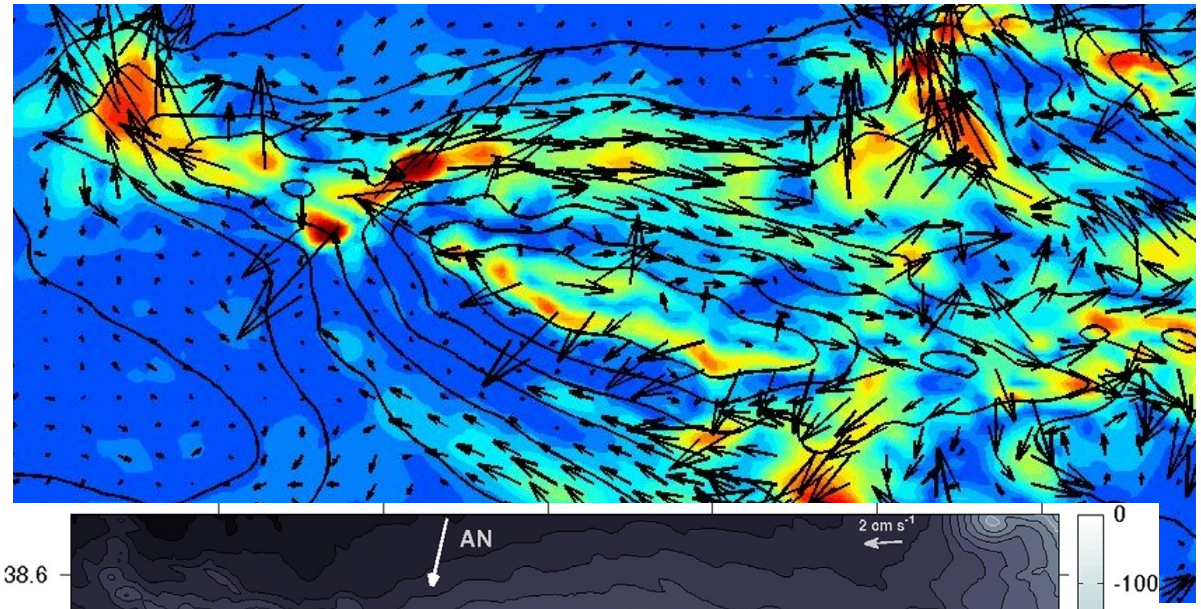

Bashmachnikov et al 2013

Ongoing activties and next steps

- **Rockall Bank:** ROMS /VIKING20 simulations completed. Model validation ongoing using data from ATLAS NIOZ cruises 2017/2018, ECOMOUND / ACES (White et al 2007, Mienis et al 2007)
- **Condor Seamount:** ROMS simulations using VIKING20 boundary conditions and tidal forcing underway. Model validation using data from the Condor observatory (2009/2010), ATLAS, CoralFISH.
- **Davis Strait:** ROMS setup to be discussed.

Thank You!

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Image credit: BGS