



A Monitoring Array along the Western Boundary of the N. Atlantic

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(1) Proudman Oceanographic Laboratory

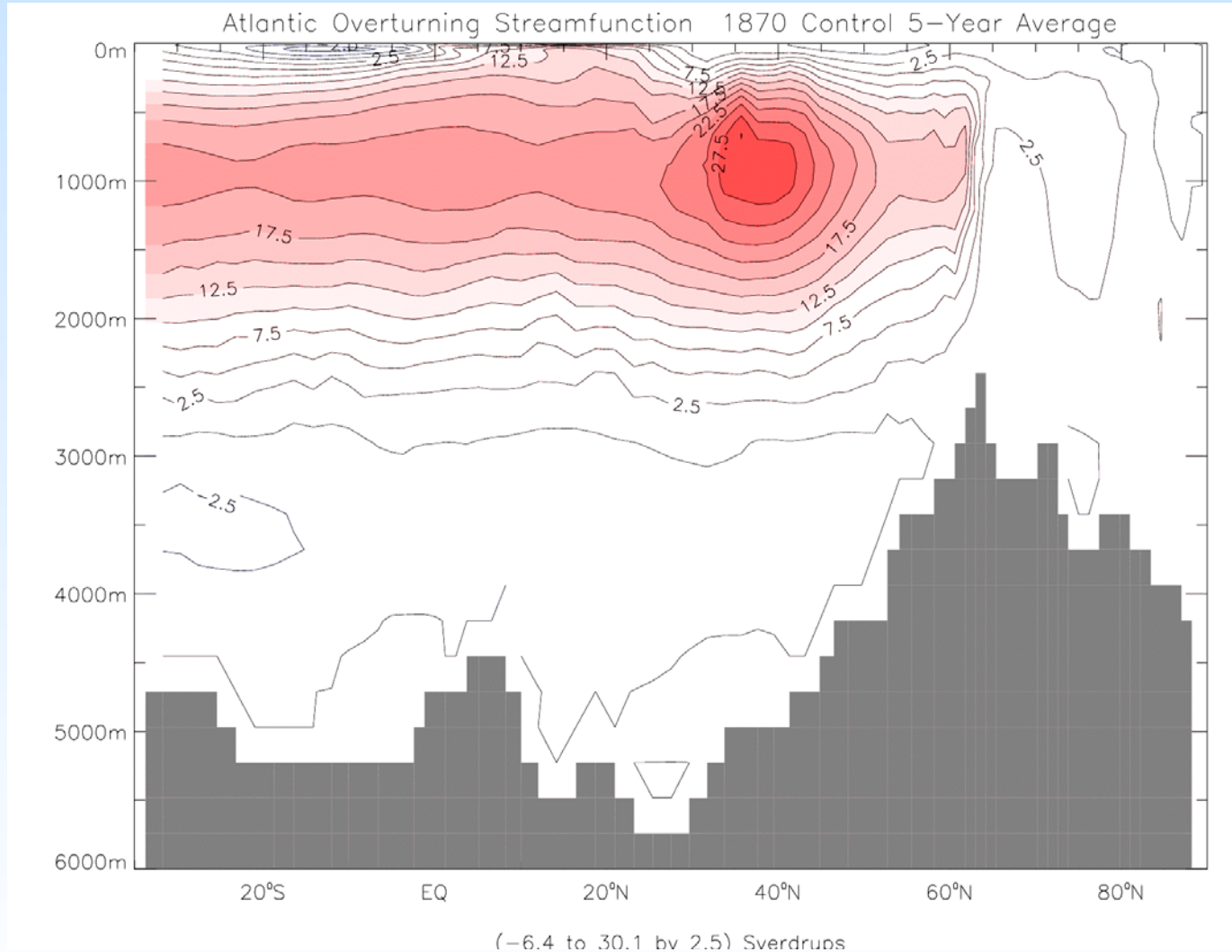
(2) Reading University

(3) Liverpool University

Monitoring what?



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“Meridional overturning” implies:

- Zonally integrated (Constant depth? Constant density? Constant temperature?)
- Coherent over a range of latitudes
- Related to ocean heat transport
- Related to ocean-atmosphere heat flux



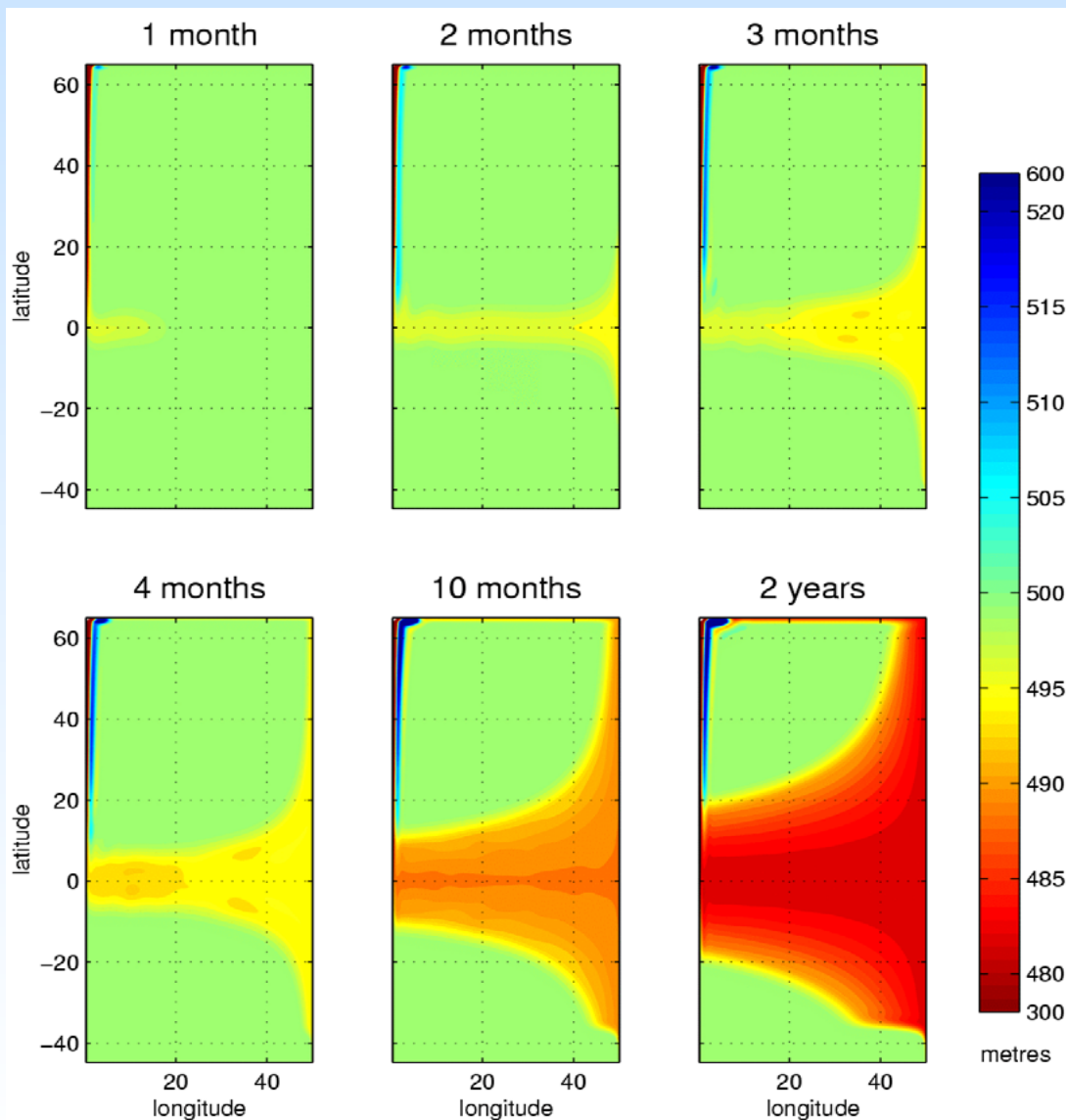
Practicality implies:

- Limited domain of measurement
- Minimising impact of
 - 1) Eddies and local recirculations
 - 2) Interactions with complex topography
- Need to double-check that measurement is representative of large scale circulation

Idealised model results



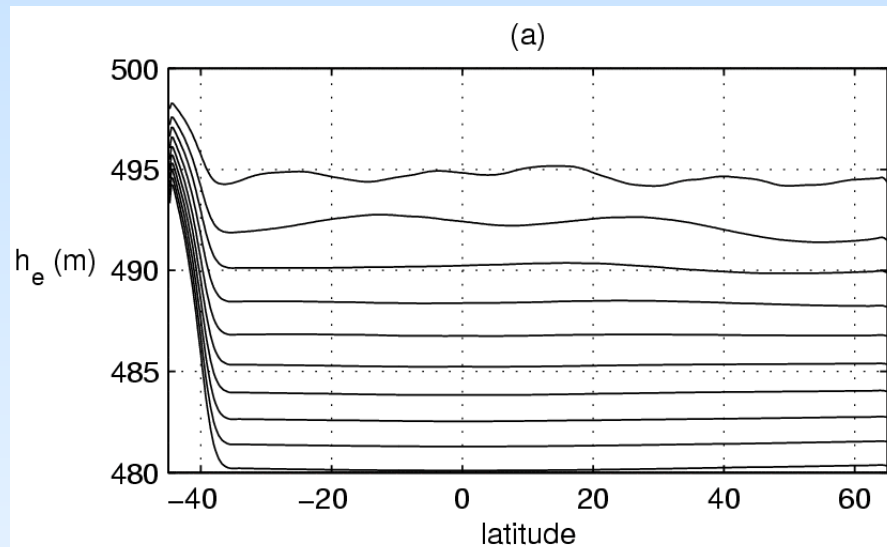
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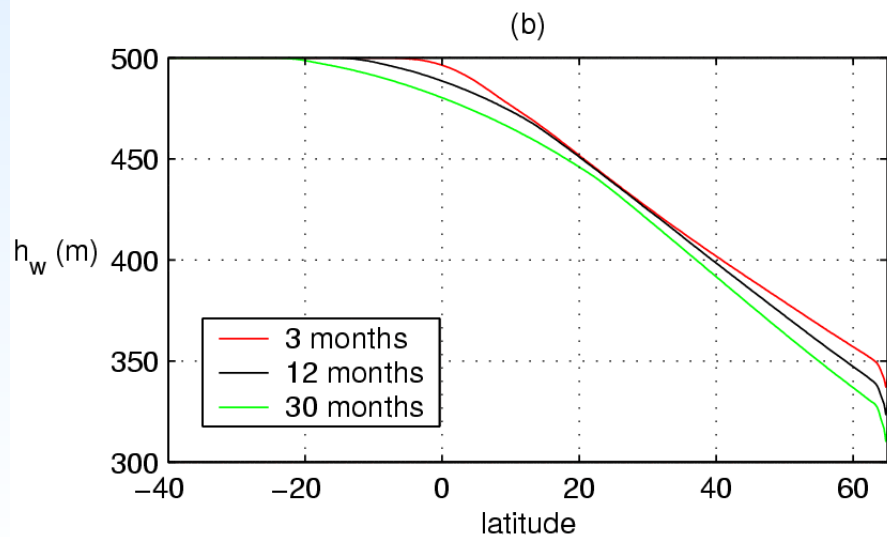
From Johnson
and Marshall,
JPO, April
2002

Surface layer thickness
after an overturning of
10 Sv is switched on at
time $t = 0$ on the
northern boundary of
the domain

Idealised model 2



Eastern
boundary



Western
boundary



Missing dynamics

- Oversimplified stratification
- Only Kelvin waves permitted at boundary
- No eddies
- No interaction with Gulf Stream
- No topography

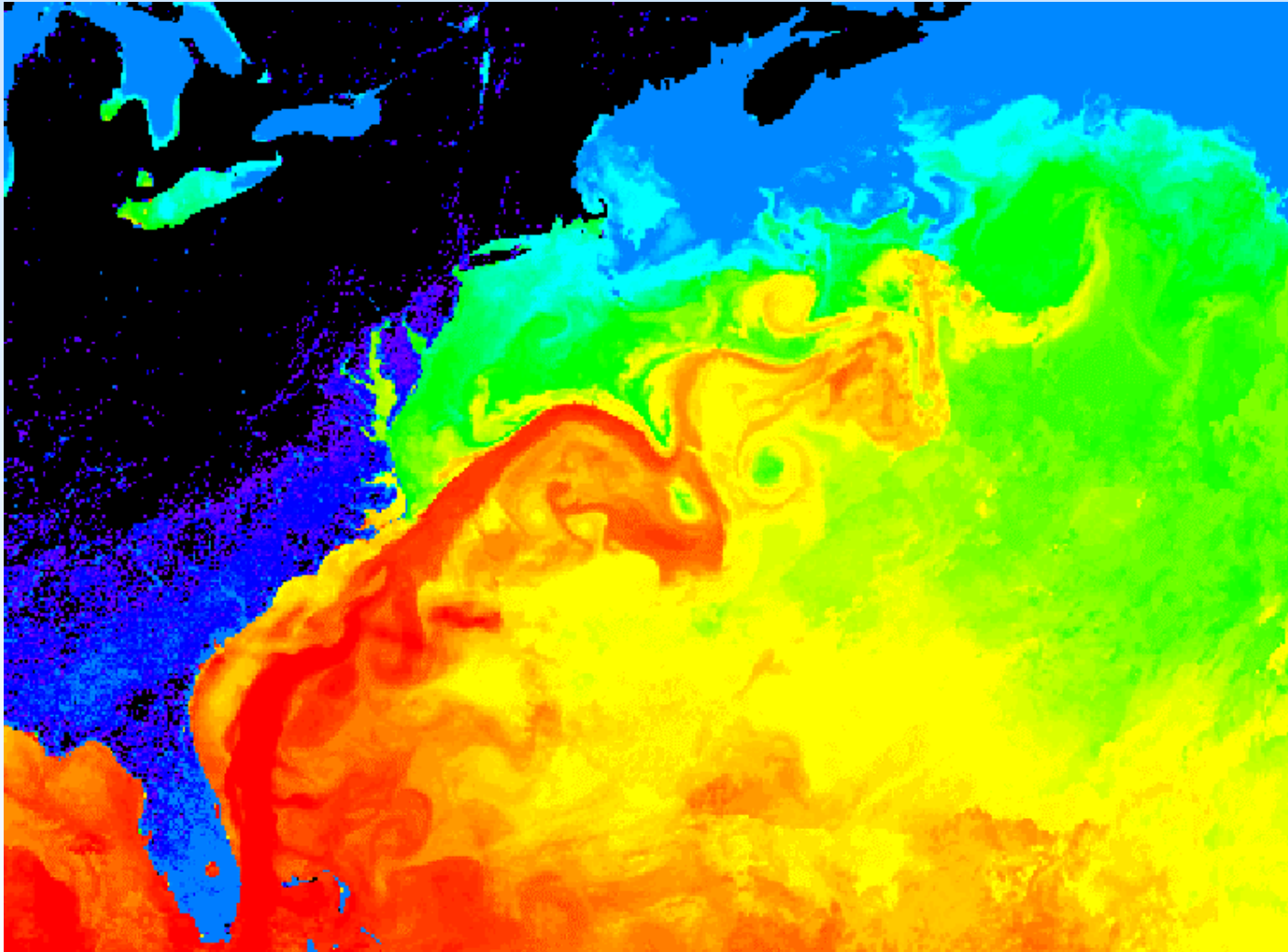
Generic dynamics

- Information transmitted by boundary waves
- Western boundary signals largest

Position of the Gulf Stream



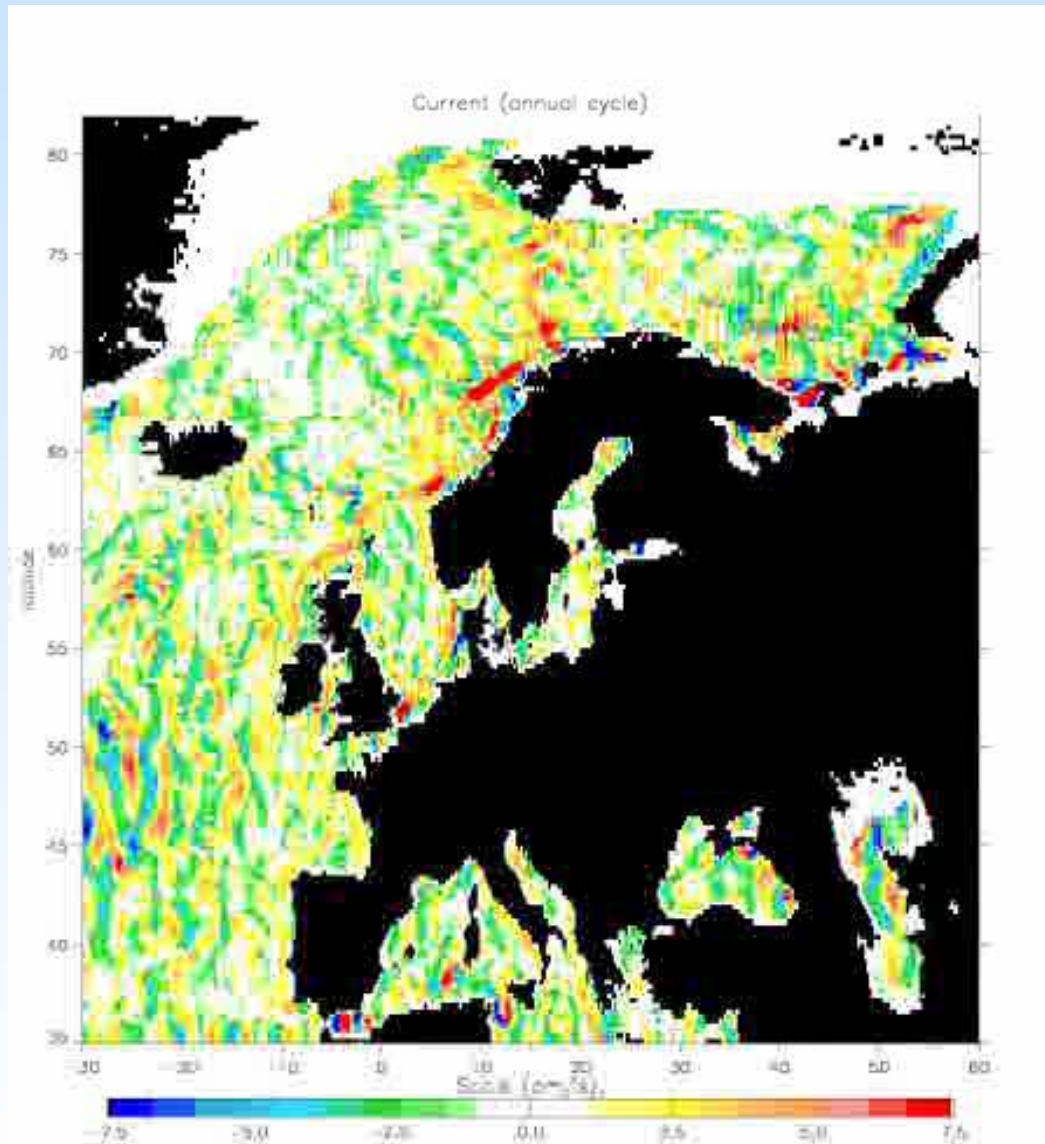
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Altimetry results



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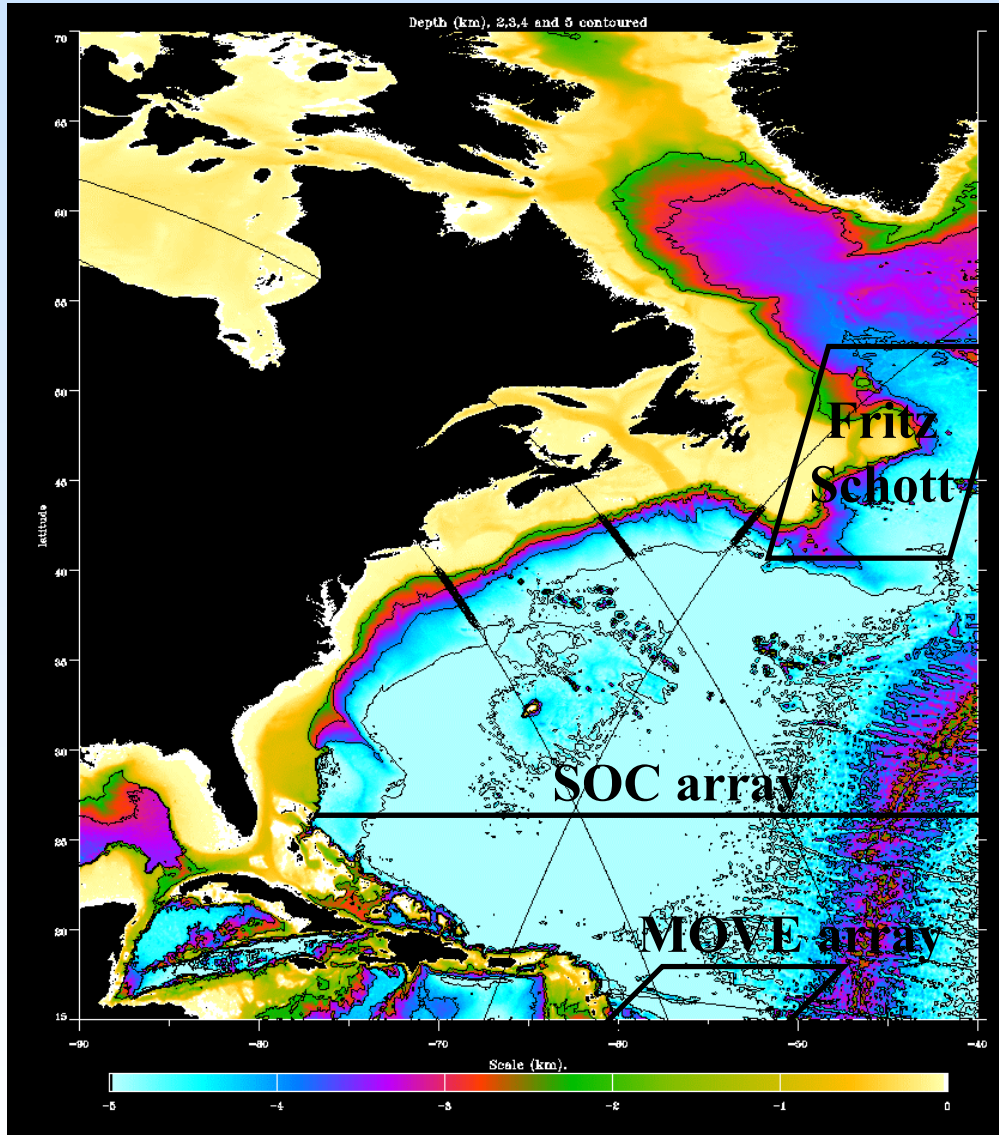


Annual cycle of
surface geostrophic
currents

Western North Atlantic

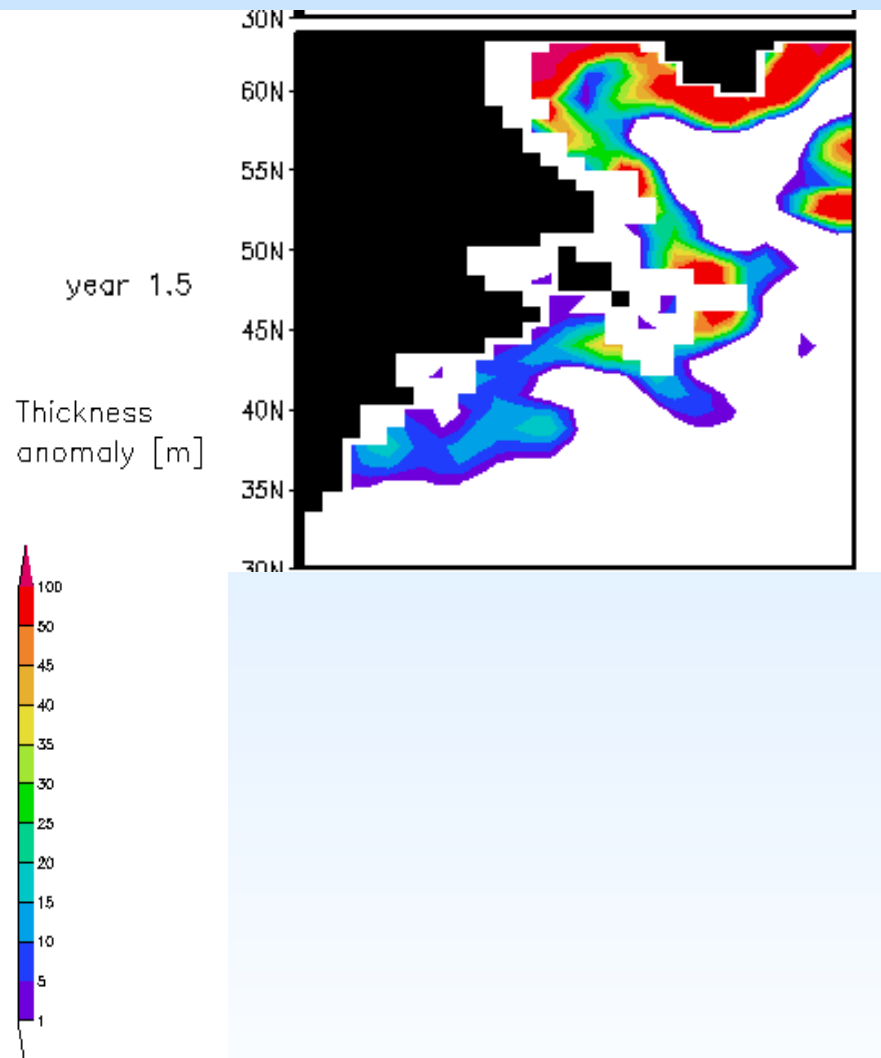
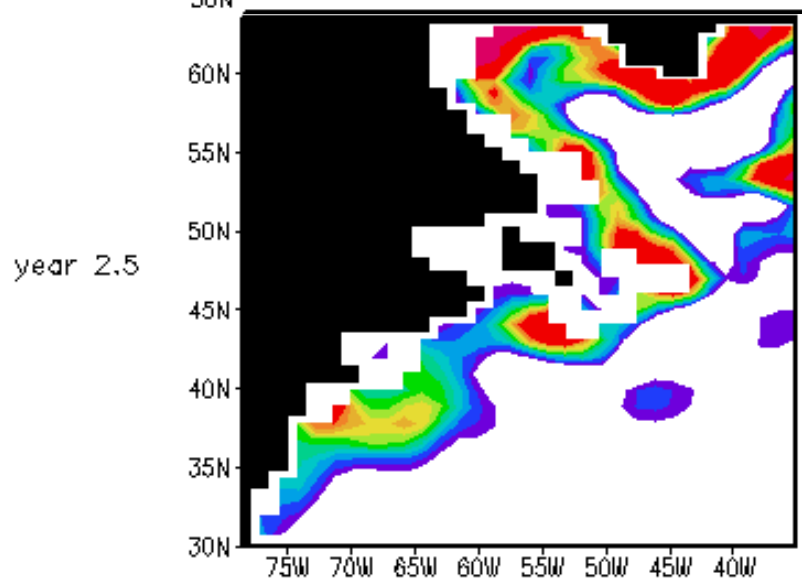
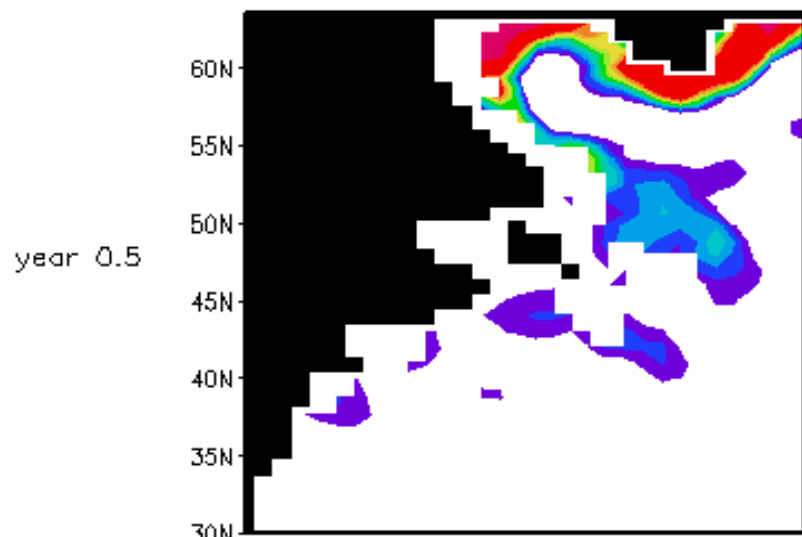


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- Intermediate steepness
- Smooth slope
- Aligned along JASON altimeter tracks
- South of deep water formation region
- North of Gulf Stream
- Should expect a coherent, propagating signal

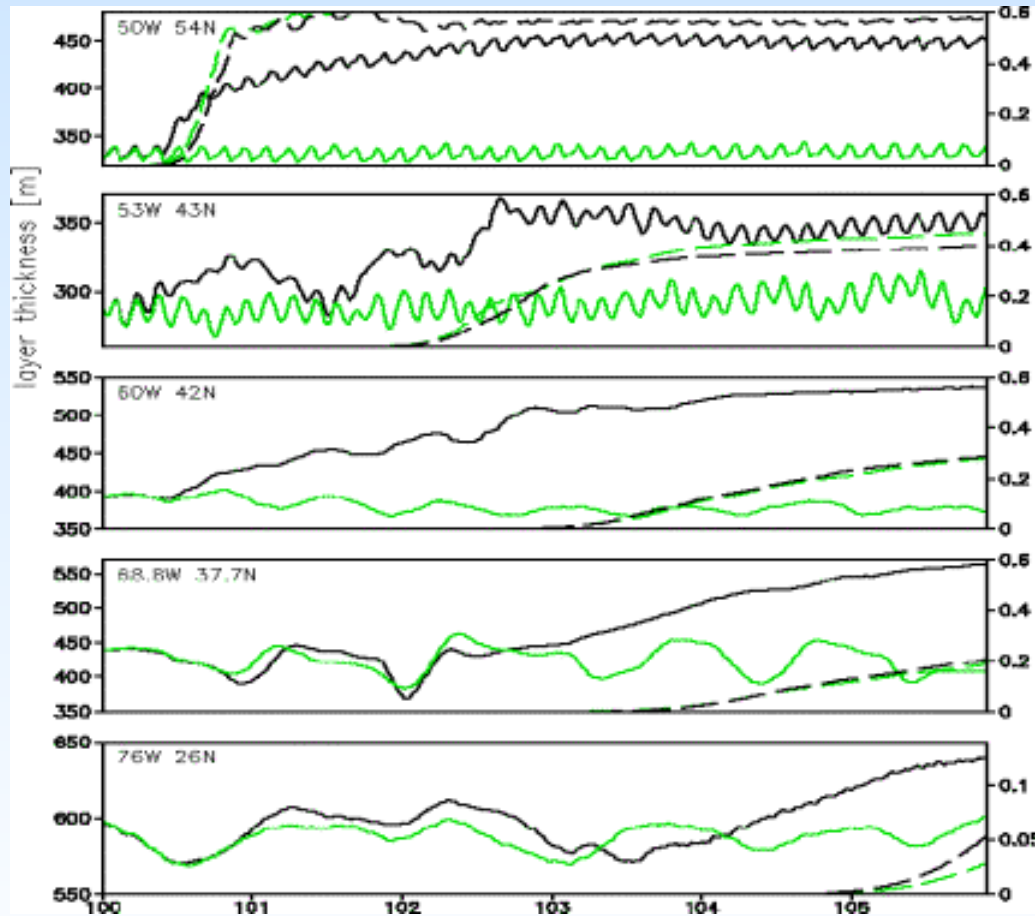
Coarse model results



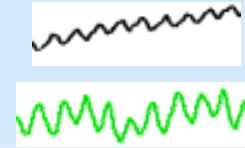
Coarse model results



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Time



Thickness
unperturbed



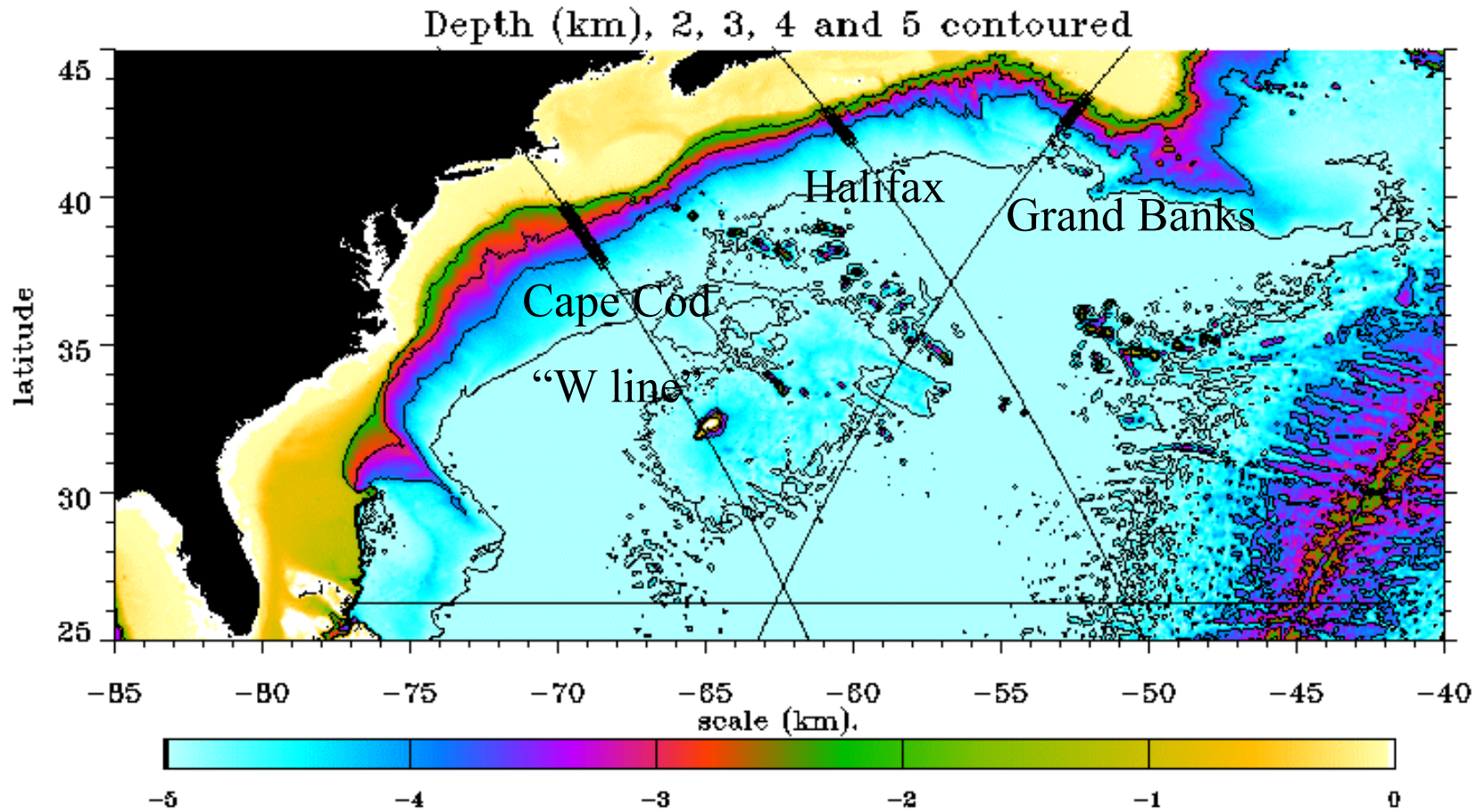
Tracer

Ric Williams and
Vassil Roussenov

Schematic of region



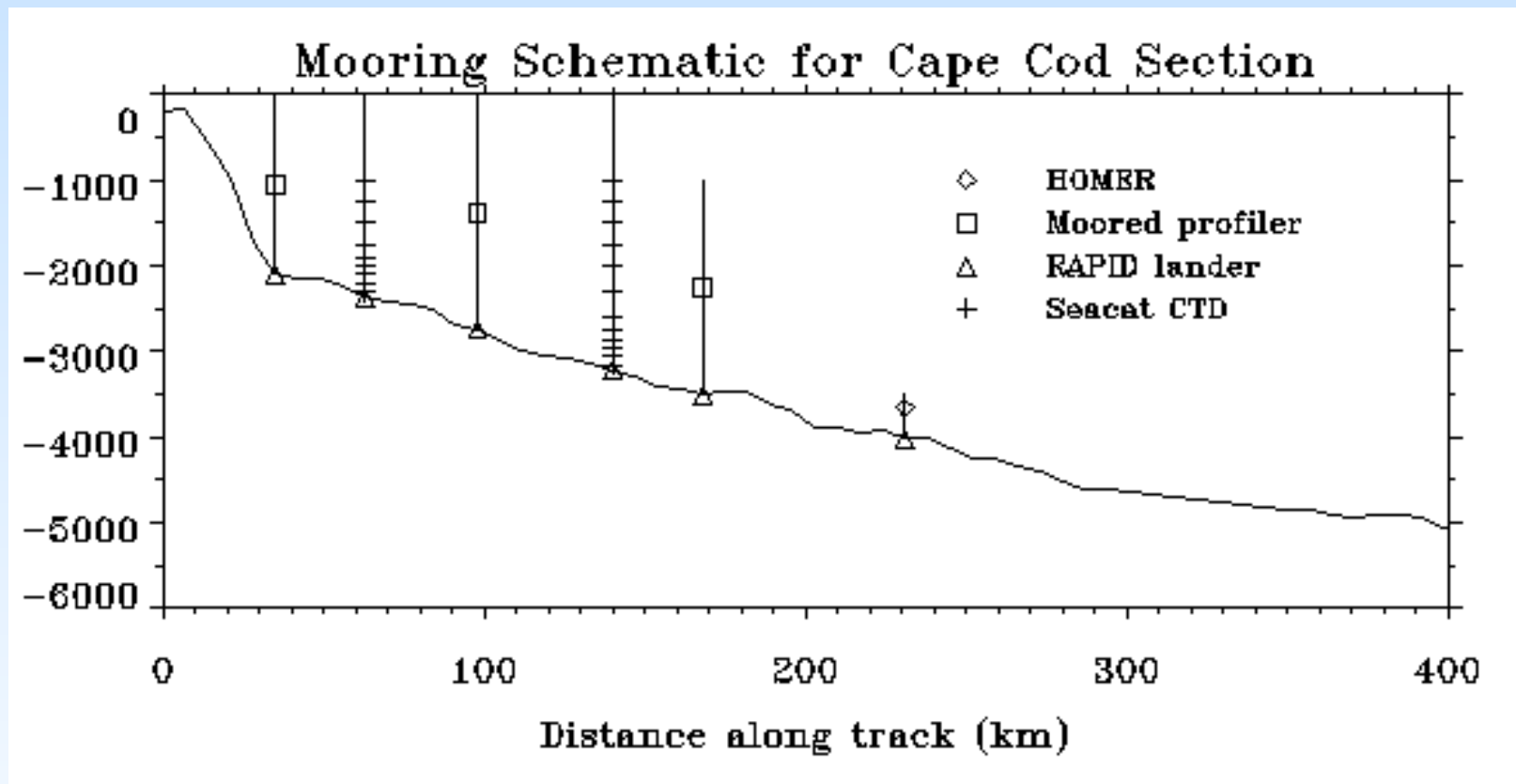
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Proposed moorings 1



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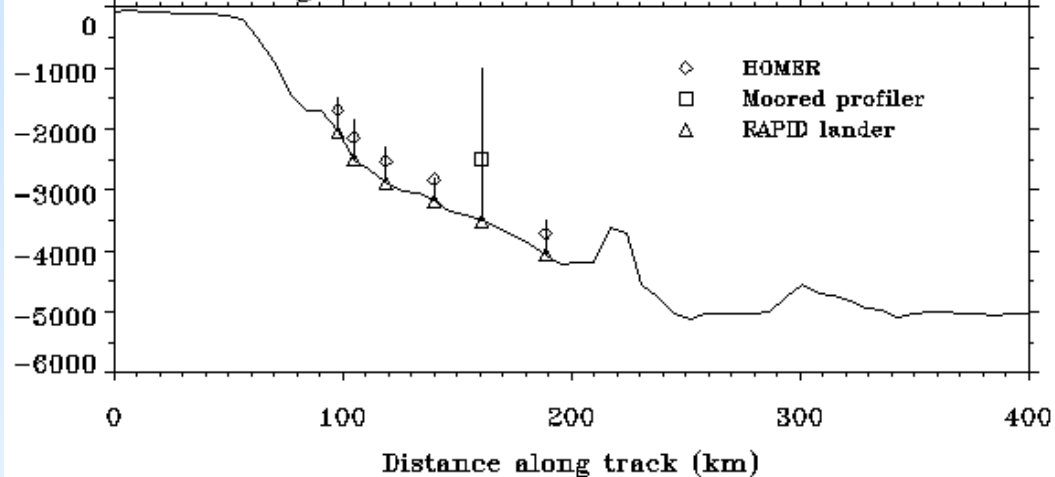
Augmented WHOI “W line”

Depths 2000,2350,2800,3200,3500,4000m

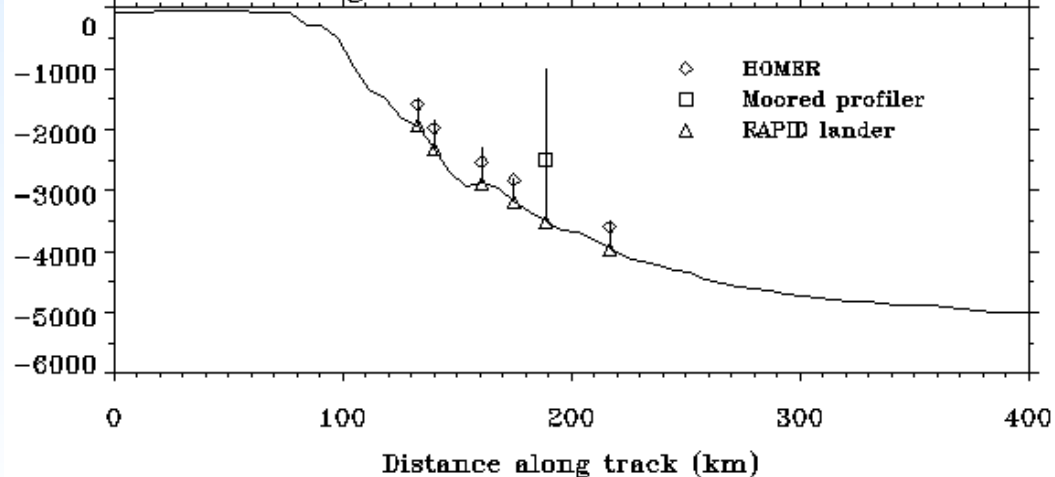
Proposed moorings 2



Mooring Schematic for Grand Banks section



Mooring Schematic for Halifax section



- ◇ HOMER
- Moored profiler
- △ RAPID lander



HOMER — HOMing Environmental Recorder



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New POL seafloor landers



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MicroLander



RapidLander

The array will

- Provide an integral measure of transport fluctuations
- Give early warning of changes, by monitoring the rapid boundary signal rather than the slower tracer transport
- Clearly determine the part of the measured signal which is representative of a range of latitudes
- Make measurements in a simple, unambiguous region
- Link to a broader context of satellite altimetry and more detailed “W line” measurements, and to boundary current measurements at other latitudes