

Glider observations as part of the Canadian Department of Fisheries and Oceans' Atlantic Zone Monitoring Program on the Scotian Shelf

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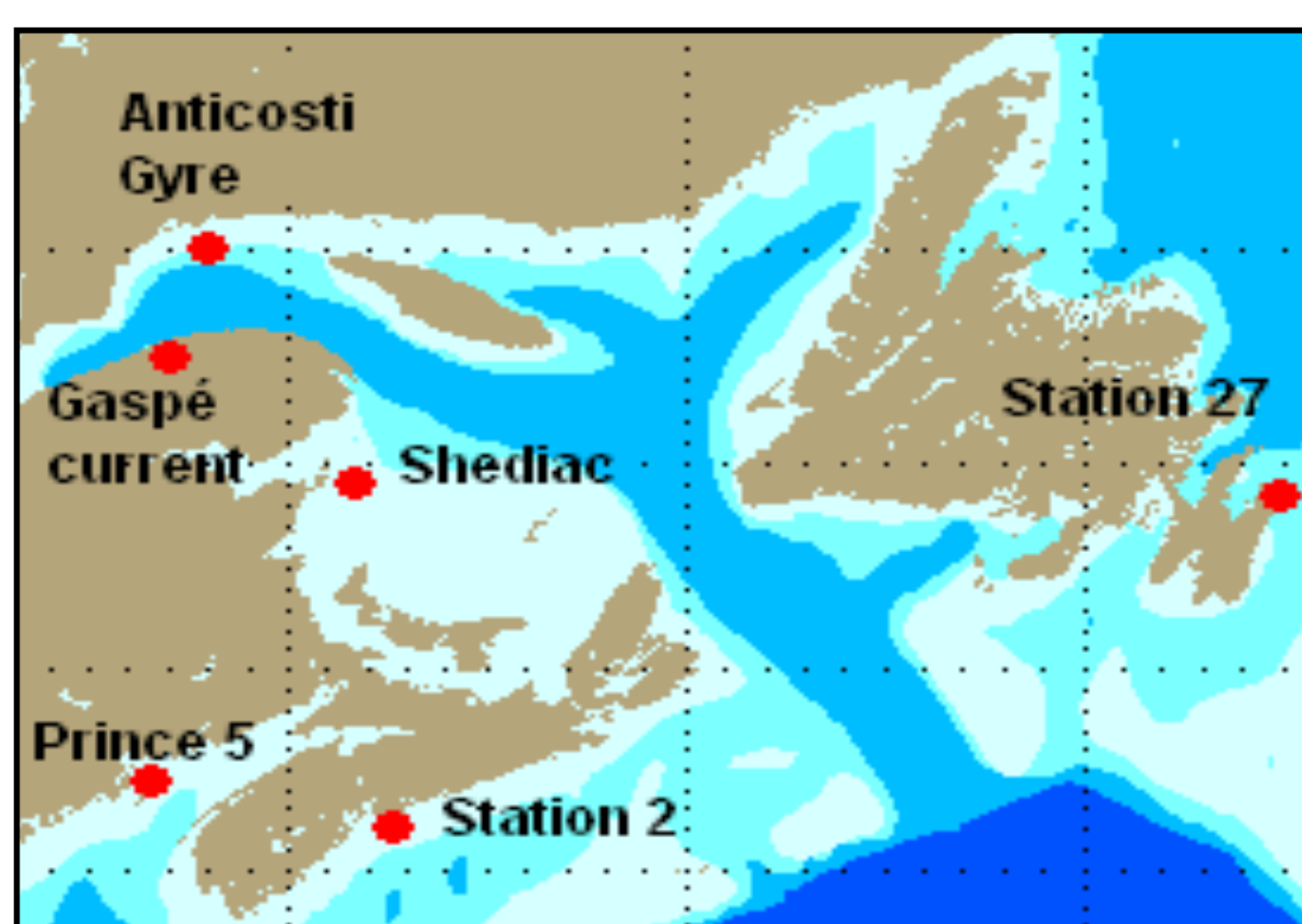
Atlantic Zone Monitoring Program (AZMP)

A coherent program for monitoring of physical, chemical and biological variables performed in parallel in the Maritimes, Québec, and Newfoundland Department of Fisheries and Ocean regions. It was built on historical and existing monitoring programs. This program is intended to fill gaps in temporal and spatial coverage and add biological measurements to the monitoring activities. It represents the *minimum* requirements to adequately detect and measure climate variability and changes on the continental shelf and upper slope of the Northwest Atlantic at seasonal and inter-annual time scales. Common methods are used across platforms and regions.

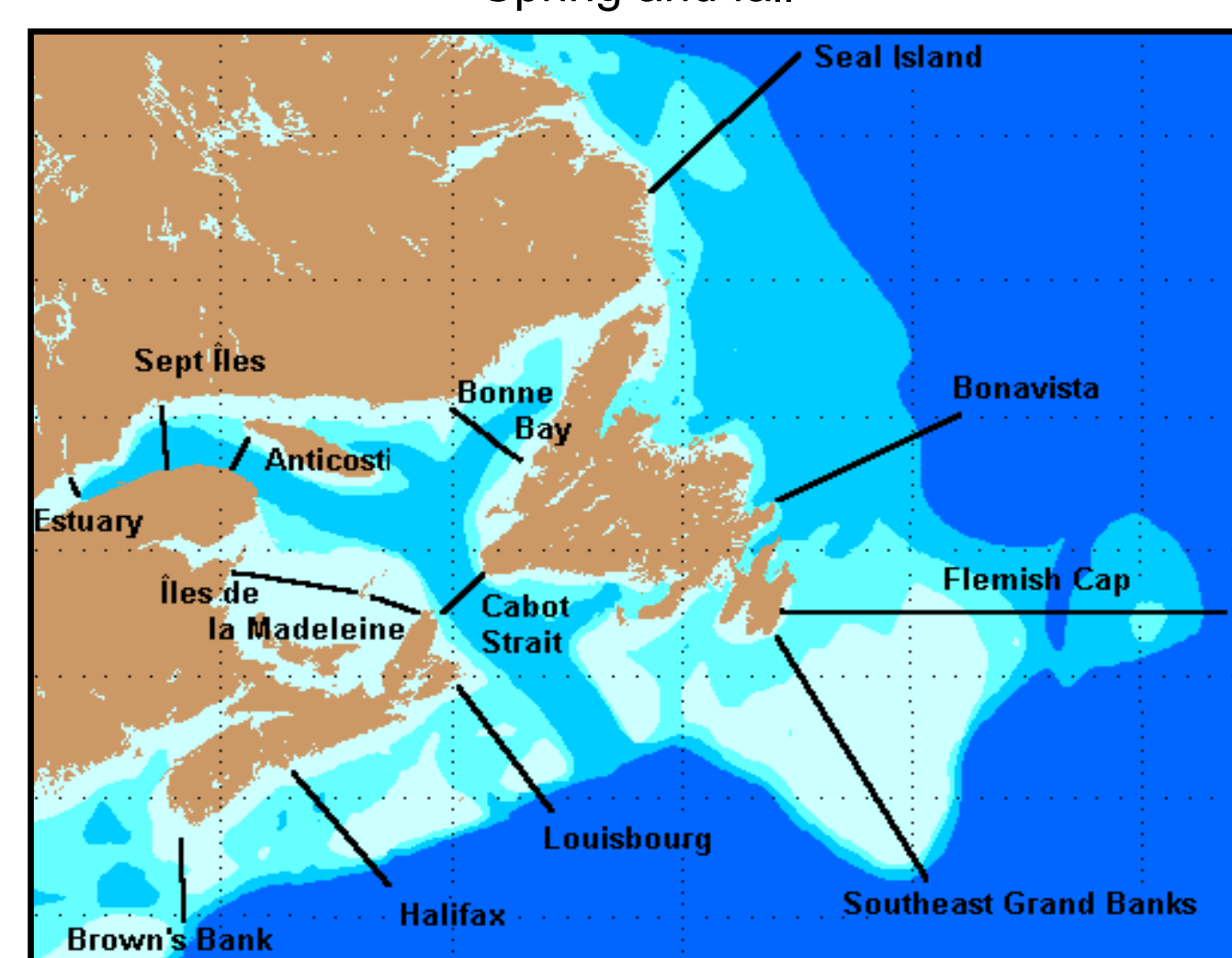
Objectives

- Collect and analyze data to characterize and understand the causes of ocean variability at seasonal, interannual and decadal scales
- Provide multidisciplinary data to establish relationships among biological, chemical, and physical variability
- Provide adequate data to support sound development of ocean activities

High frequency stations
Monthly / semi-monthly

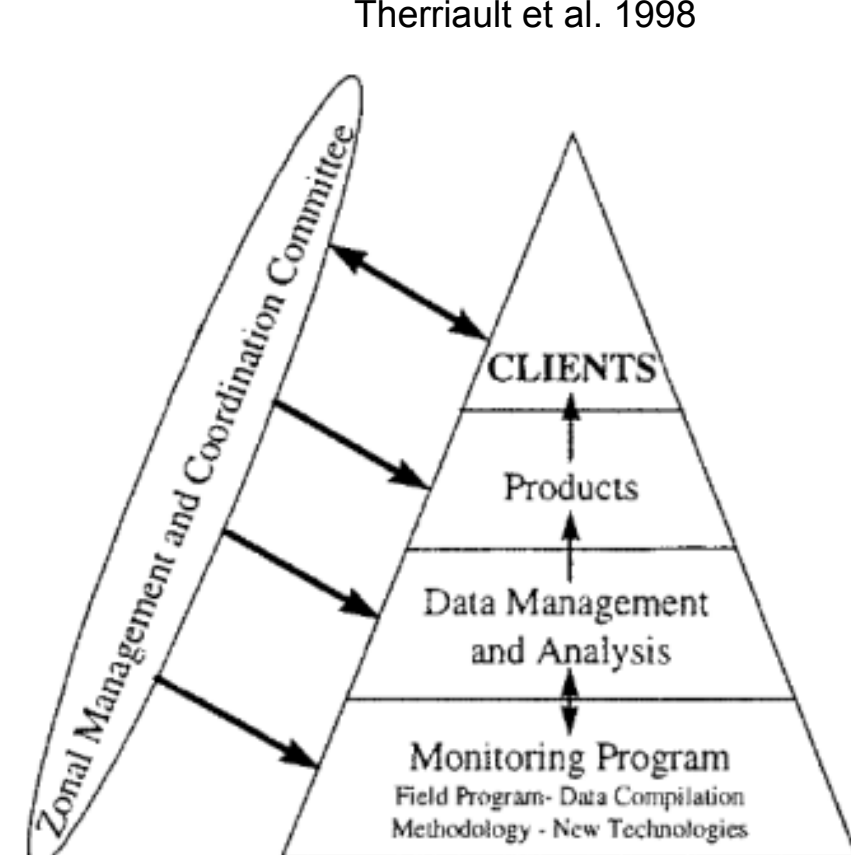


Seasonal section surveys
Spring and fall



Zonal program structure

Schematic Overview
Therriault et al. 1998



Permanent Management and Coordination Committee

- Representatives from each region
- Representative from Atlantic Zone Offshore Monitoring Program

Analysis and synthesis

- Zonal coordination at annual workshop
- Single or multi-regional, opportunistic

Dissemination of information

- Reporting through annual DFO State of the Ocean reports
- National website
- Peer-reviewed publications

Logistics Committee

- Coordination on equipment, new technology, new measurements

Data Management

- Executed in each region
- Utilizes national and regional databases
- Zonal DM committee

Client engagement

- Interaction with diverse range of clients
- Single or multi-regional, opportunistic

AZMP Variables

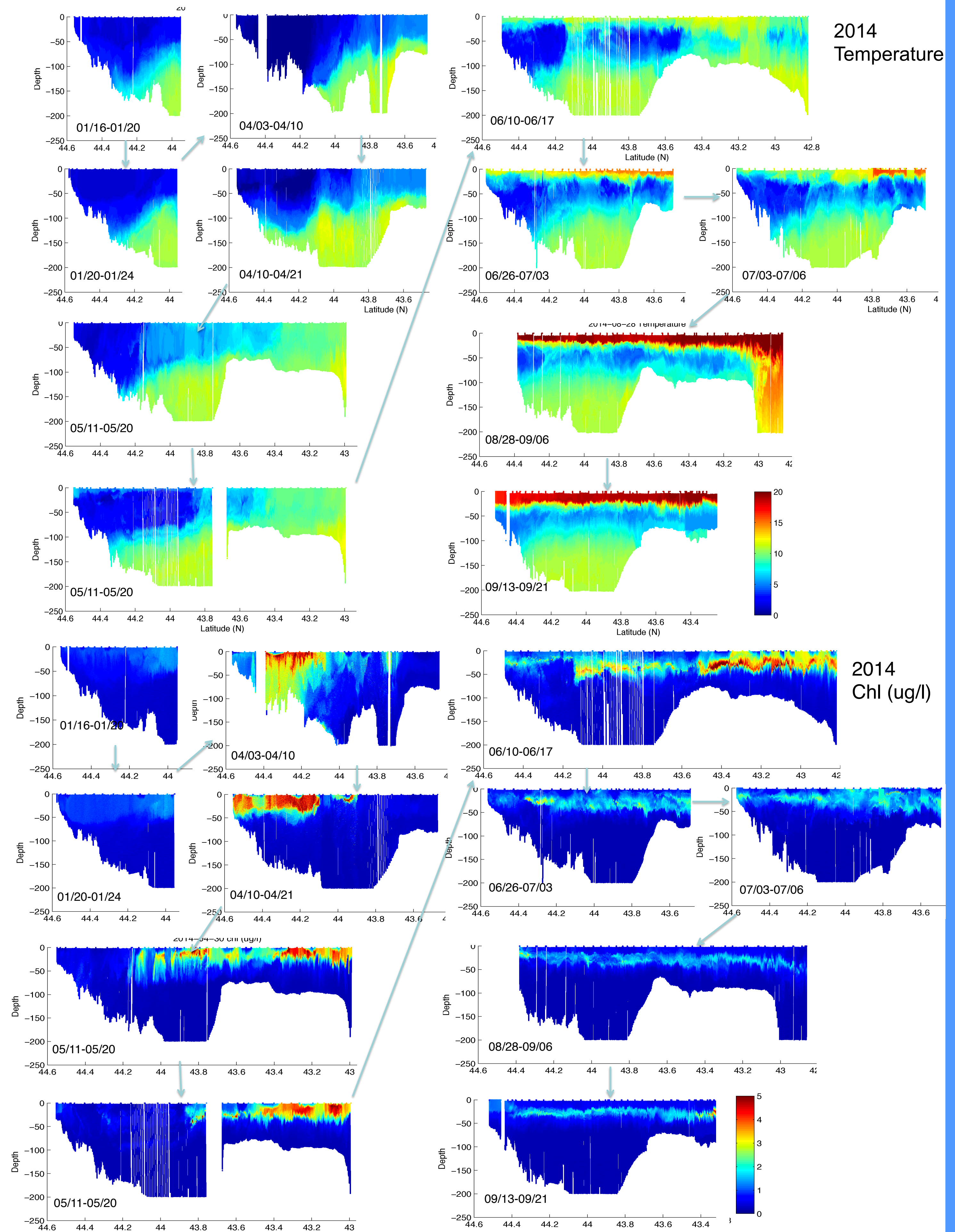
Standard variables

- CTD Profiles (conductivity, temperature, depth, oxygen, fluorescence, light (PAR))
- Bottle samples (chlorophyll, nutrients, oxygen)
- Net mesozooplankton

Optional variables

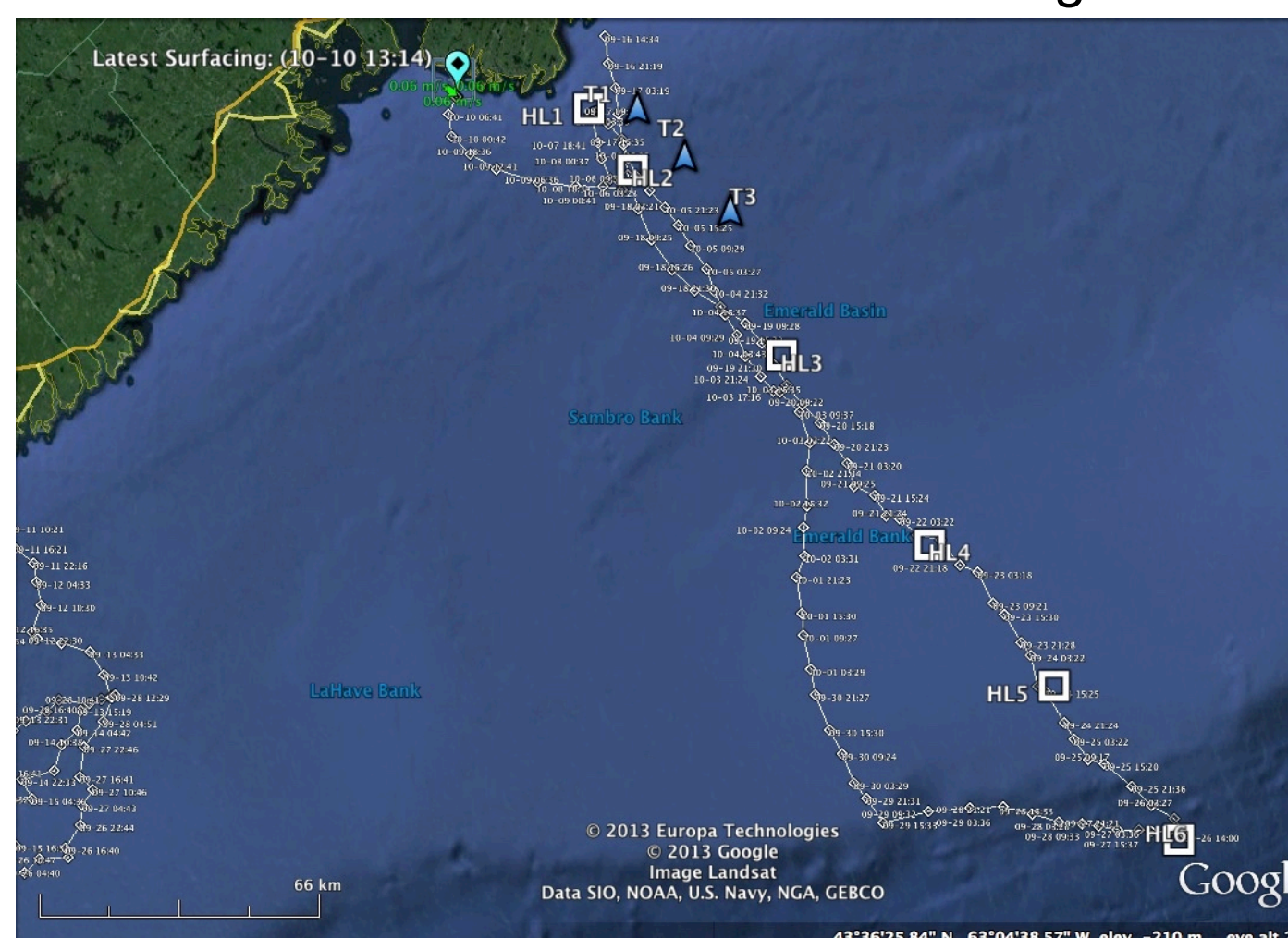
- pH, alkalinity, DIC
- Coloured dissolved organic matter (CDOM)
- Phytoplankton pigments (HPLC)
- Ammonium
- Phytoplankton counts
- Net microzooplankton
- Stratified net meso/ macrozooplankton
- ...

Temperature and Chlorophyll Variations Throughout the Year

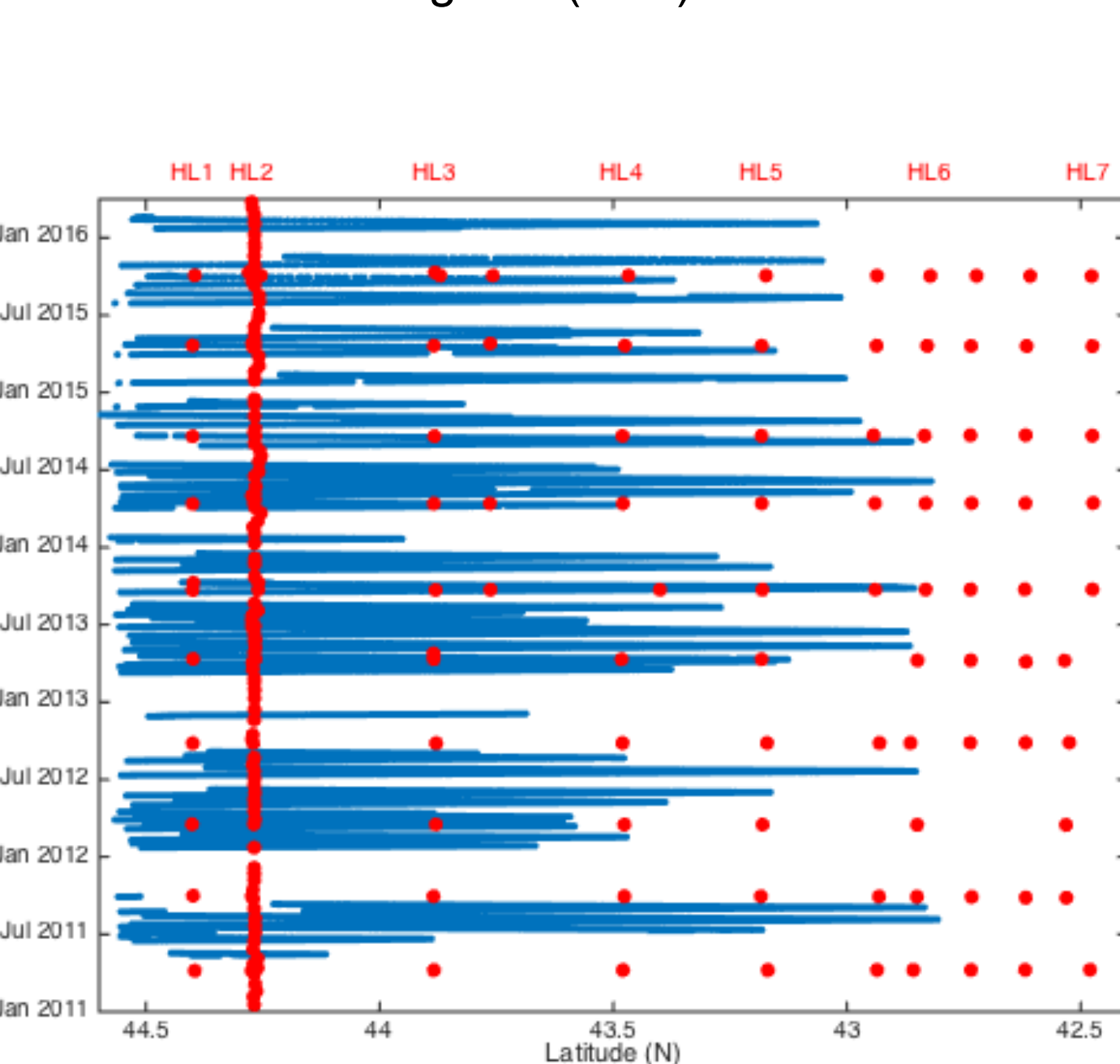


Hydrographic sampling on the Halifax Line

Location of the core AZMP stations on the Halifax Line (squares), the bottom mounted ADCP/CTD moorings (triangles) and the trajectory of an Ocean Tracking Network (OTN) glider sampling on the Halifax Line on the outbound leg and the OTN acoustic curtain on the inbound leg

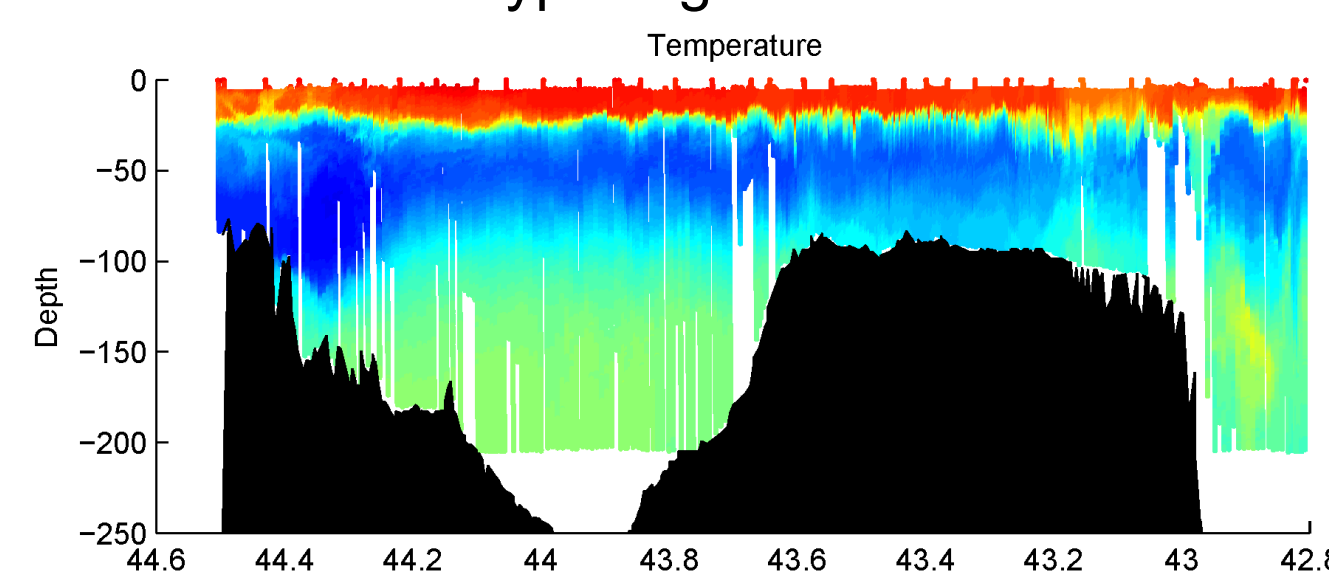


Temporal/Spatial sampling of the Halifax Line by AZMP (red) and the Ocean Tracking Network glider (blue)

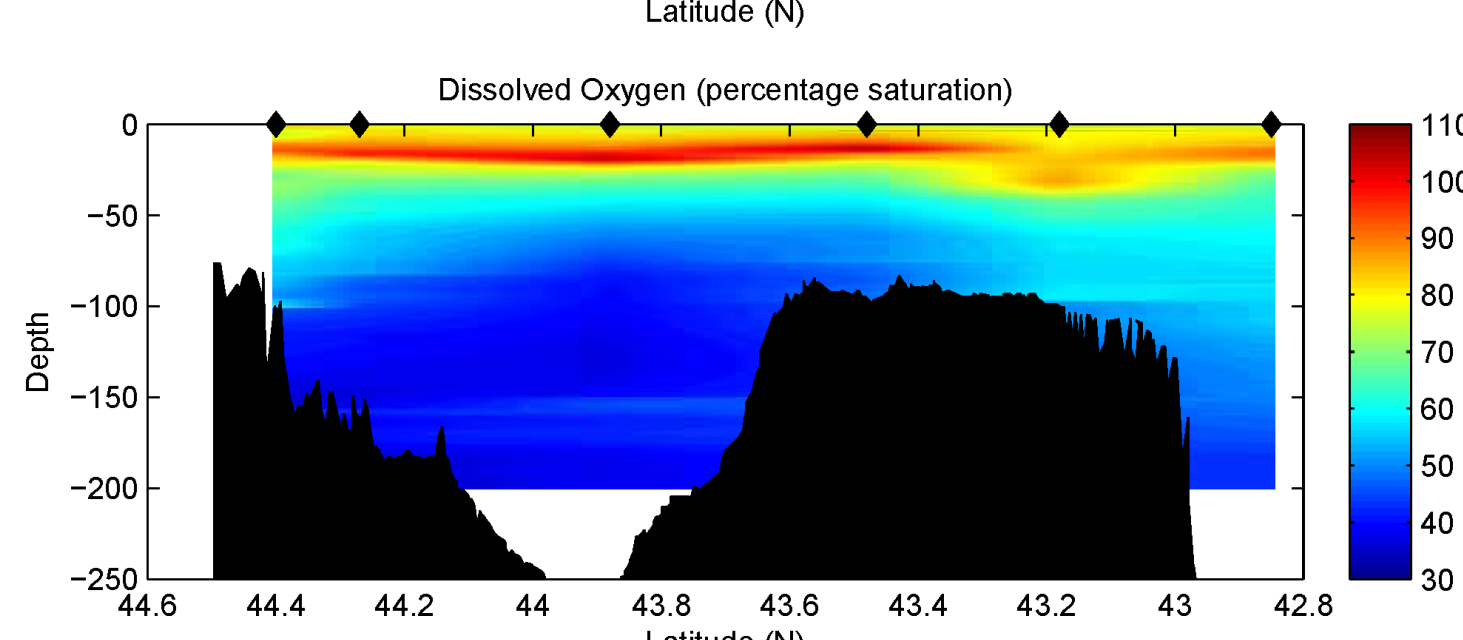
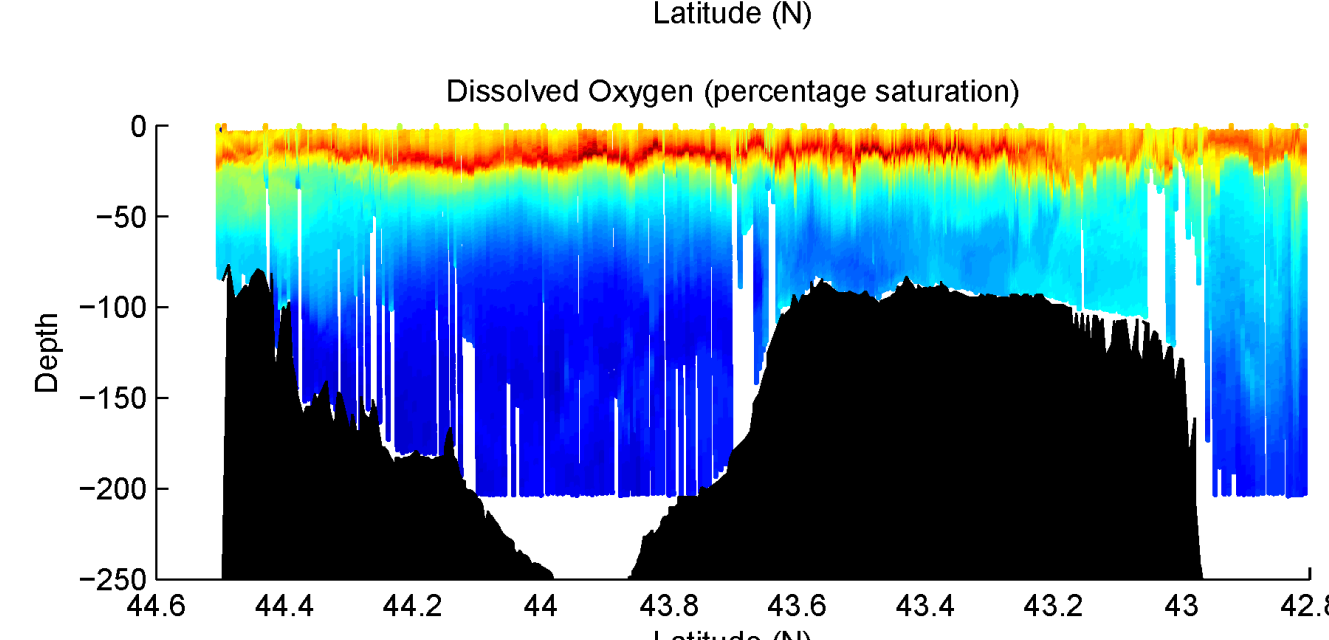
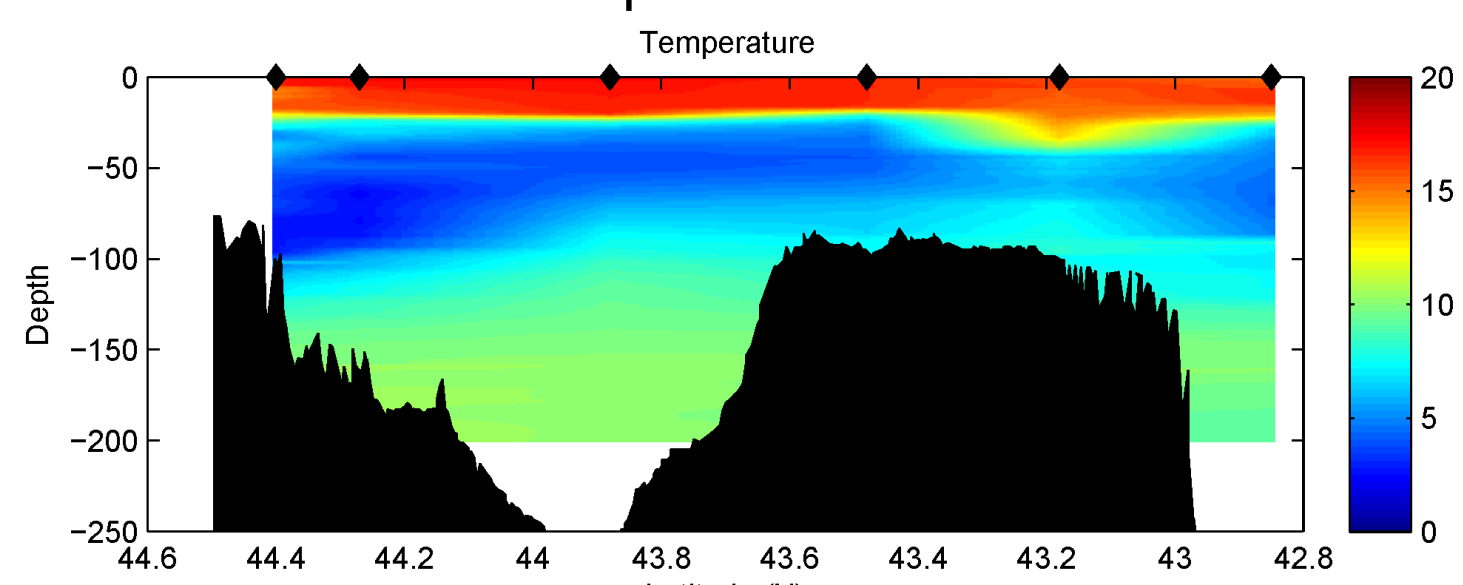


Glider provide high horizontal resolution data

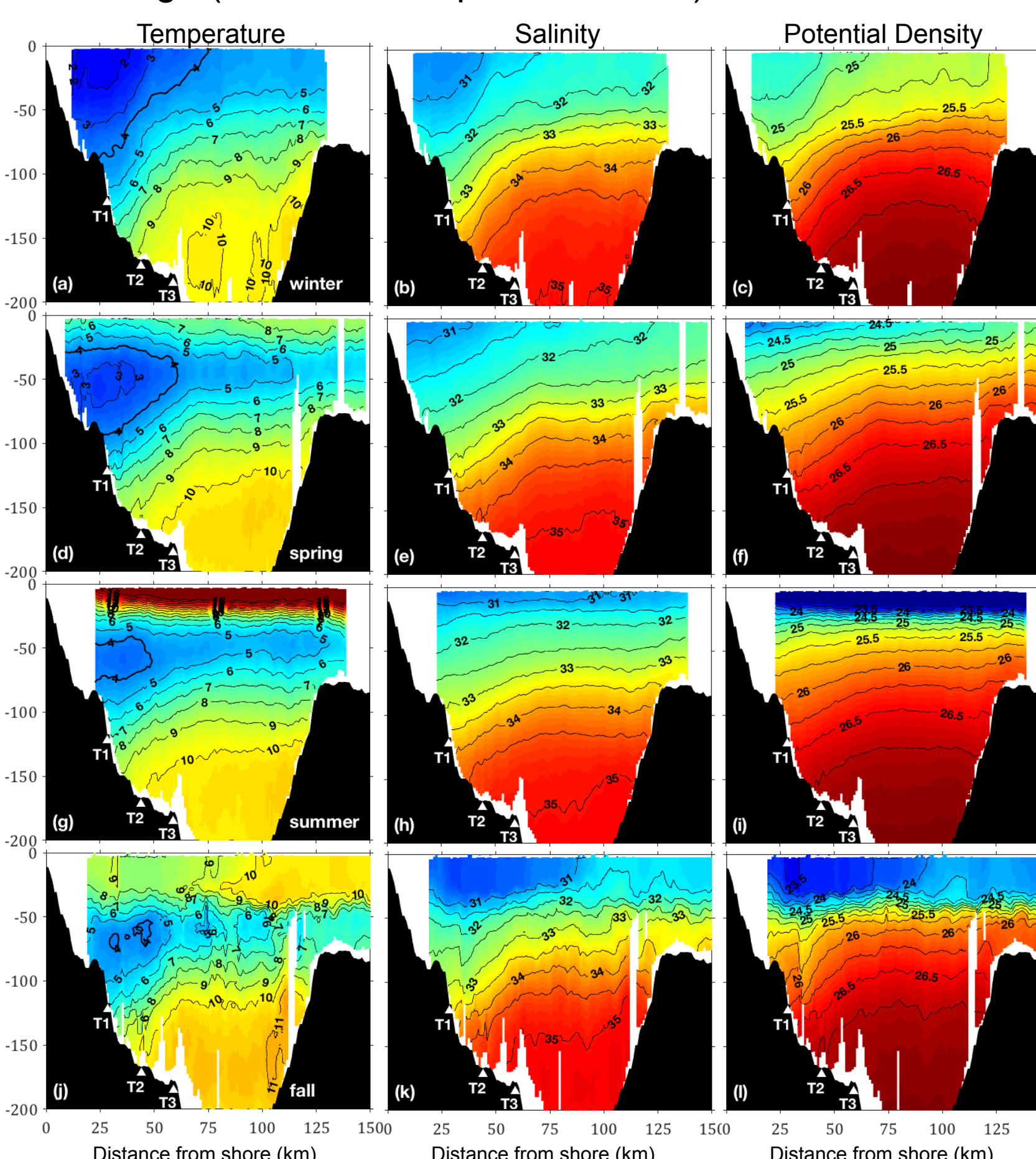
Typical glider transect



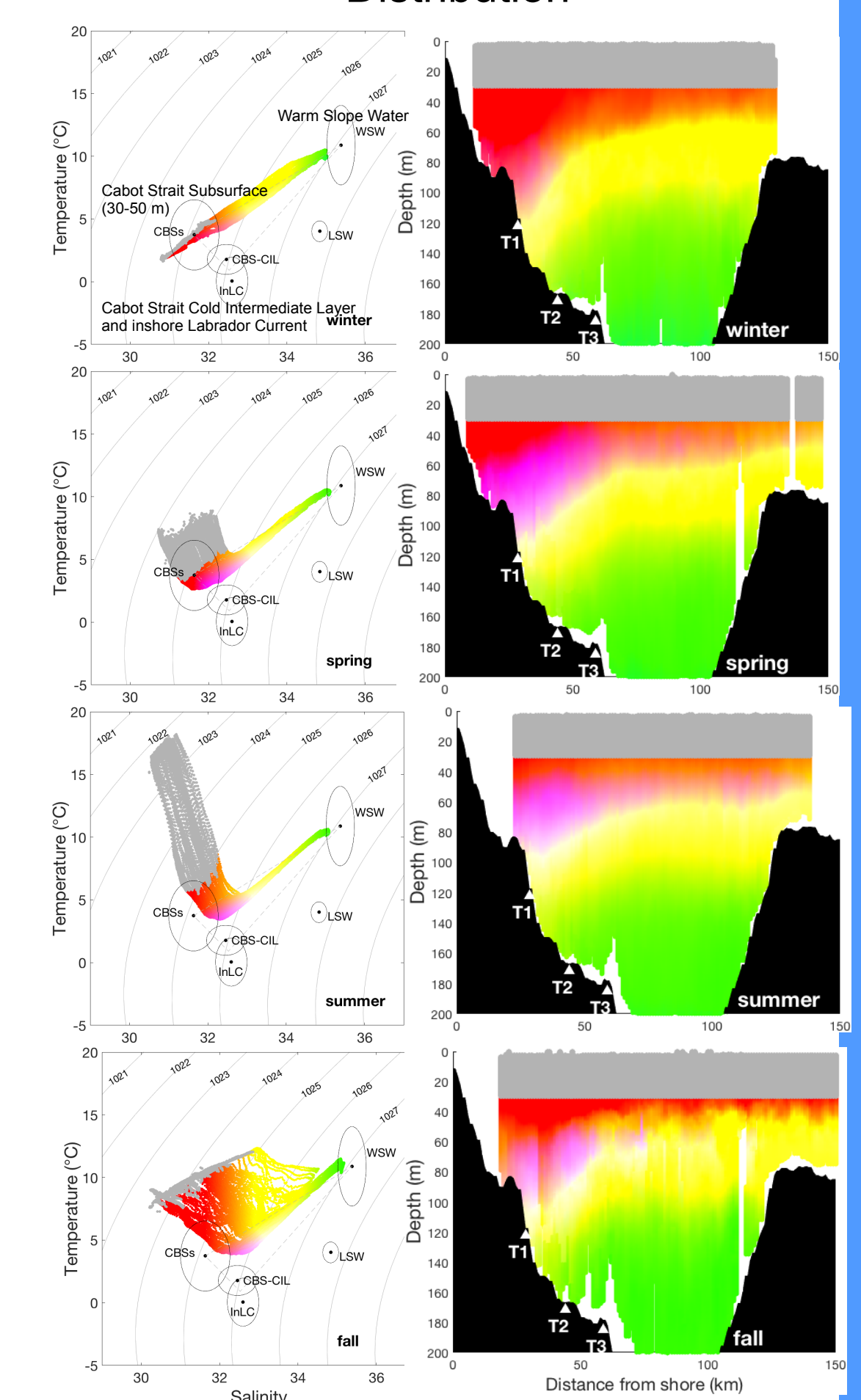
Glider data subsampled to the core AZMP stations



Average (June 2011-September 2014) Seasonal Variation



Average Seasonal Water Mass Distribution



Summary

- AZMP is providing a world class long term (almost twenty years) dataset of physical, biological and chemical data that is only produced in a few places around the world.
- AZMP data are used by DFO groups for stock assessments and advice on environmental conditions.
- AZMP can take advantage of new technologies (but they won't replace at sea sampling) and require additional resources.
- AZMP datasets, although short for climate-related studies, have provided information on long-term variability and trends and their impacts for DFO's climate studies.
- AZMP data are used by US investigators for their research since we provide the upstream conditions for the US east coast.
- DFO is purchasing gliders for its monitoring programs to provide more continuous sampling than the ship-based sampling and not rely on other resources which might be used for other projects.