



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian Arctic Marine Science 2020

Pacific Arctic Group Fall Meeting

Online

24 November, 2020

Bill Williams, Fisheries and Oceans Canada

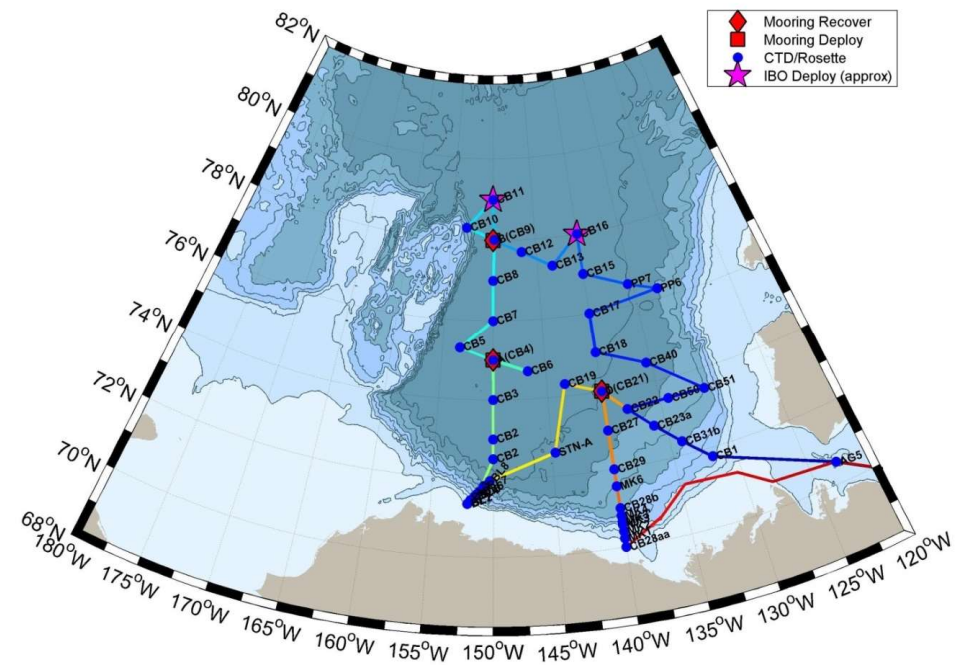


Canada

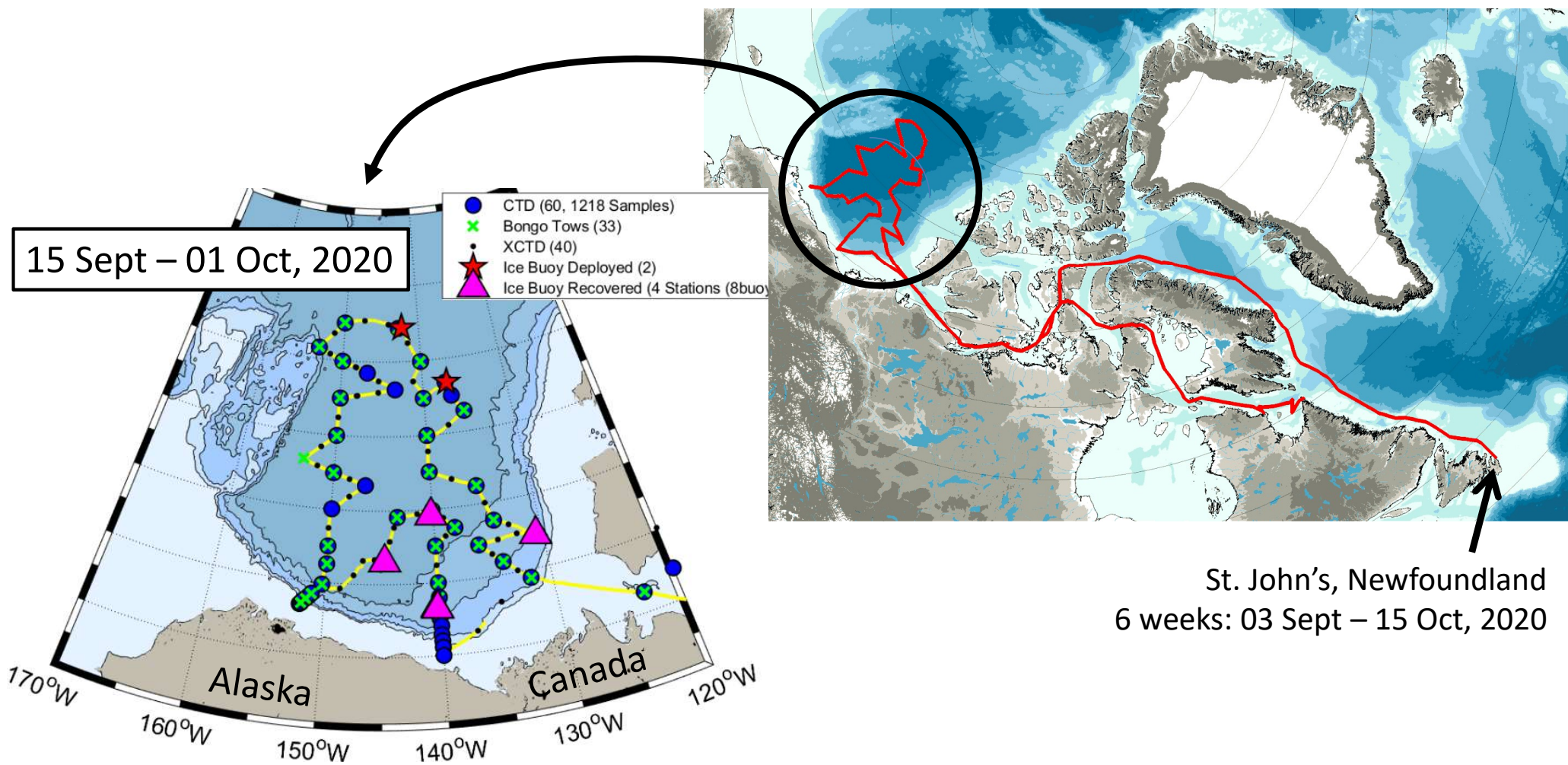
2020 Joint Ocean Ice Study / Arctic Observing Network - Beaufort Gyre Observing System CCGS Louis S. St-Laurent

- A USA-Canada collaboration aboard the *CCGS Louis S. St-Laurent*
- Created and supported by the National Science Foundation, Fisheries and Oceans Canada, Woods Hole Oceanographic Institution, Yale and the Institute of Ocean Sciences.
- 2020 was our 18th year! Funded until 2024.

CCGS Louis S. St-Laurent

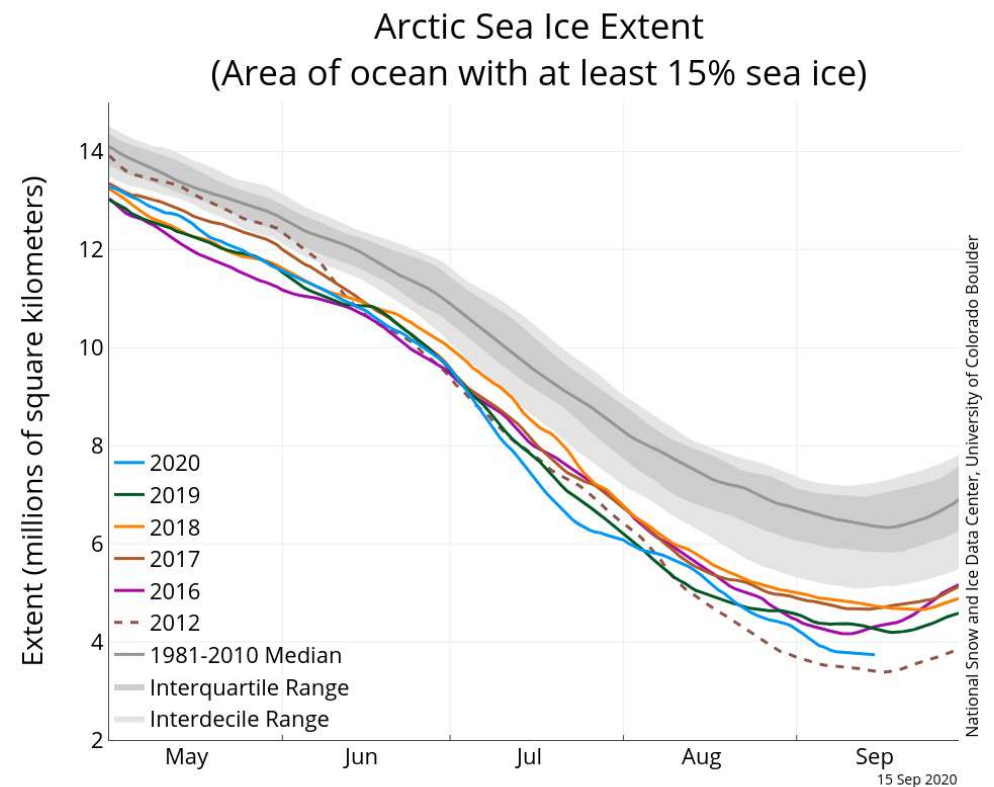
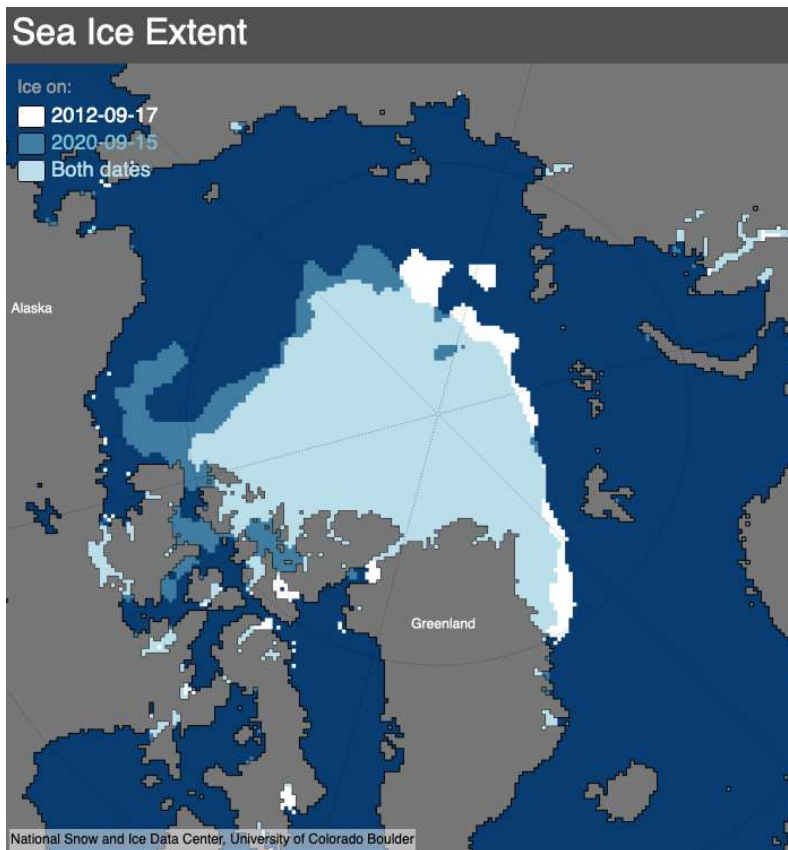


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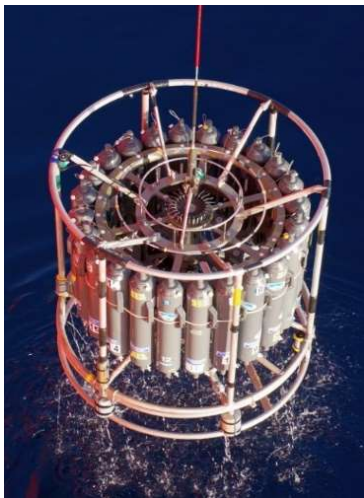
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Sea-Ice extent at the 2020 sea-ice minimum (from NSIDC):



2020 Joint Ocean Ice Study / Arctic Observing Network - Beaufort Gyre Observing System

Observations and Sampling:



50 Stations using SBE911+ CTD
with Pressure, Temperature, Salinity,
Dissolved Oxygen, Chl Fluorometer, CDOM
Fluorometer, PAR, Transmissometer.
Rosette has 24 x 10L Niskins

Water Samples: 1175 Niskin Bottles sampled.

All full depth stations:

- Salinity
- Dissolved O₂
- Nutrients (NO₃, PO₄, SiO₄)
- ¹⁸O isotope in H₂O
- Alkalinity
- Dissolved Inorganic Carbon (DIC)
- Chlorophyll-a
- Bacteria (Connie Lovejoy, U. Laval)
- Fluorescent Dissolved Organic Matter (FDOM) (Celine Gueguen, U. Sherbrooke)



30 Zooplankton Net casts to 100m depth

Water samples at select stations:

- Microbial Diversity (Connie Lovejoy, U. Laval, David Walsh, Concordia)
- Dissolved Organic Material (DOM), Lignin and Phenols, Barium (Celine Gueguen, U. Sherbrooke)
- ¹²⁹I and ²³⁶U (John Smith DFO, Nuria Casacuberta ETH Zurich)

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Buoy Deployments and Recoveries:



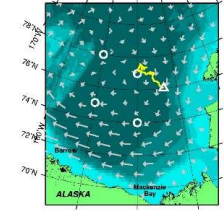
2 Ice Stations, each with an Ice Tethered Profiler and Seasonal Ice Mass Balance Buoy (WHOI; Mary-Louise Timmermans, Yale; CRREL; Mike DeGrandpre, U Montana)



Recoveries of expired buoys from 4 ice stations (deployed from LSSL and Healy)

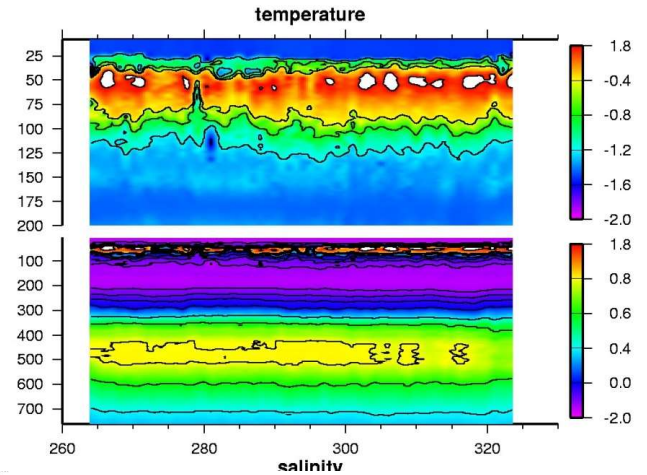


ITP121 Drift Track (as of 2020/11/18)

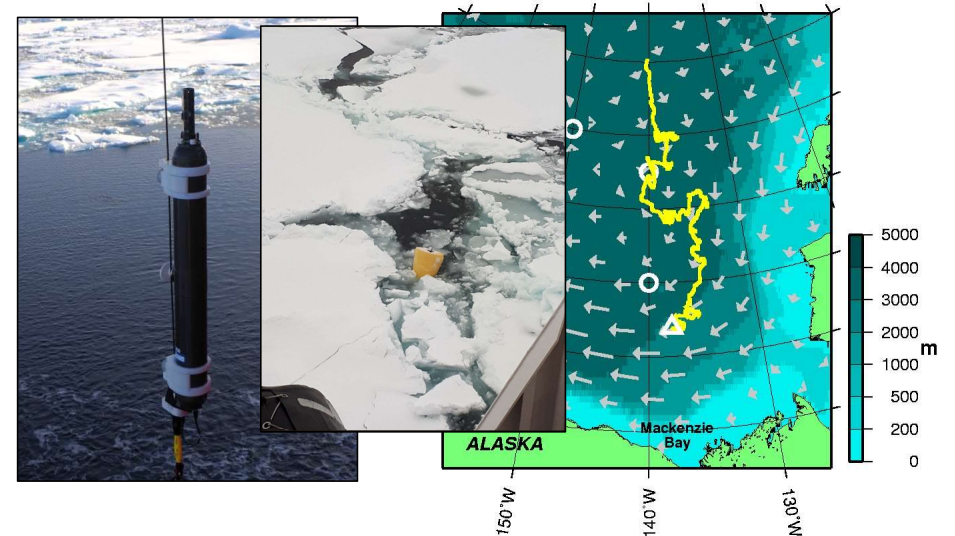


ITP drift (yellow line) and latest location (triangle)
BOOS moorings (white circles) and annual ice drift
IABP (grey vectors) on IBCAO bathymetry (shading).

ITP121 Up Profile Contours (to profile 118)



ITP118 Drift Track (as of 2020/08/20)



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Underway Measurements:

Surface water measurements:

- Thermosalinograph with Chl-a and FDOM Fluorometers
- pCO₂ system (Mike DeGrandpre, U Montana)
- Water samples for Salinity, Chlorophyll, Nutrients, DIC/Alkalinity, FDOM (Celine Gueguen, U Sherbrooke)

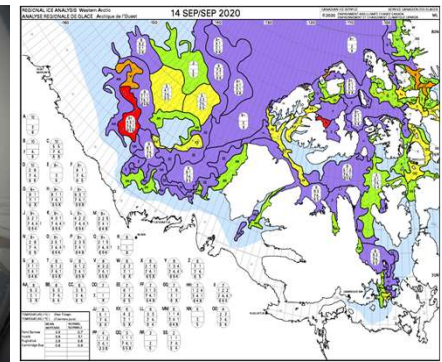
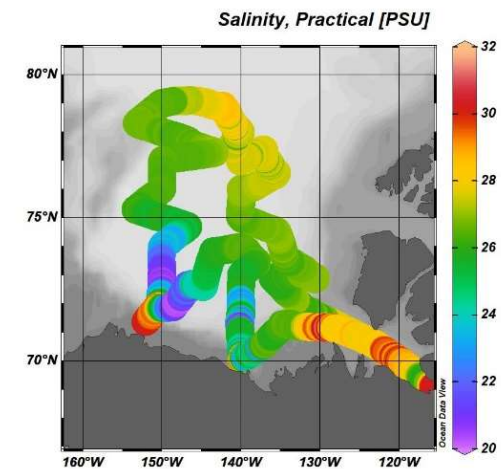
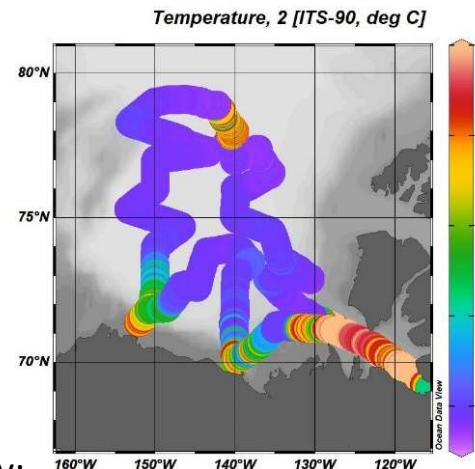
Meteorological data: AVOS weather station

Sea-Ice Observations (Jenny Hutchings, Oregon State University; Kazutaka Tateyama, Kitami Institute of Technology; Canadian Ice Service)

Expendable CTDs (XCTD) deployed between Rosette Stations (DFO, WHOI, JAMSTEC)

Data and Dispatches (2003-2020) :

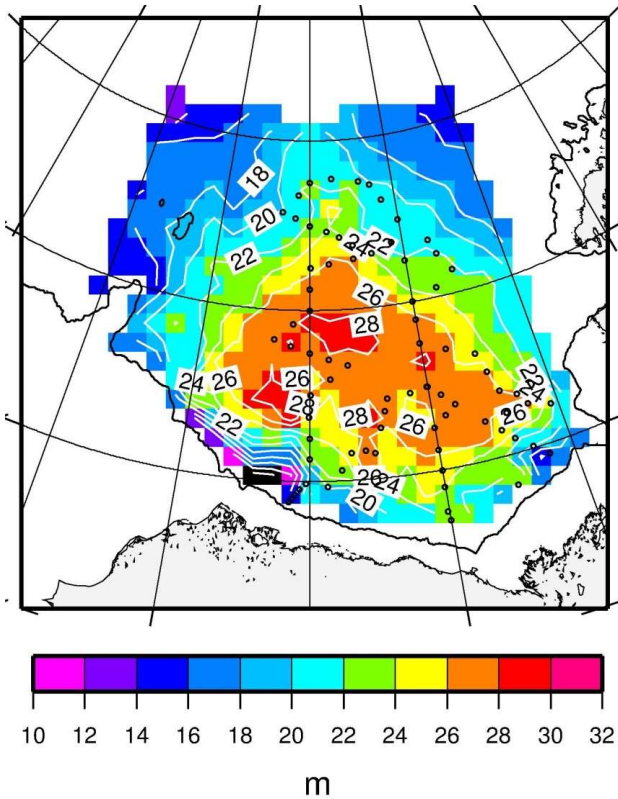
Project	Website Address
Beaufort Gyre Observing System	www.whoi.edu/beaufortgyre
Beaufort Gyre Observing System dispatches	https://www.whoi.edu/page.do?pid=166776
Ice-Tethered Profiler buoys	www.whoi.edu/itp
Ice Mass Balance buoys	http://imb-crrel-dartmouth.org/



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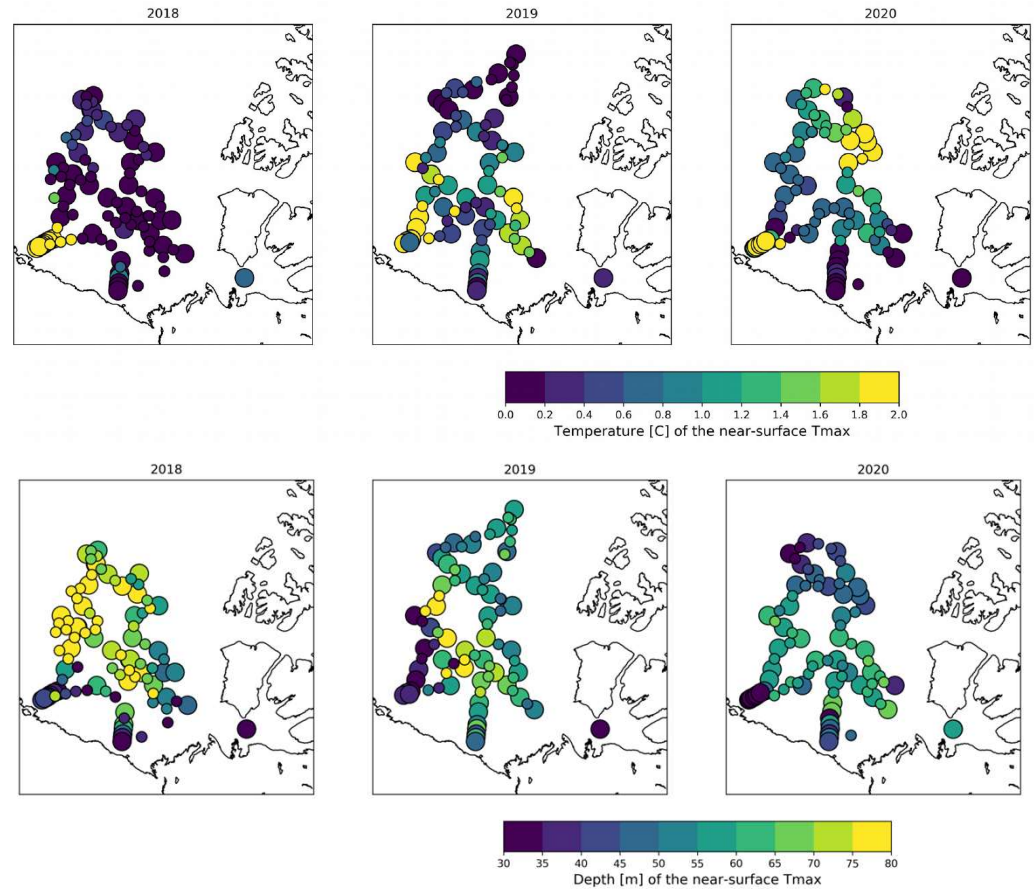
Monitoring of the Beaufort Gyre since 2003:

2020 Freshwater content:



(from Rick Krishfield, WHOI)

Pacific Water temperature maximum:

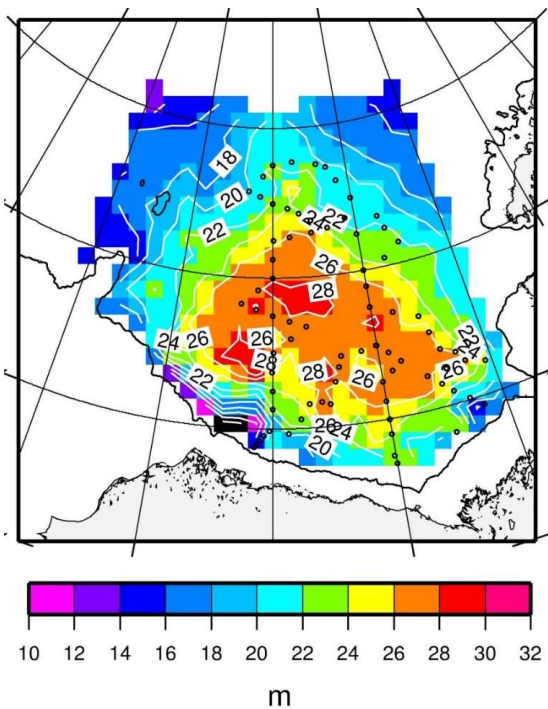


(from Birgit Rogalla, UBC)

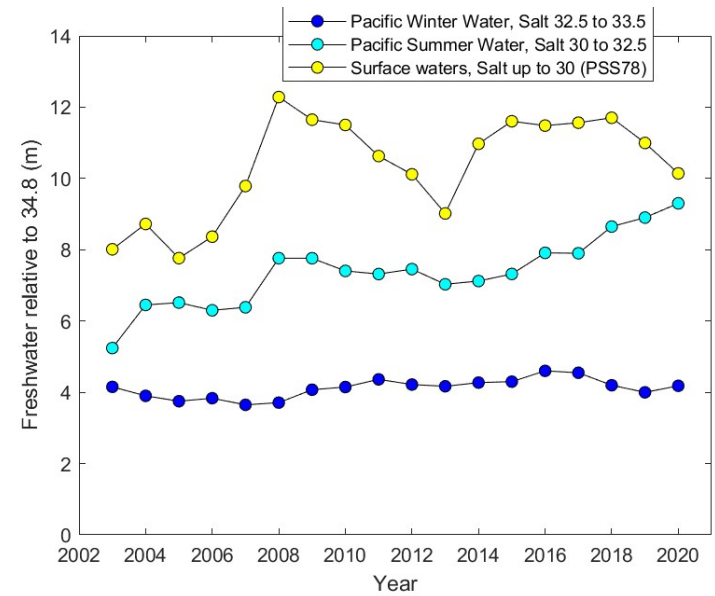
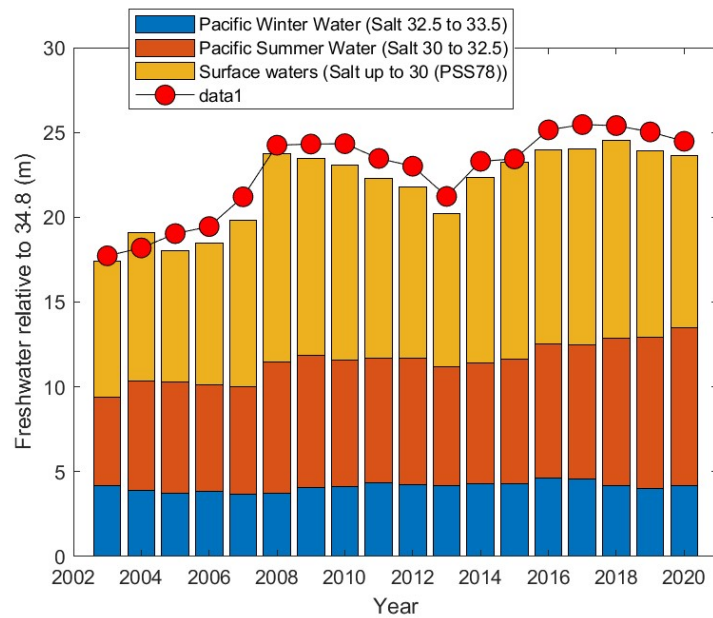
2020 Joint Ocean Ice Study / Arctic Observing Network - Beaufort Gyre Observing System

Monitoring of the Beaufort Gyre since 2003:

2020 Freshwater content:



(from Rick Krishfield, WHOI)



(from Sarah Zimmermann, DFO)

Thank you for your participation in this successful mission!

JOIS 2020

CCGS Louis S. St-Laurent | September 3rd to October 15th



There were 20 research scientists involved this year from 14 research institutions from 4 countries.

Of the 15 on board, 5 were undergraduate and graduate students.



CCGS Sir Wilfrid Laurier



CCGS Sir Wilfrid Laurier C30/DBO
cruise 2020
August 8 to 18*

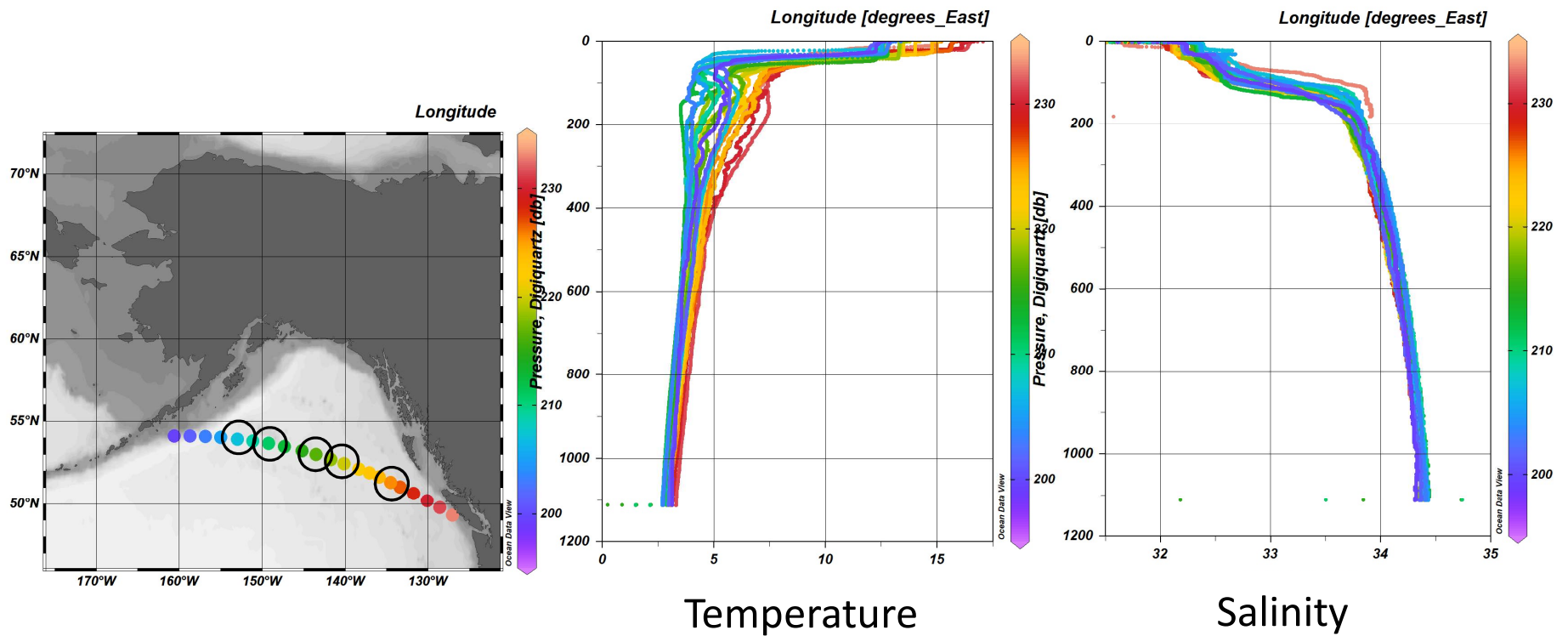
*approx. 1 month later than typical

COVID-19 restrictions resulted substantially scaled back C30/DBO activities in 2020.

Activities:

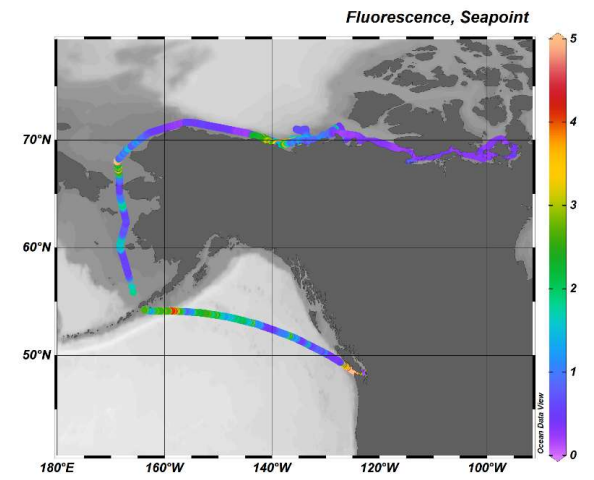
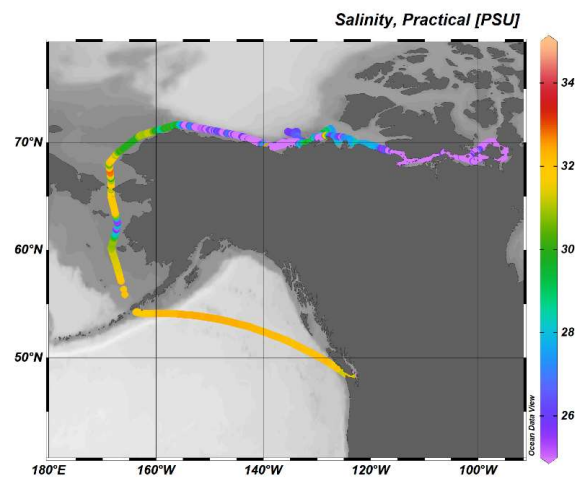
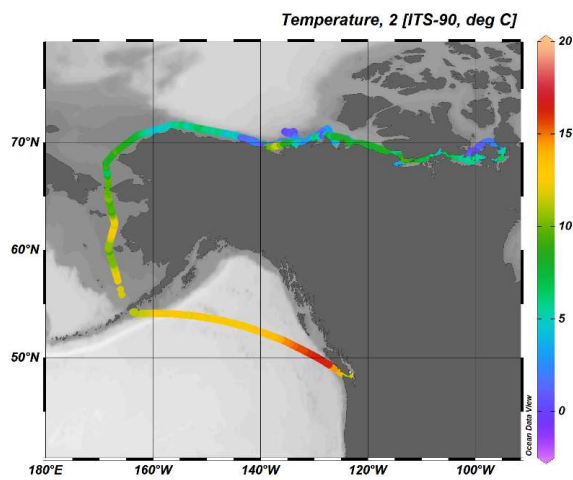
- XCTDs – Across the Gulf of Alaska
- 5 ARGO floats deployed across the Gulf of Alaska, approximately evenly spaced starting at 51 18.9 N 134 30.1 W
- Underway – temp, salinity, fluorescence – Victoria to Barrow and beyond.
- Continuous Plankton Recorder (CPR)
- Mooring recovery – Chukchi Sea

Gulf of Alaska: 21 XCTD casts and 5 ARGO floats deployed (black circles)



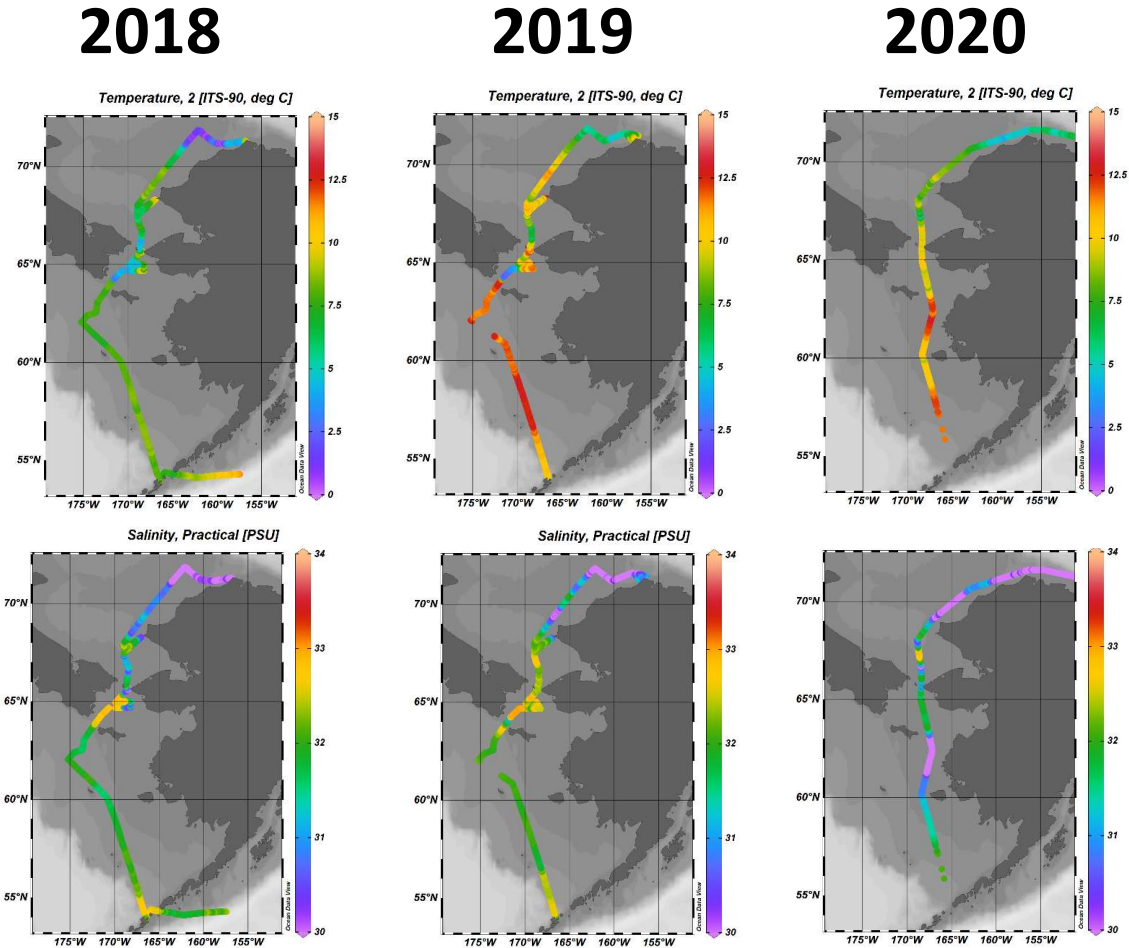
Underway:

2020



Last three years temperature and salinity:

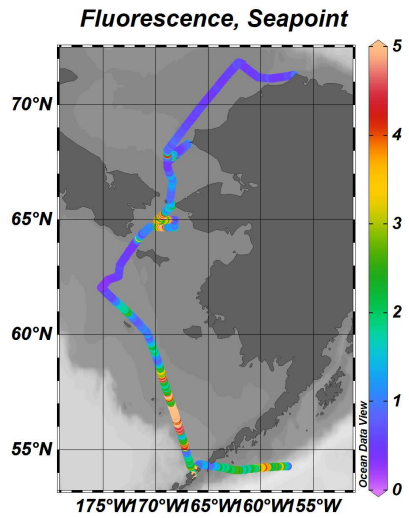
Temperature



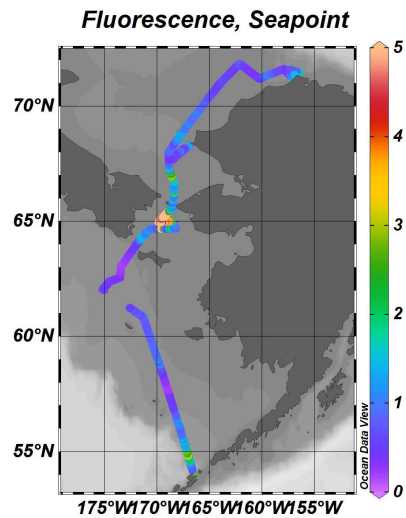
Salinity

Last three years fluorescence:

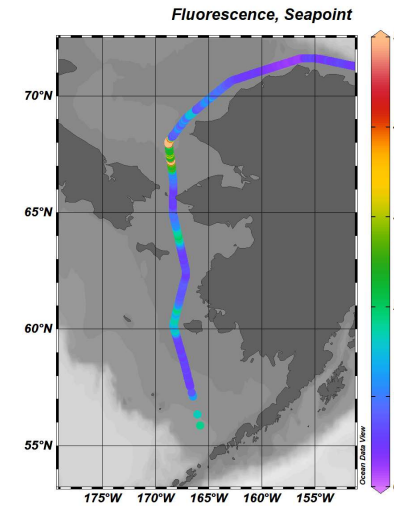
2018



2019

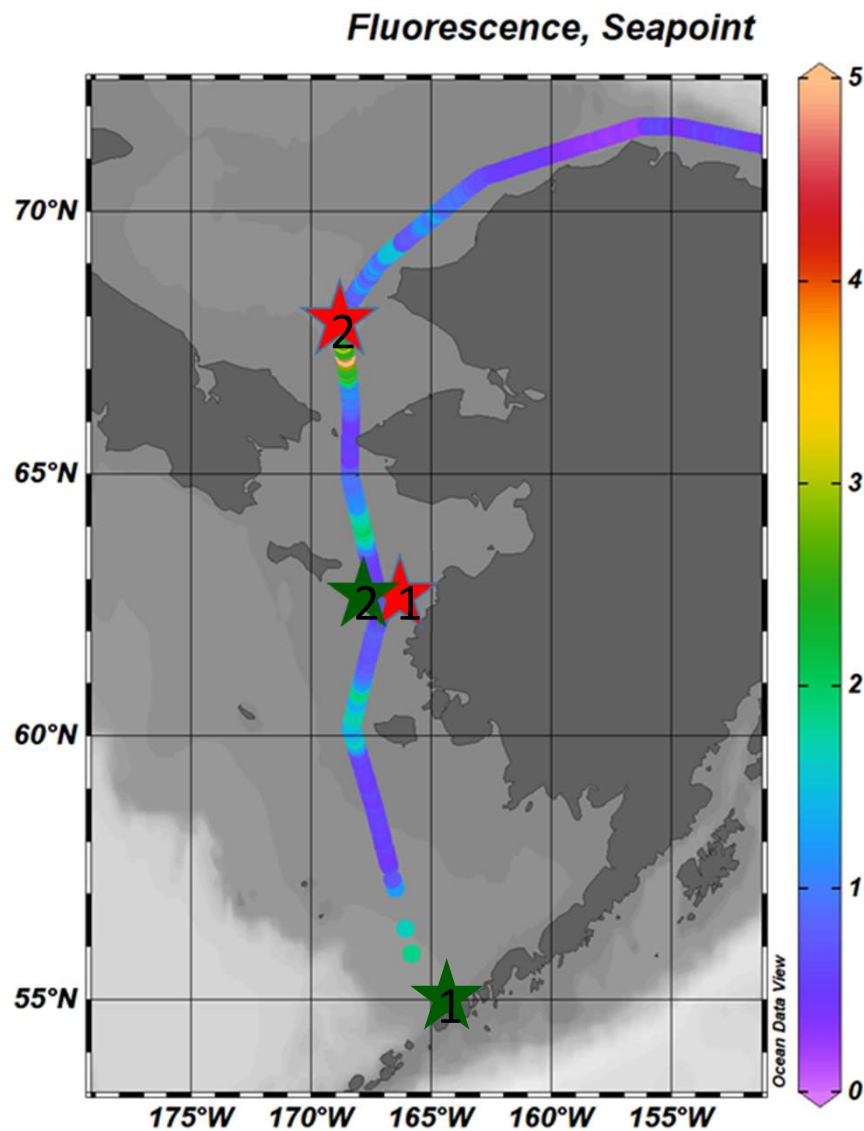


2020



CPR tow stop and start
superimposed on florescence
from underway system

Tow #2 stopped at site of JAMSTEC
Mooring recovery (successful) of
SCH-17 deployed in Sept 2017



CPR start 

CPR end 

817 NM towed
(two cassettes)

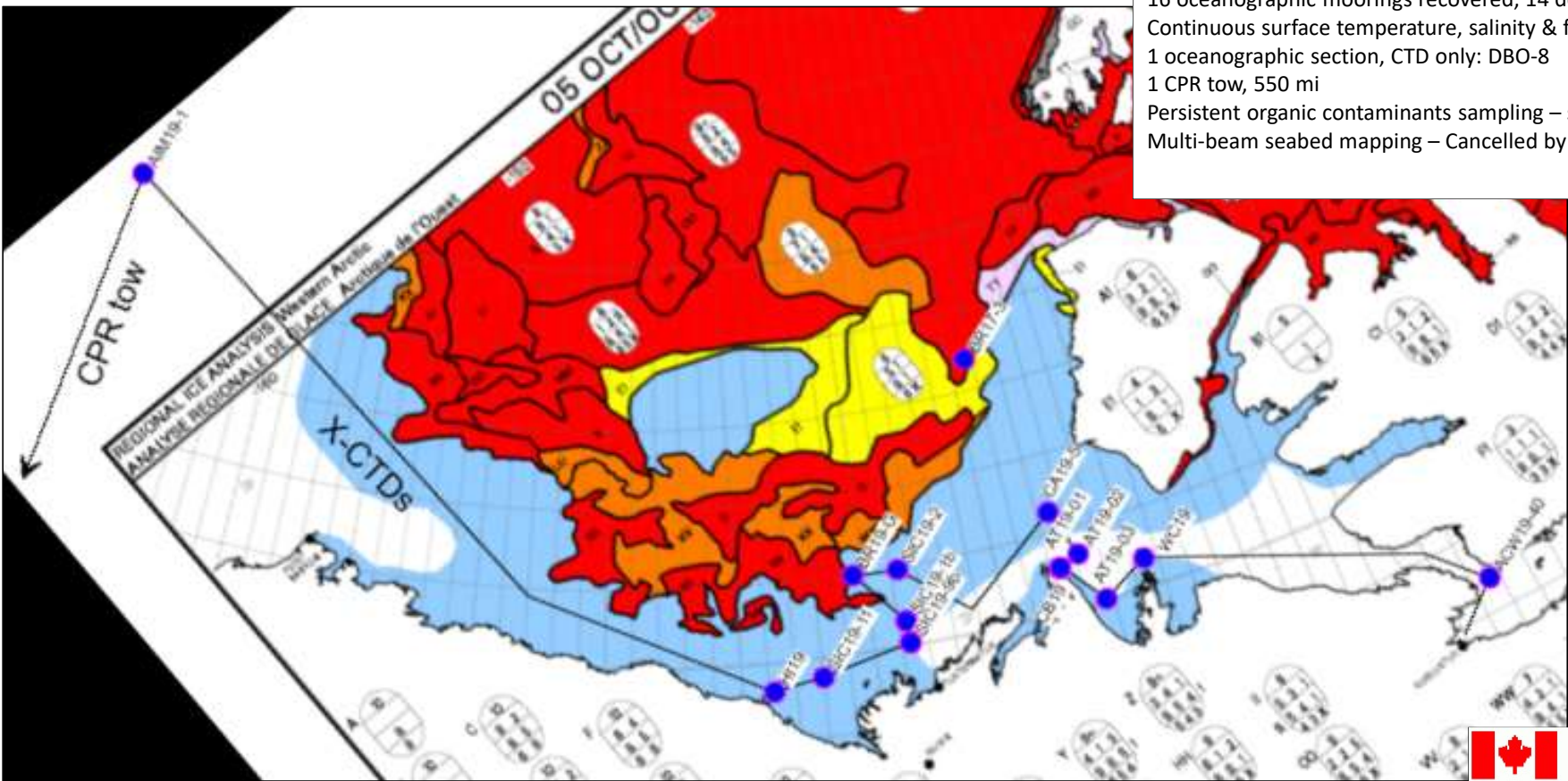
CCGS Sir Wilfrid Laurier (Arctic Leg 3)

Marine Hazards ... Beaufort Shelf Monitoring

15 Sep – 7 Oct 2020 ... Kugluktuk to Bering Strait

Chief Scientist
Humfrey Melling, DFO at IOS
Collaborators
DFO at FWI, ECCC, NOAA, WCS

16 oceanographic moorings recovered, 14 deployed
Continuous surface temperature, salinity & fluorescence
1 oceanographic section, CTD only: DBO-8
1 CPR tow, 550 mi
Persistent organic contaminants sampling – seawater
Multi-beam seabed mapping – Cancelled by COVID



Year-round data document marine climate and hazards: Norms, natural variation, extremes, progressive change

Sea ice

Thickness, drift, hazardous features

Sea surface

Storm waves, storm surge

Ocean current – surface to seabed

Seawater pathways (e.g. nutrient delivery, pollutant dispersal),
dangerous currents

Ocean water masses – temperature, salinity

Identify properties, origins of seawater

Sediment in seawater

Suspension, transport & deposition

Organic contaminants in seawater

Biological enhancers

Nutrient upwelling, zooplankton variation

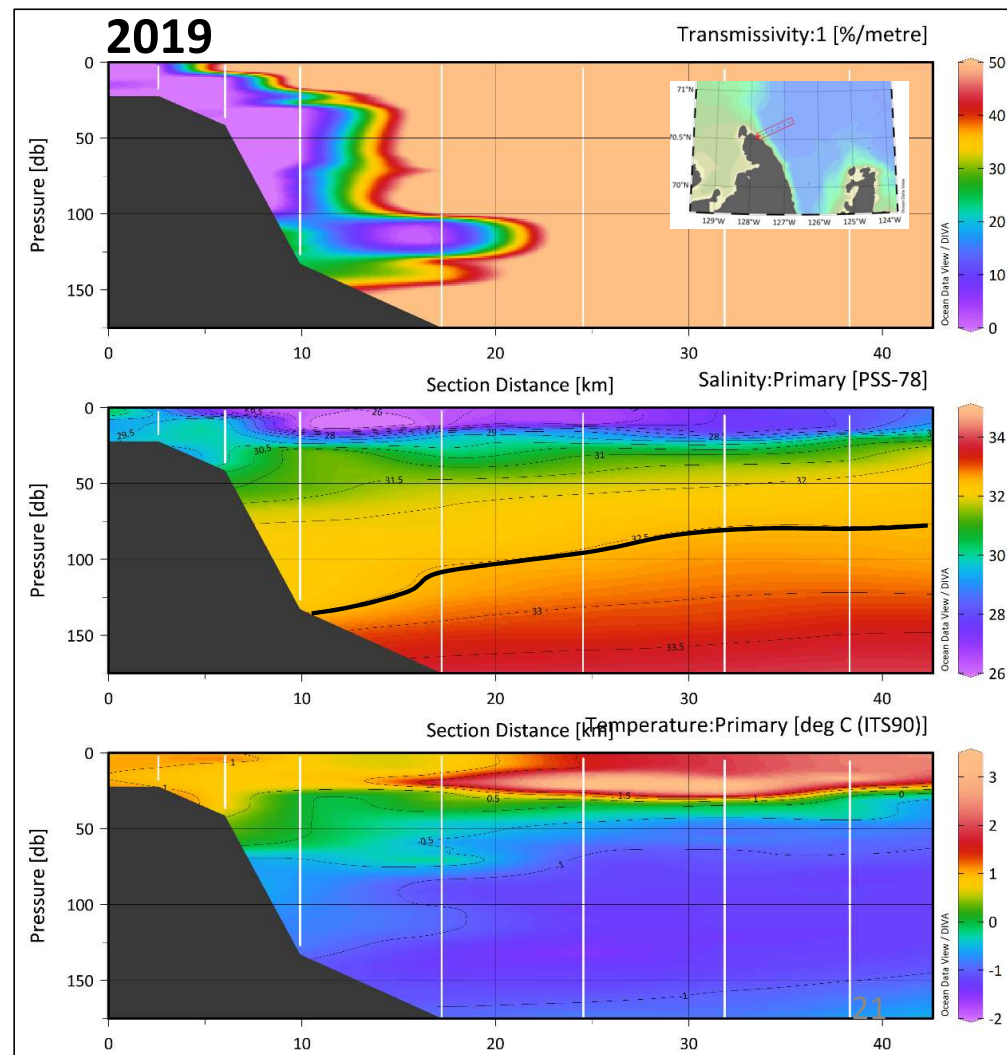
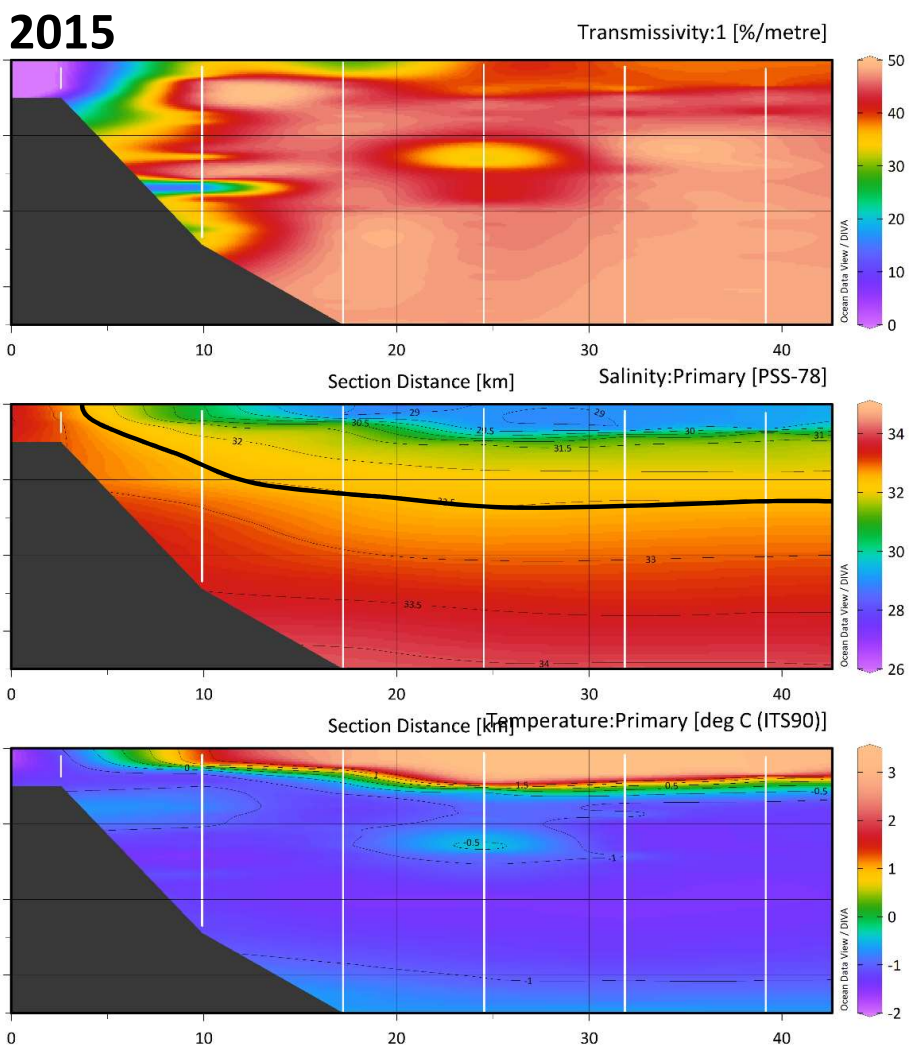
Ambient sound

Mammal's vocalization, species presence, natural sound, seismic
surveys, ship noise

Ocean and ice dynamics



Up-welling and down-welling at DBO-8, 2015 and 2019:



Thank-you!

