

NUTRIENTS AND OXYGEN DISTRIBUTION IN THE OPEN PART OF THE GULF OF ALASKA IN WINTER 2019

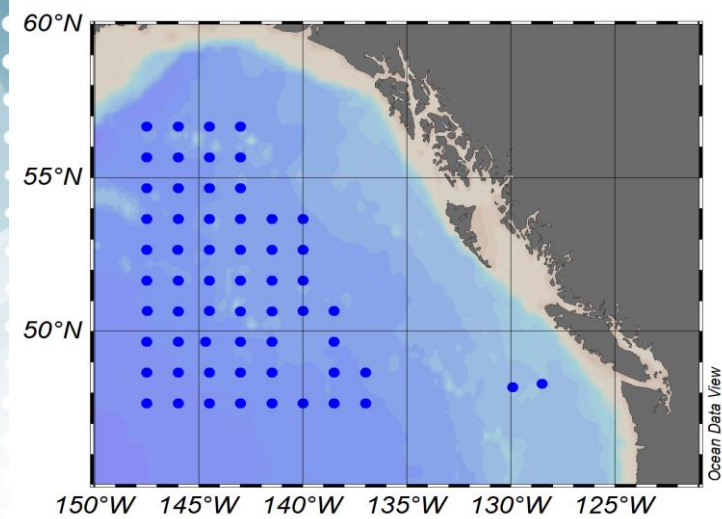
Anna Vazhova

TINRO

PICES-2019 Annual Meeting
Victoria, BC, Canada

Oceanographic team

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- Anna Vazhova
- Arkady Ivanov
- Hae Kun Jung
- Igor Shurpa



Chemistry investigation
2600 samples
at 60 stations:

Dissolved Oxygen – 315

Phosphates – 575

Silicates – 575

Nitrites – 575

Nitrates – 575



Nutrients and Oxygen distribution in accordance with oceanographic data

Part 1

- Surface currents in the Gulf of Alaska
- Water masses by T,S- curves
- Temperature anomalies

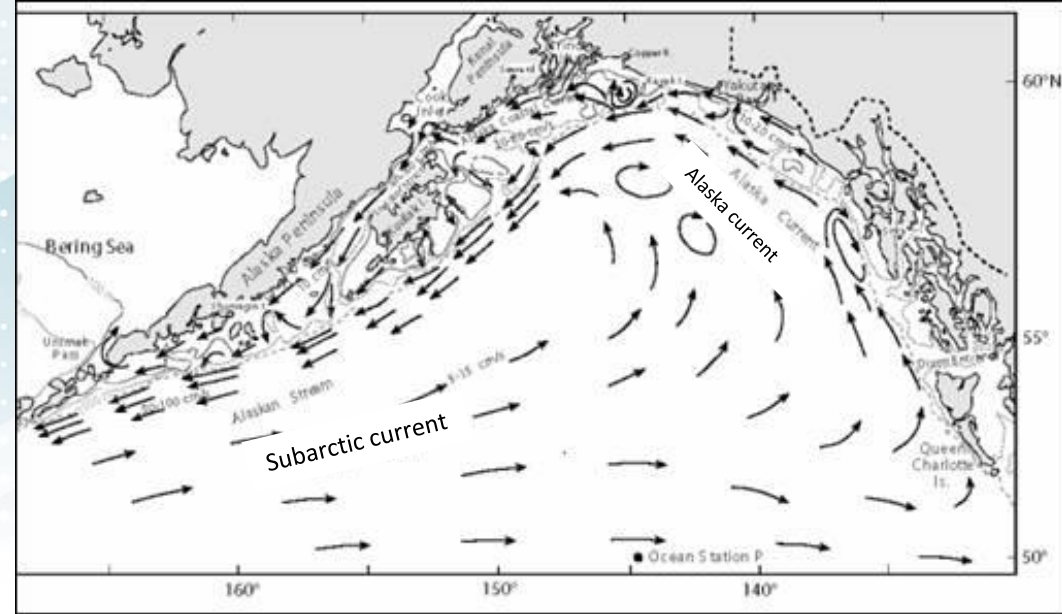
Part 2

- Oxygen and nutrients distribution
- Vertical structure of chemical properties in the upper layer

Part3

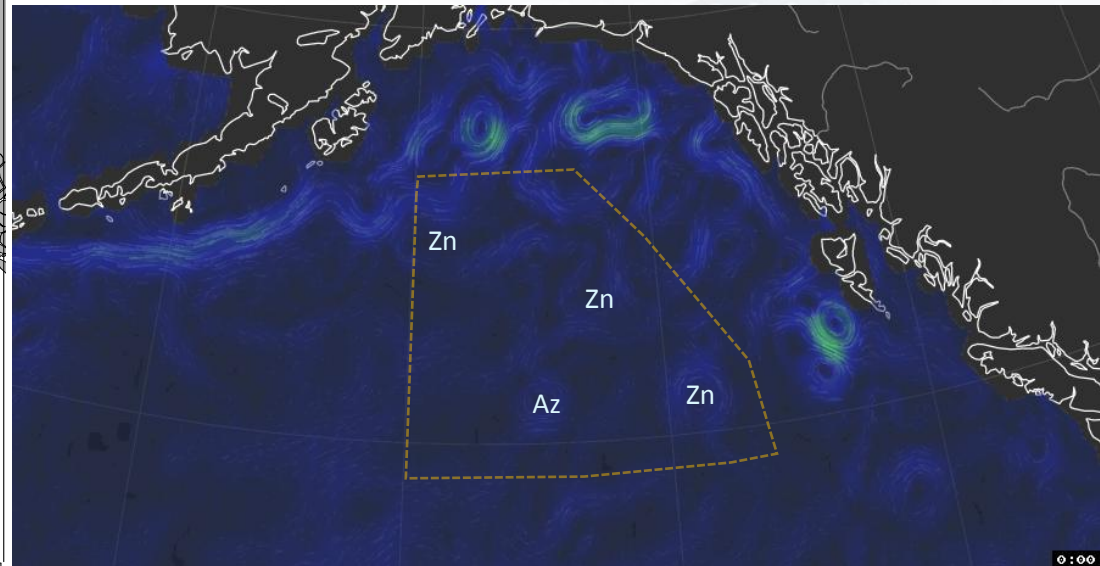
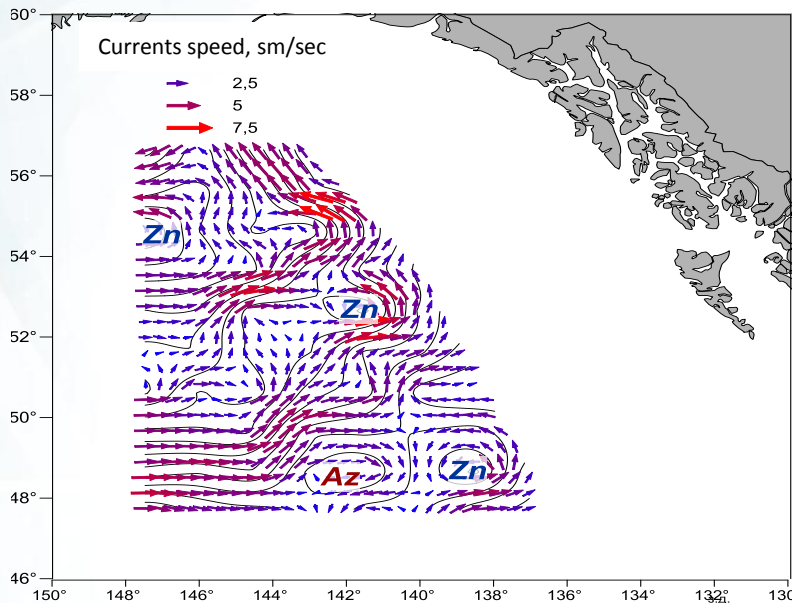
- Oxygen and nutrients changes from the open ocean to the coast
- Comparison with Chl a

Surface currents



- Surface geostrophic currents

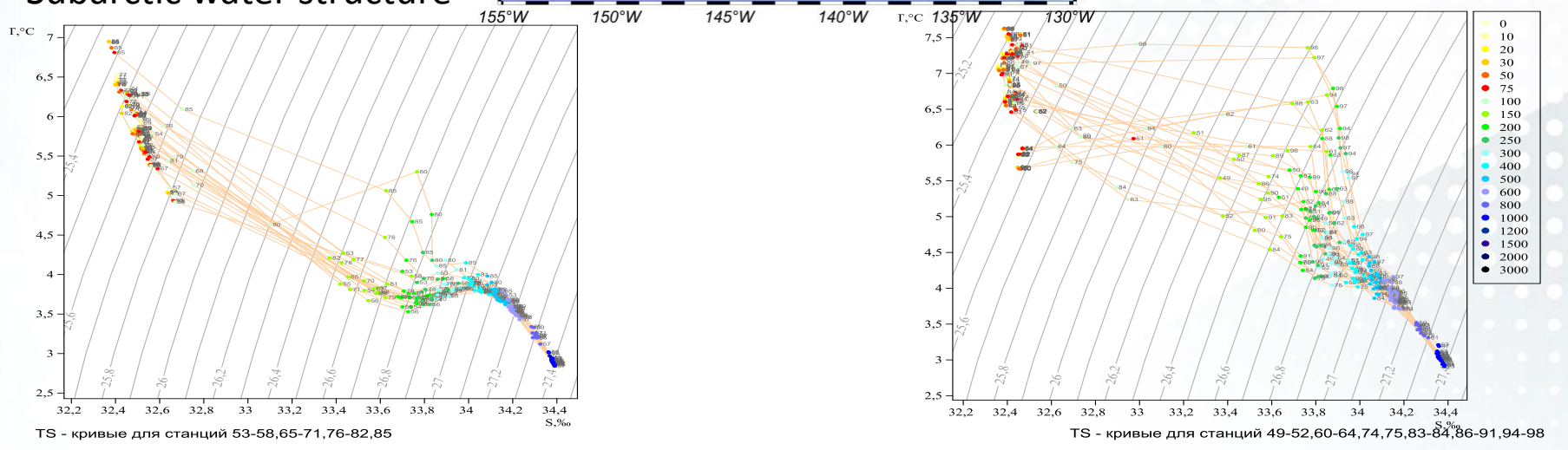
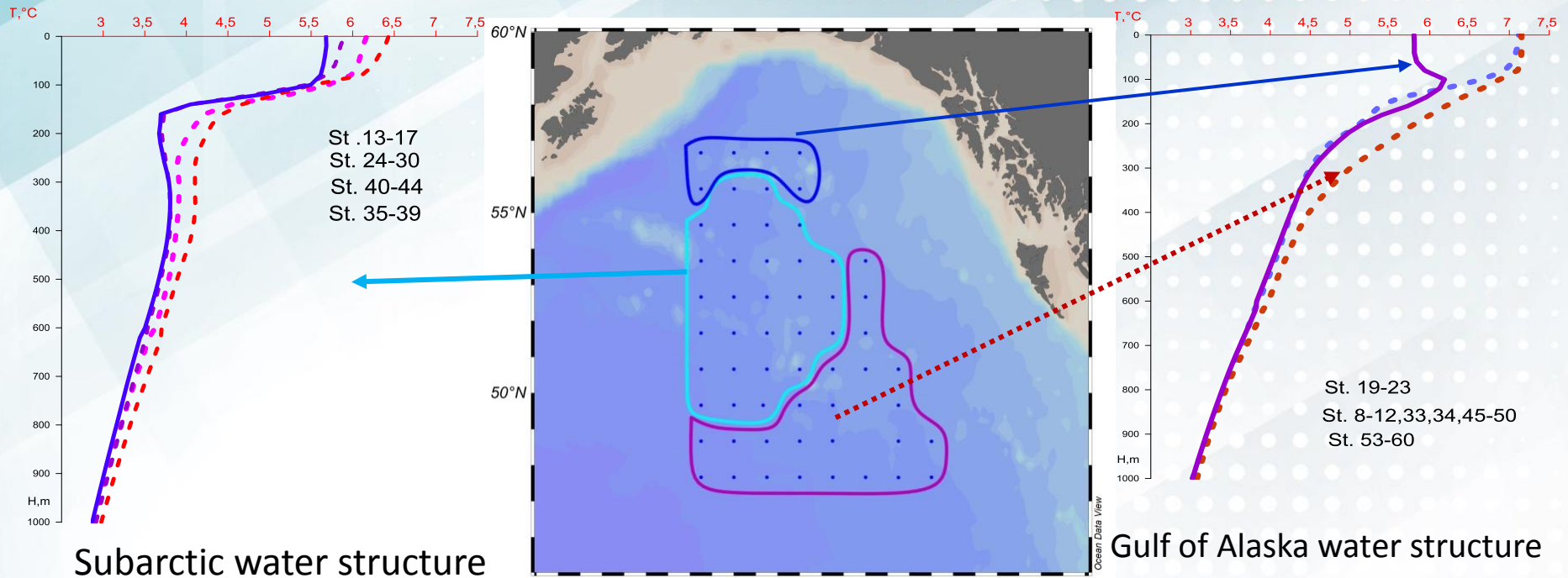
(relative to 600 dB) and currents from OSCAR model on March 10, 2019



OSCAR / Earth & Space Research

<https://earth.nullschool.net/>

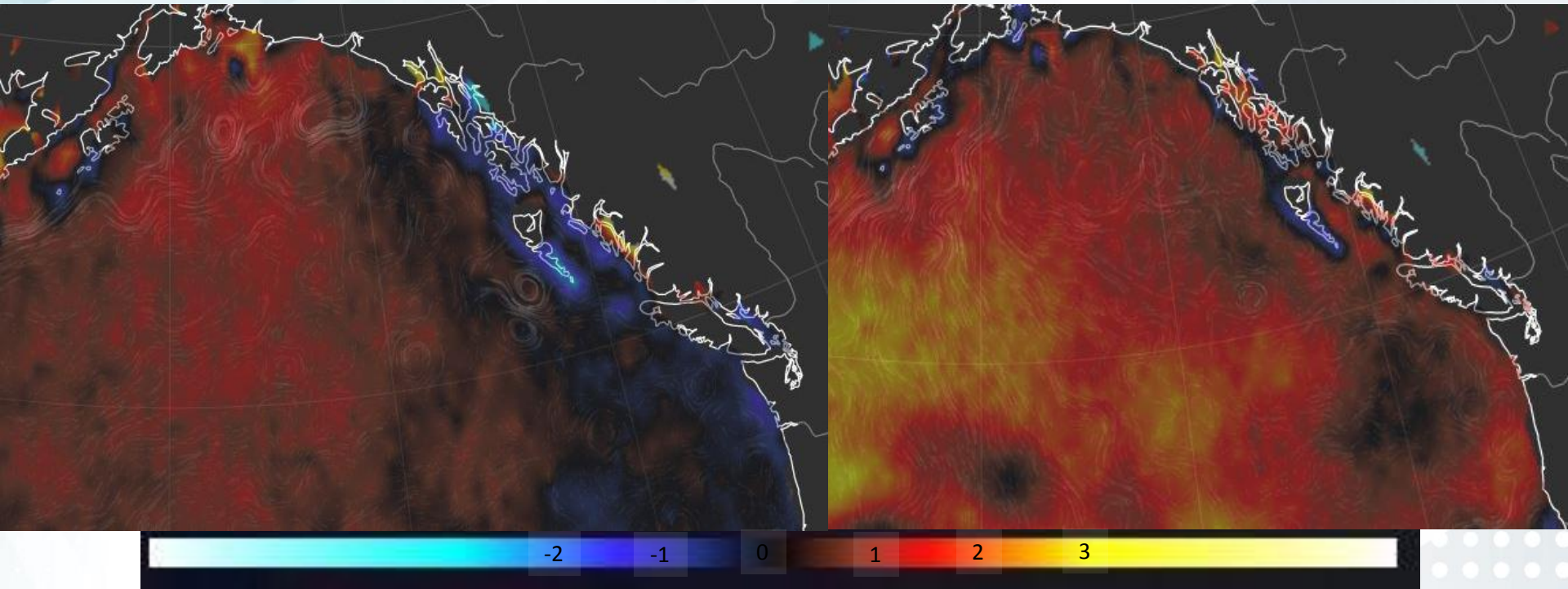
TS-curves and water masses in the GoA



Sea Surface Temperature Anomalies

10 March 2019

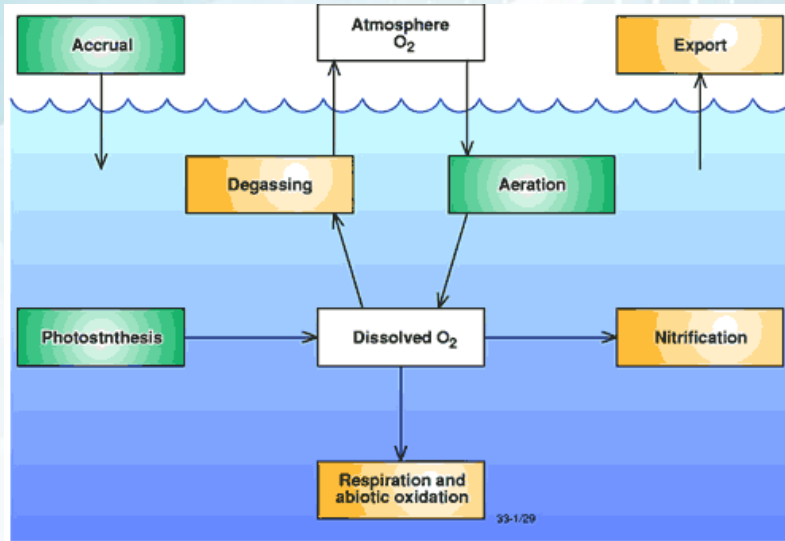
10 October 2019



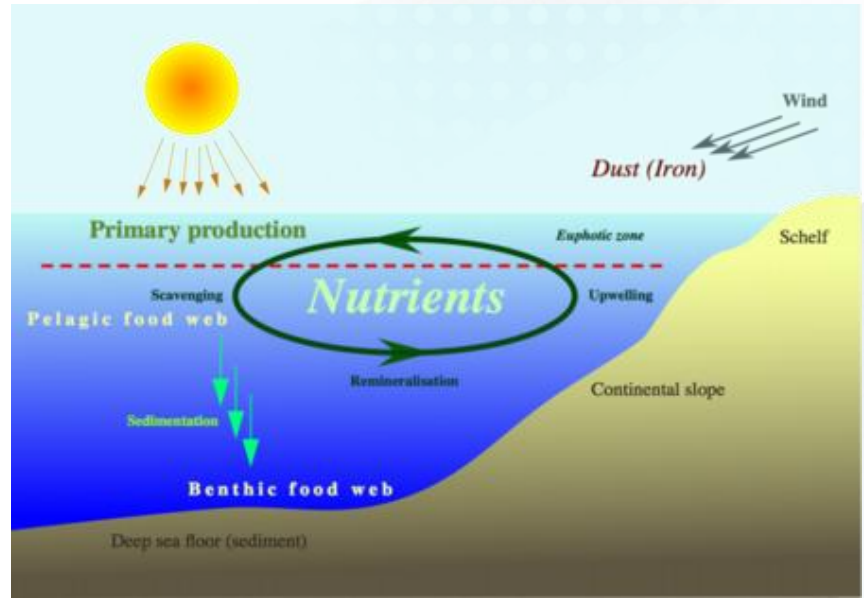
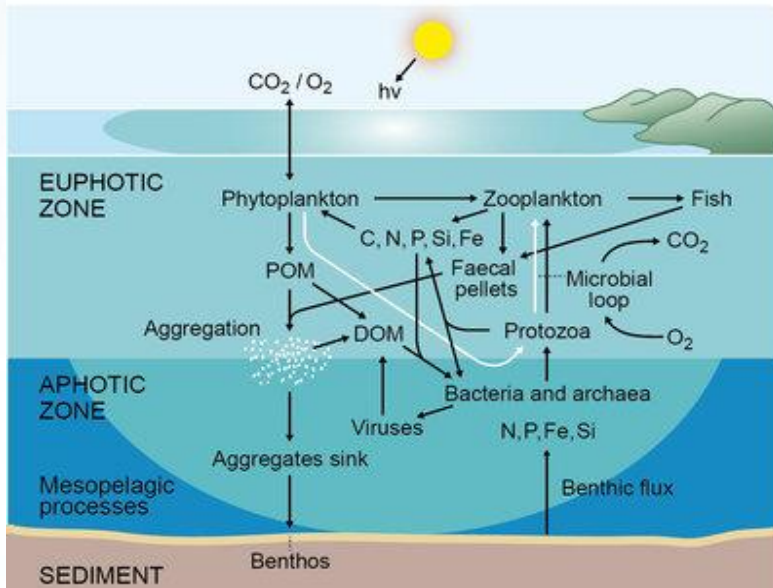
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Nutrients and Oxygen Distribution

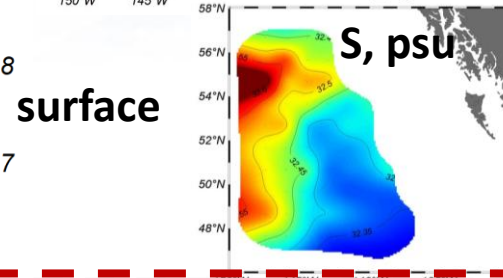
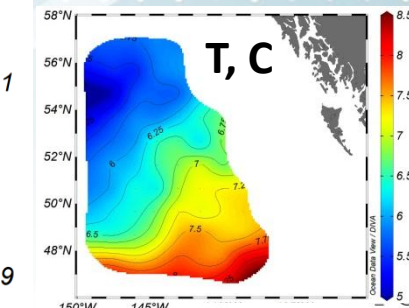
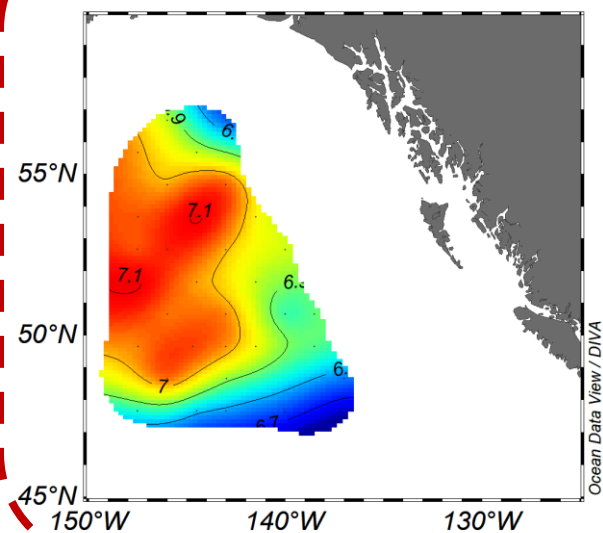


- Content of dissolved oxygen and nutrients concentration depend on physical and biochemical processes



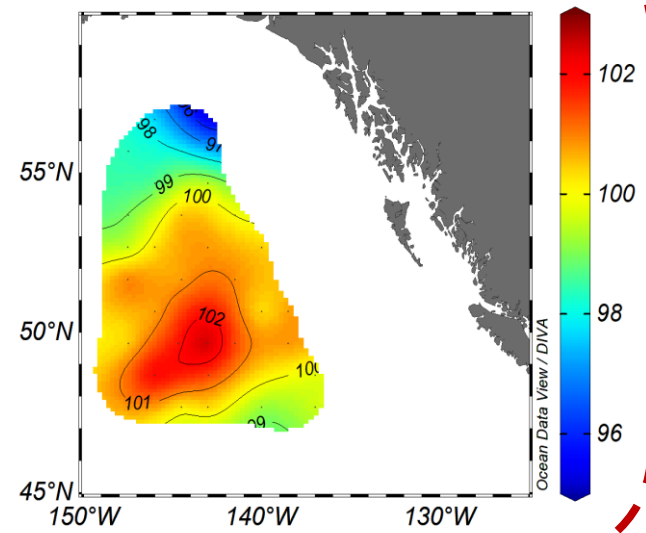
Surface Oxygen Distribution

Surface Dissolved Oxygen, mL/L

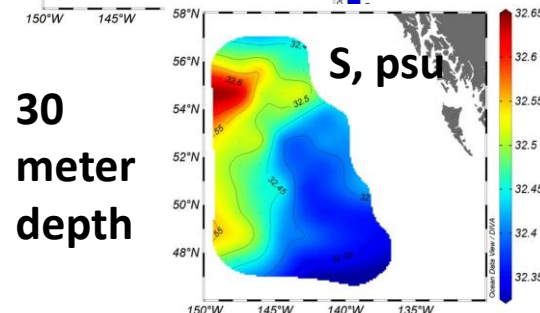
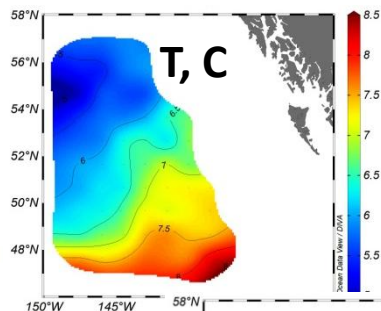
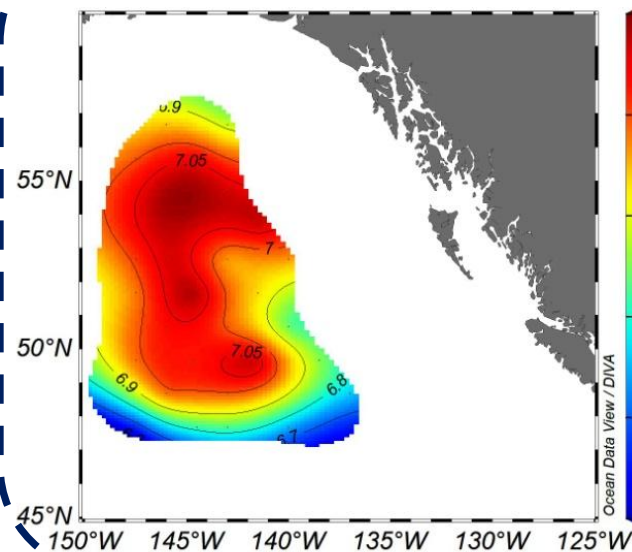


surface

Surface Oxygen Saturation, %

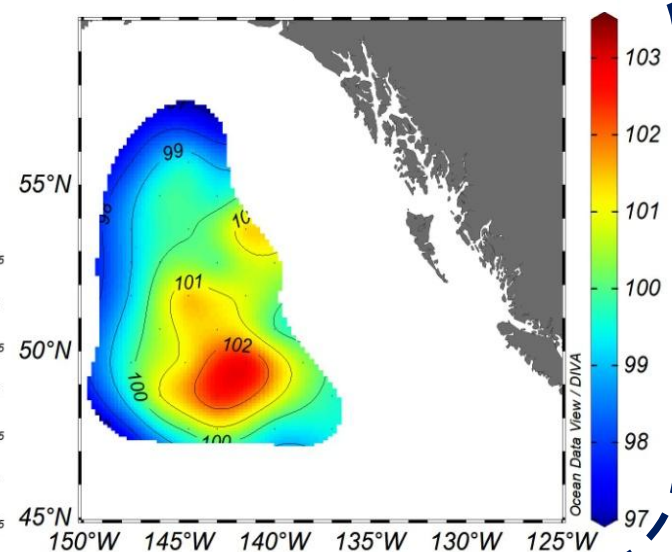


Subsurface Dissolved Oxygen, mL/L



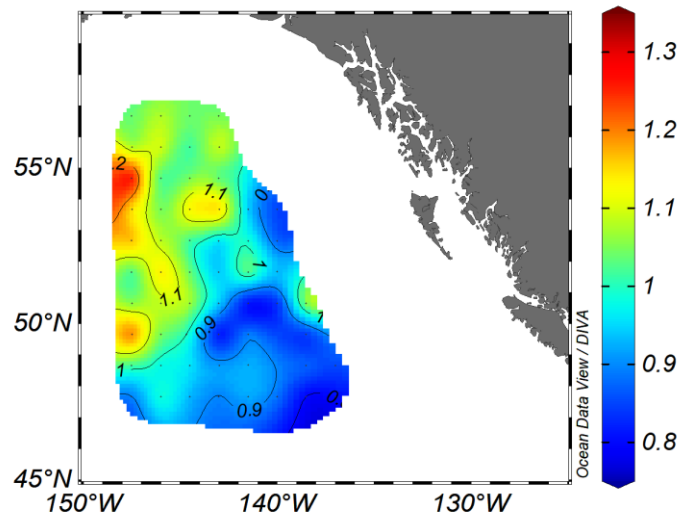
30
meter
depth

Subsurface Oxygen Saturation, %

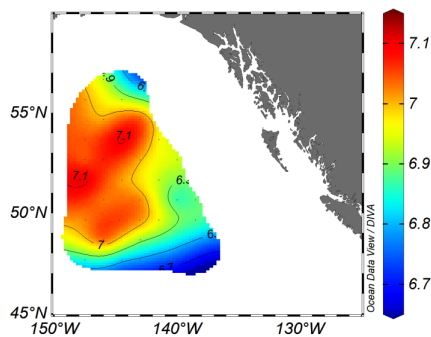


Surface Nutrients Distribution

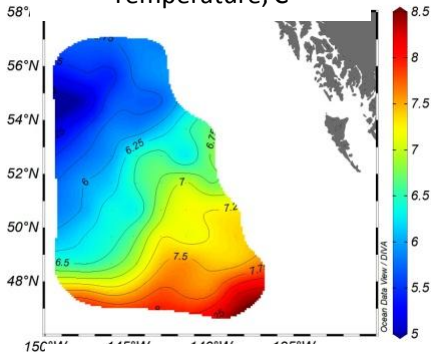
Phosphates $\mu\text{M/L}$



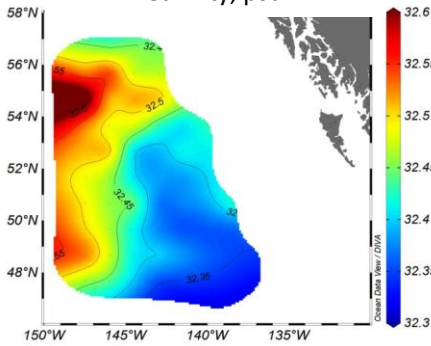
Dissolved Oxygen, mL/L



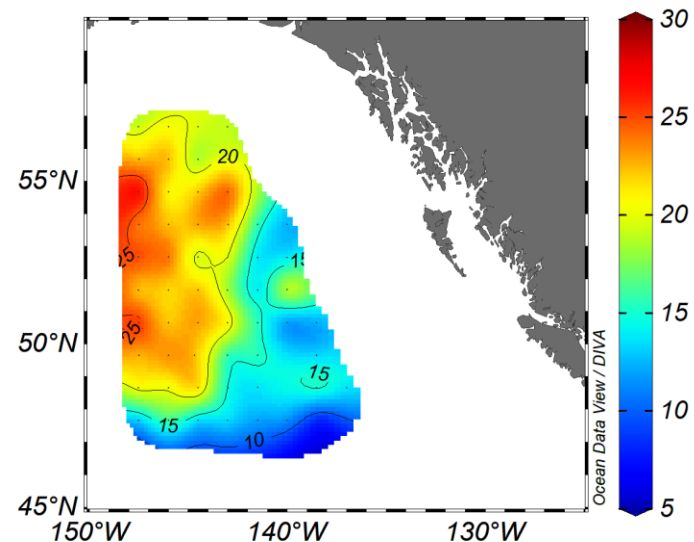
Temperature, C



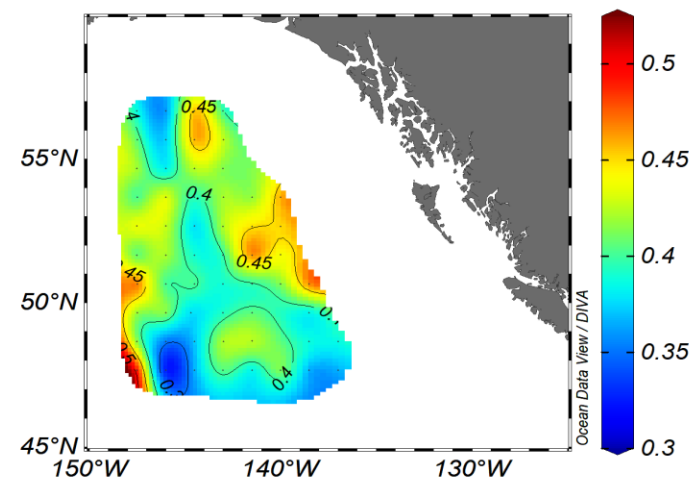
Salinity, psu



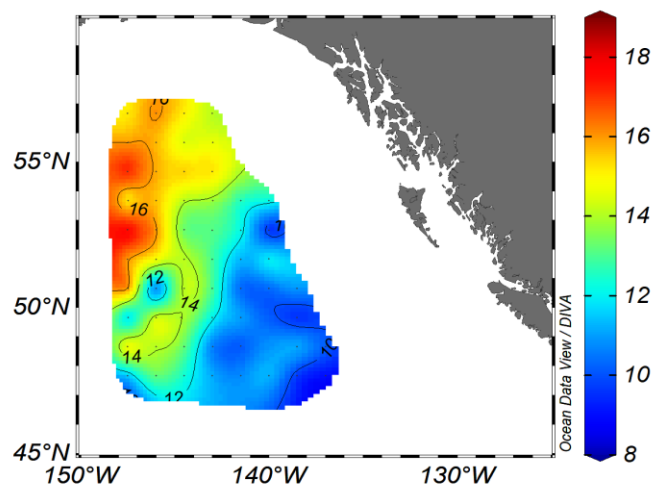
Silicates $\mu\text{M/L}$



Nitrite $\mu\text{M/L}$

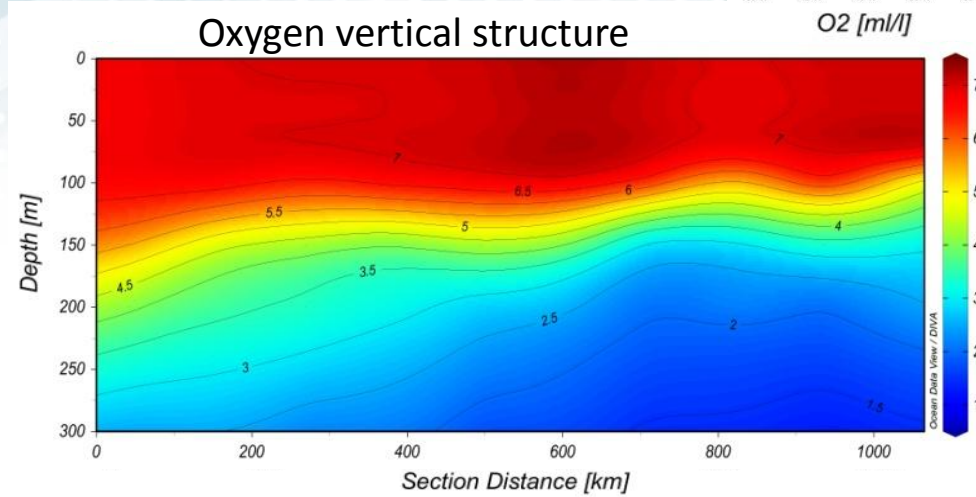
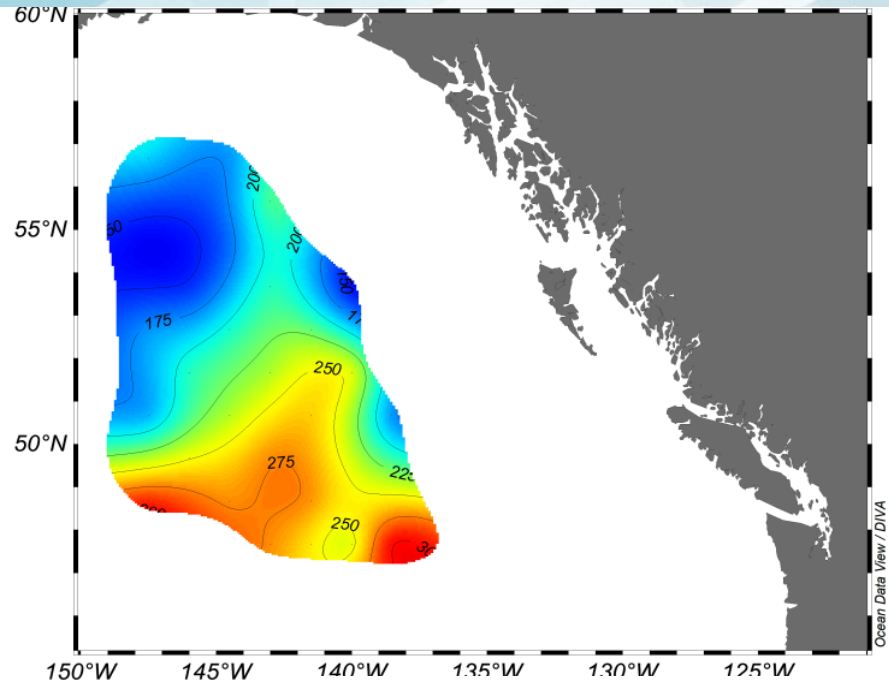
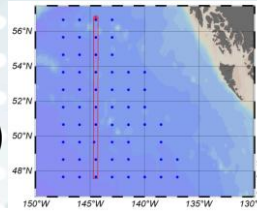


Nitrate $\mu\text{M/L}$

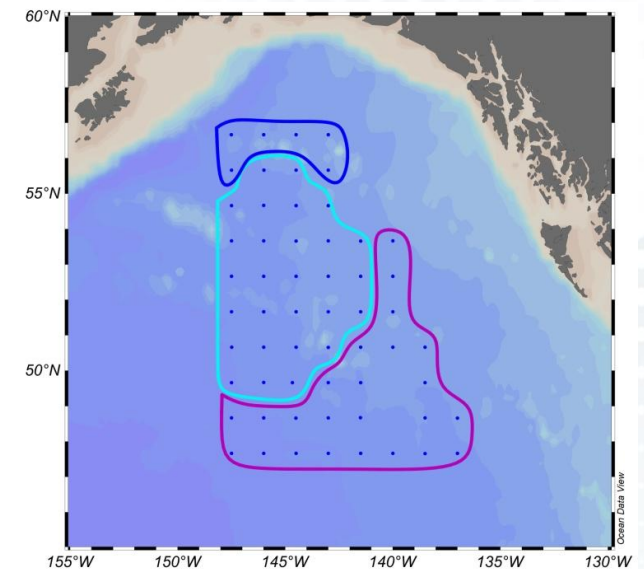
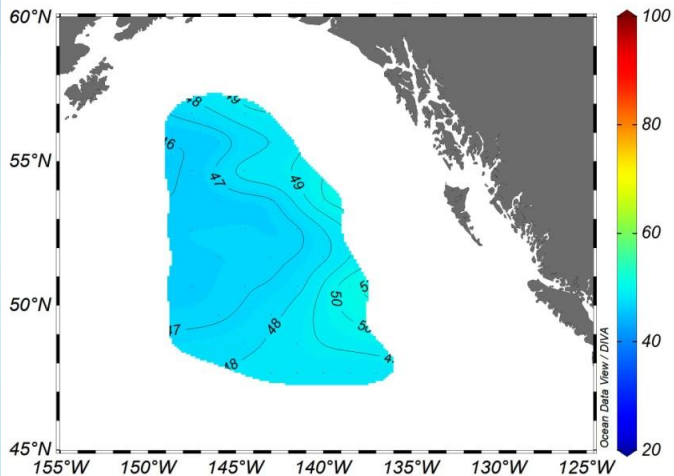


Critical oxygen depth (2.5 mL/L)

In the north, the depth of DO 2.5 mL/L is shallower (175 m) than in the south (300m)

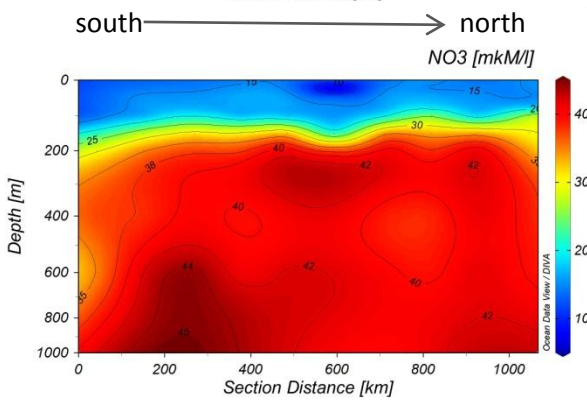
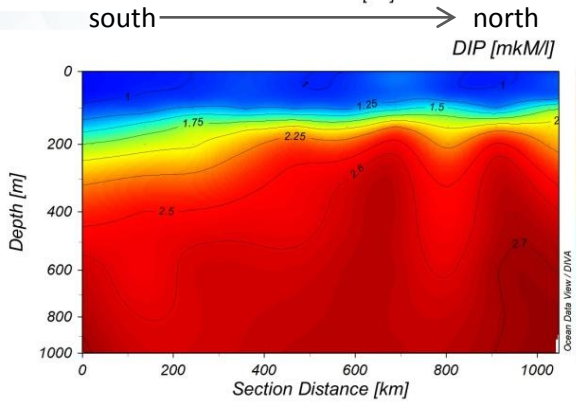
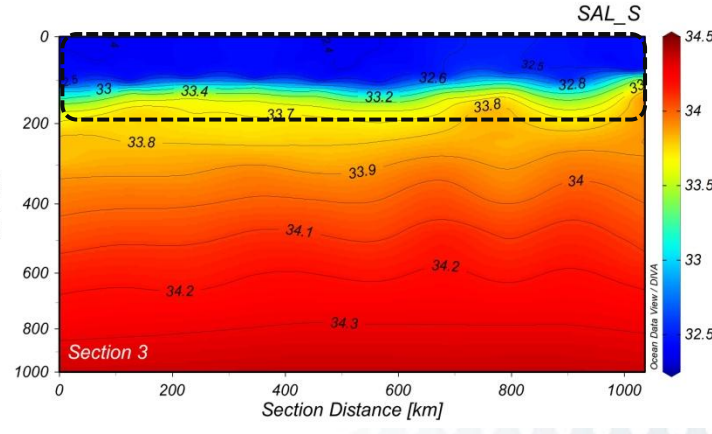
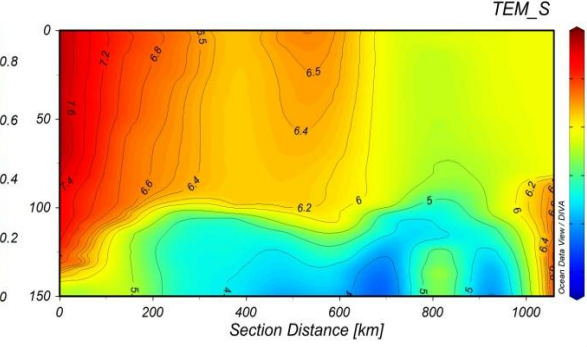
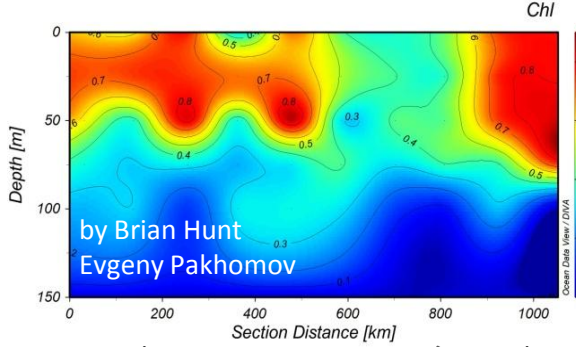
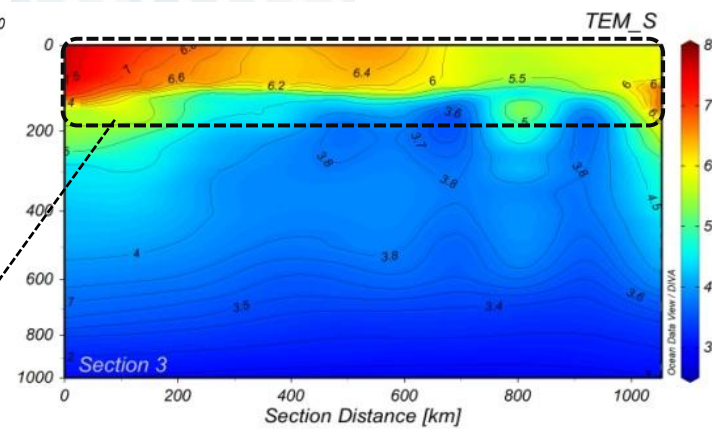
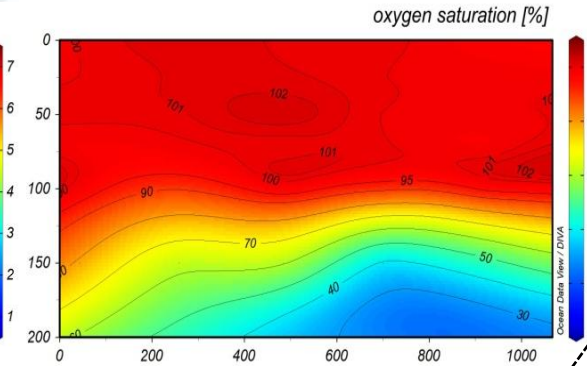
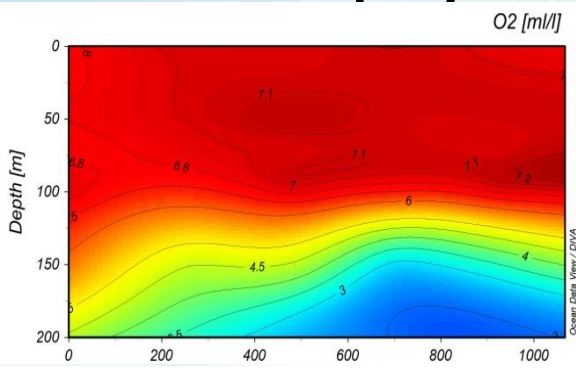
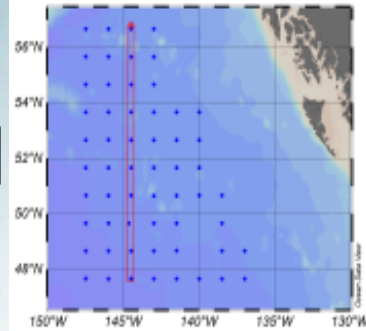


Oxygen saturation % at this depths



Base for productivity

Vertical structure of nutrients, oxygen and chlorophyll



south → north

south → north

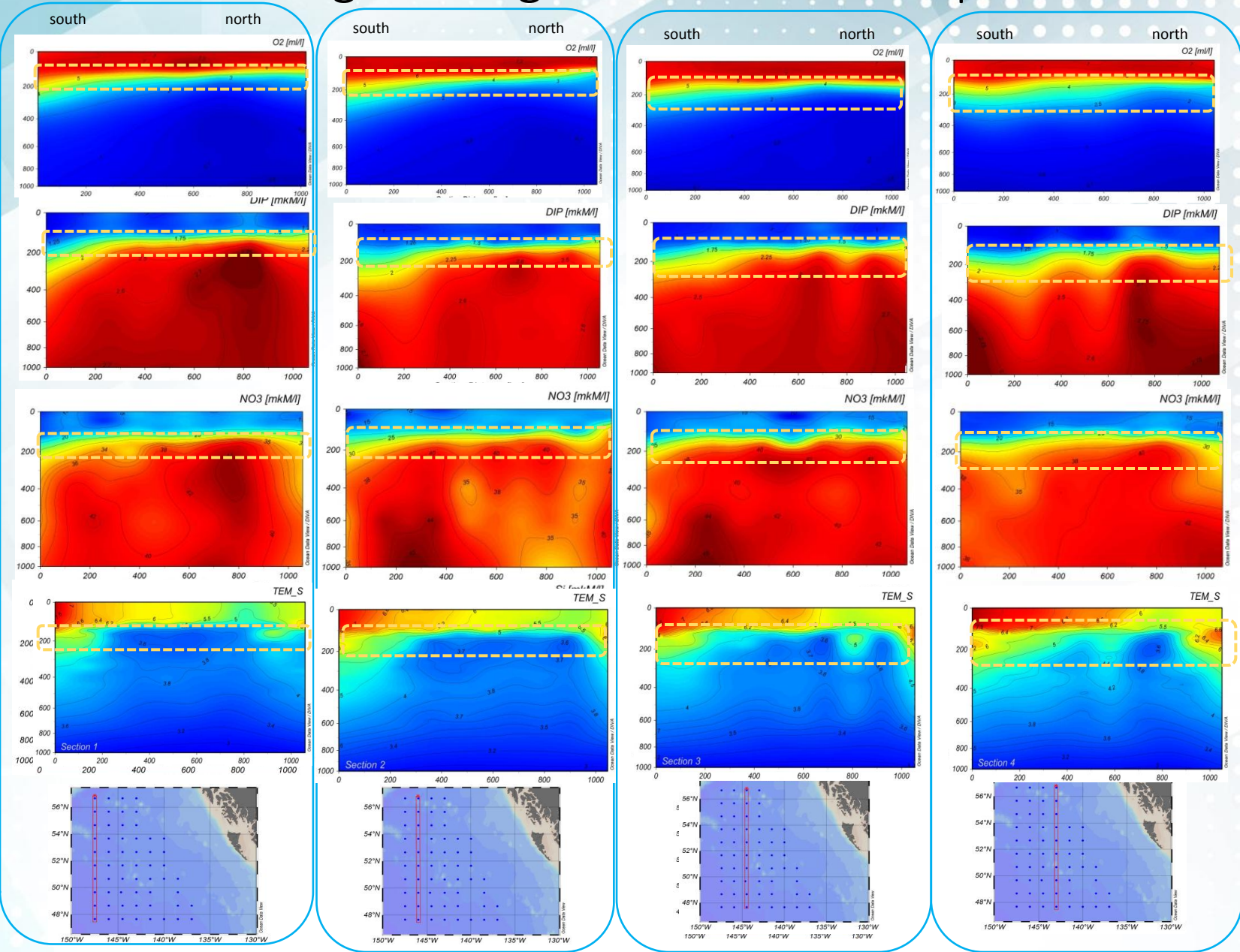
DIP [mKM]

NO3 [mKM]

by Brian Hunt
Evgeny Pakhomov

Vertical structure of nutrients and oxygen

Softening of the gradient from the open to the shore



Oxygen

Phosphates

Nitrates

Temperature

Highlights of oceanographic and chemical studies

Currents/ Watermasses

During the expedition, typical patterns of water circulation in the Gulf of Alaska were observed.

Distribution of nutrients and their vertical structure show a large pre-vegetation supply and reflect the dynamics of currents.

Nutrients

Oxygen

High oxygen saturation was in the upper 100 meter layer. Oxygen content and saturation indicate that the spring blooming has begun only in some part.

In early spring, chlorophyll concentrates in the pycnocline between different water masses where oxygen supersaturation occurs

Base for productivity



Conclusions

- Two domains are determined within the surveyed area
 - 1) The first domain was located in the northwestern part of the area, where the cyclonic circulation of the Subarctic gyre provides high concentrations of dissolved oxygen and nutrients.
 - 2) The second domain was influenced by both Subarctic front and the coastal processes that forms its transformed waters of the Gulf of Alaska. In this area, oxygen content and pre-vegetative concentrations of nutrients were lower.
- Below the thermocline (~200 m), the maximum concentrations of silicon, dissolved phosphate and nitrogen were observed in the centre of Subarctic gyre. The nutrients concentrations decreased southward.

- Noting the ocean acidification is very acute topic, pH measuring should be included in the plan of next expeditions.
- Chemical observations make possible to identify the areas of heightened productivity and to assess the state of ecosystem. Besides, chemical data could be used as additional parameters of water masses, gradient zones, or dynamically active areas.

THANK YOU

