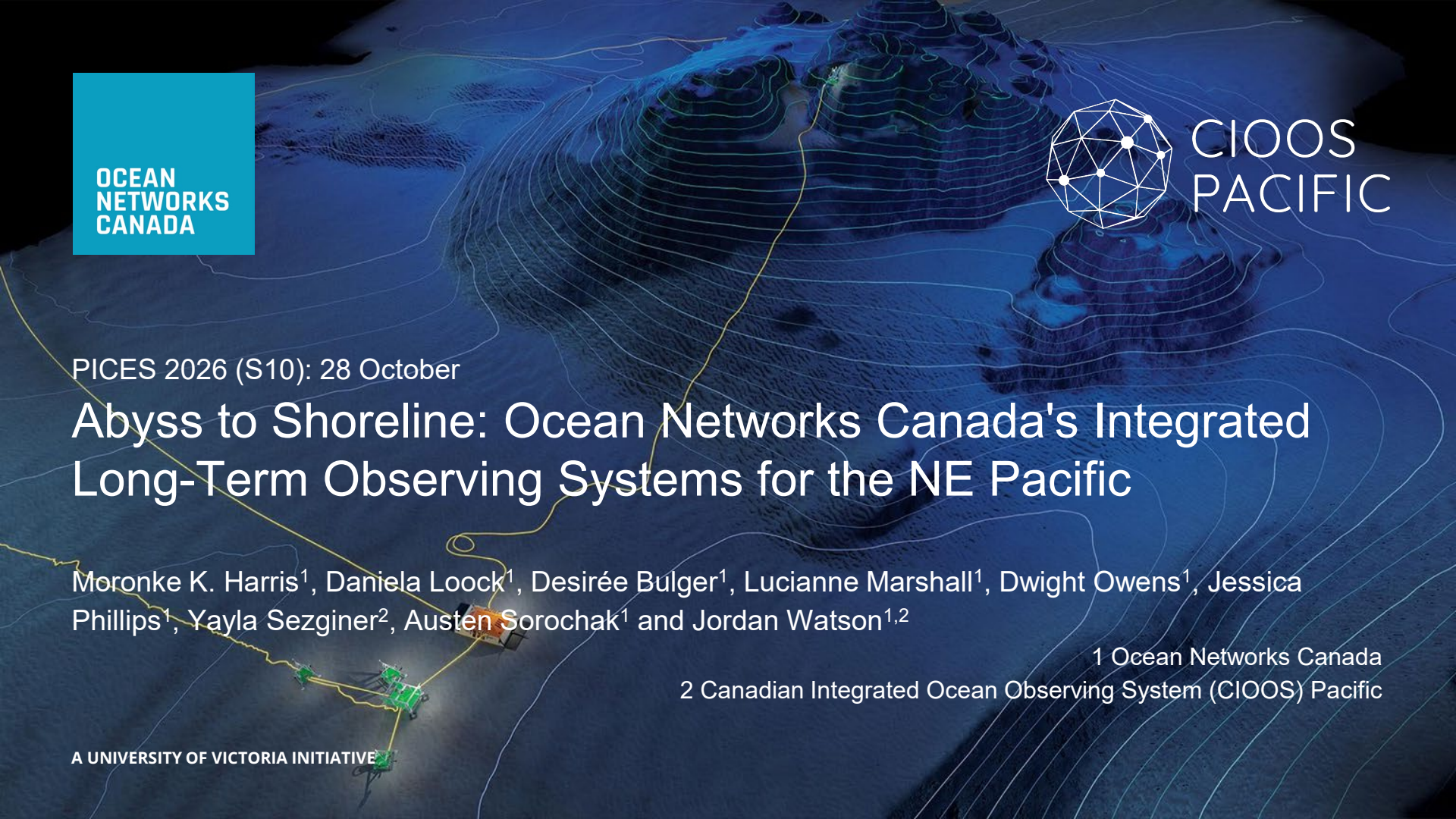


OCEAN NETWORKS CANADA

CIOOS PACIFIC

PICES 2026 (S10): 28 October

# Abyss to Shoreline: Ocean Networks Canada's Integrated Long-Term Observing Systems for the NE Pacific

Moronke K. Harris[1], Daniela Loock[1], Desirée Bulger[1], Lucianne Marshall[1], Dwight Owens[1], Jessica Phillips[1], Yayla Sezginer[2], Austen Sorochak[1] and Jordan Watson[1,2]

1 Ocean Networks Canada

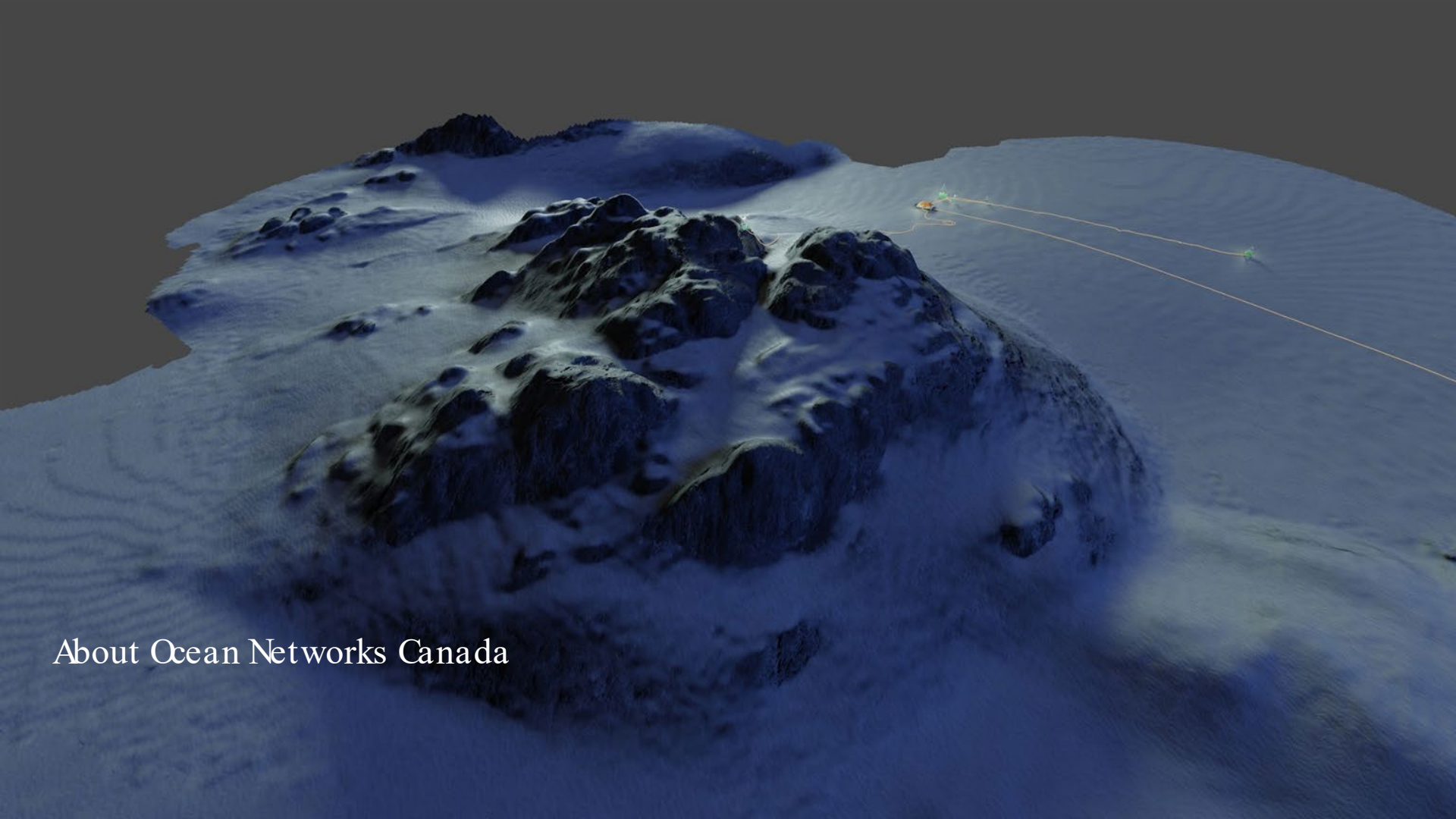
2 Canadian Integrated Ocean Observing System (CIOOS) Pacific

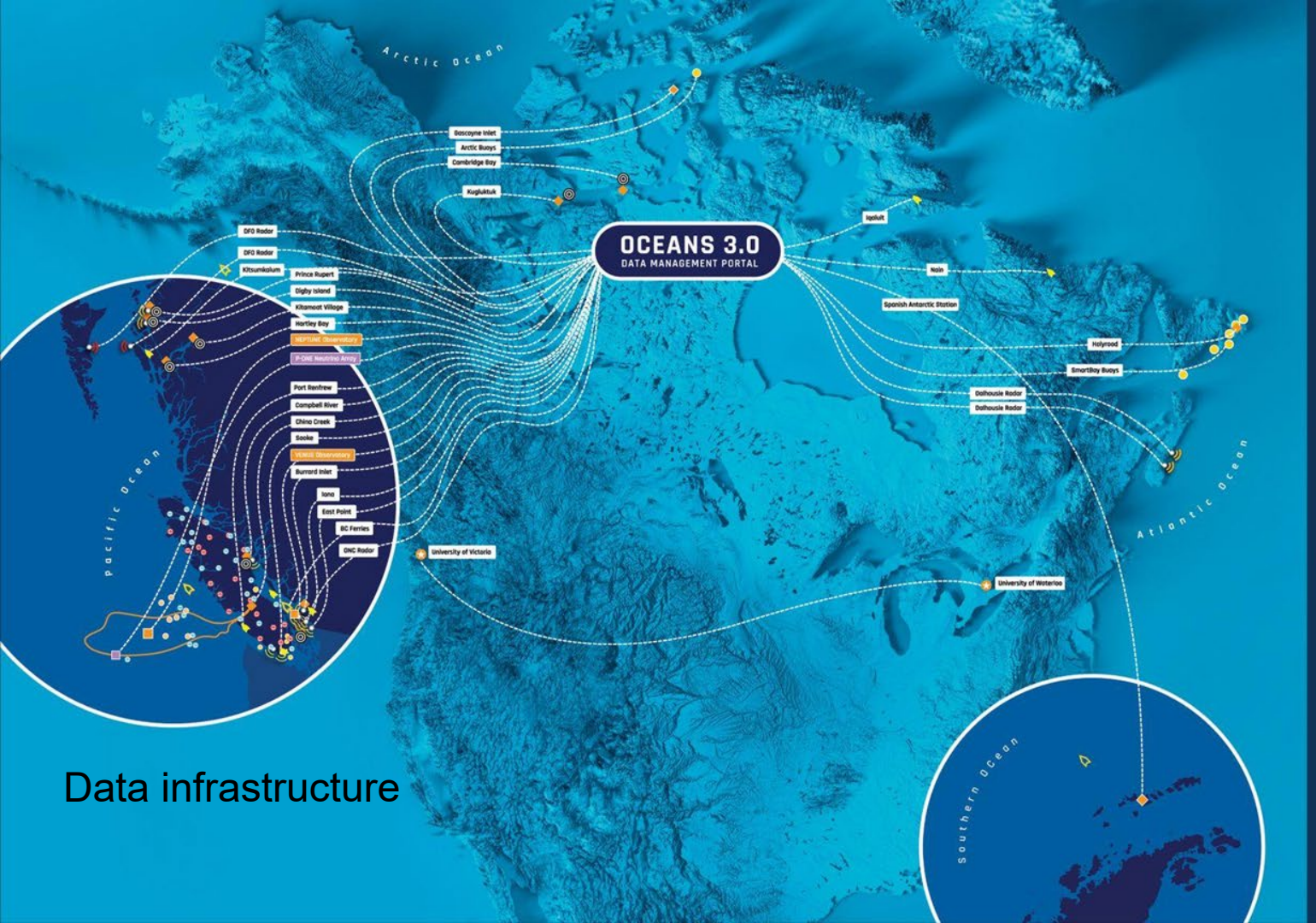
A UNIVERSITY OF VICTORIA INITIATIVE



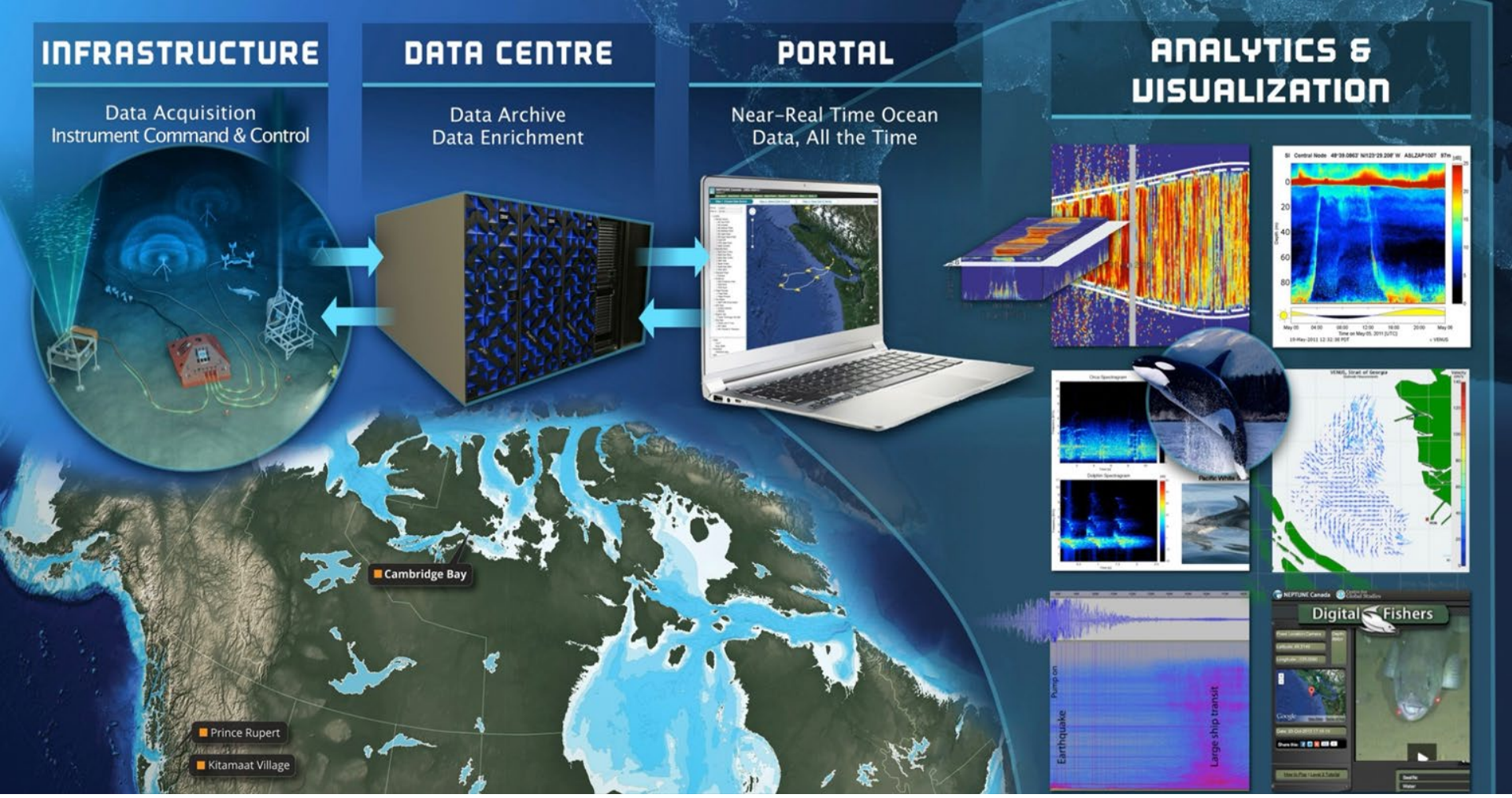
Credit:
Snuneymuxw First Nation


Why Sustained Observations Matter
Separate signal from variability
Put extreme events into context


About Ocean Networks Canada




# Data infrastructure




QEGCP"PGWYQTMU"ECPCFC"Yqtnf"Ngcfkpi"Fkueqxgtkgu"cv"c"Etkvkecn"Vko g

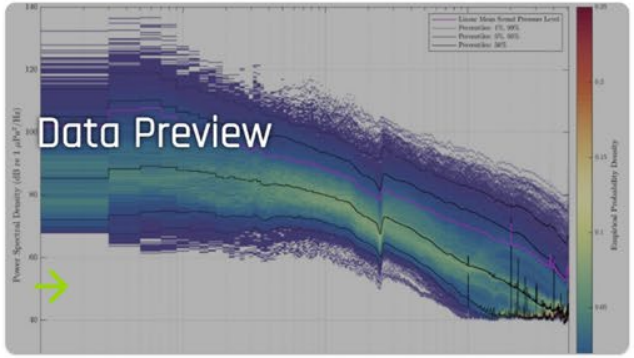
OCEAN NETWORKS CANADA

data.oceannetworks.ca

Log In

# Oceans 3.0 Data Portal

Search, preview, download and visualize data from cabled observatories, mobile platforms and autonomous instruments.



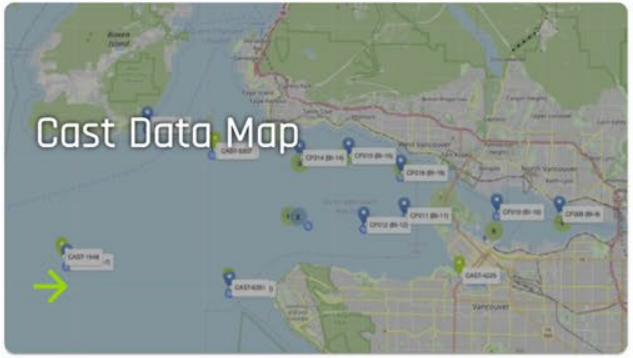
















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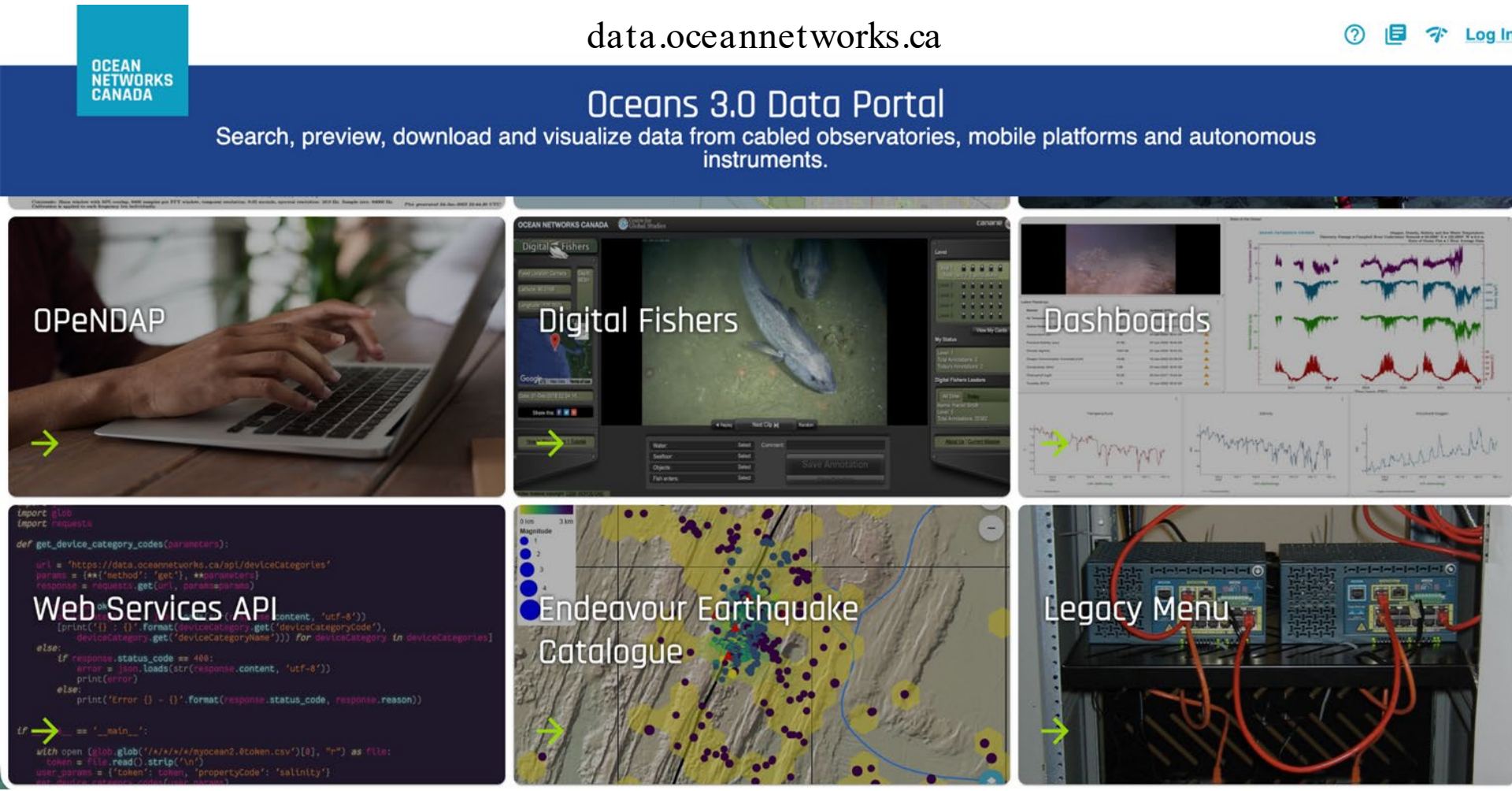
data.oceannetworks.ca

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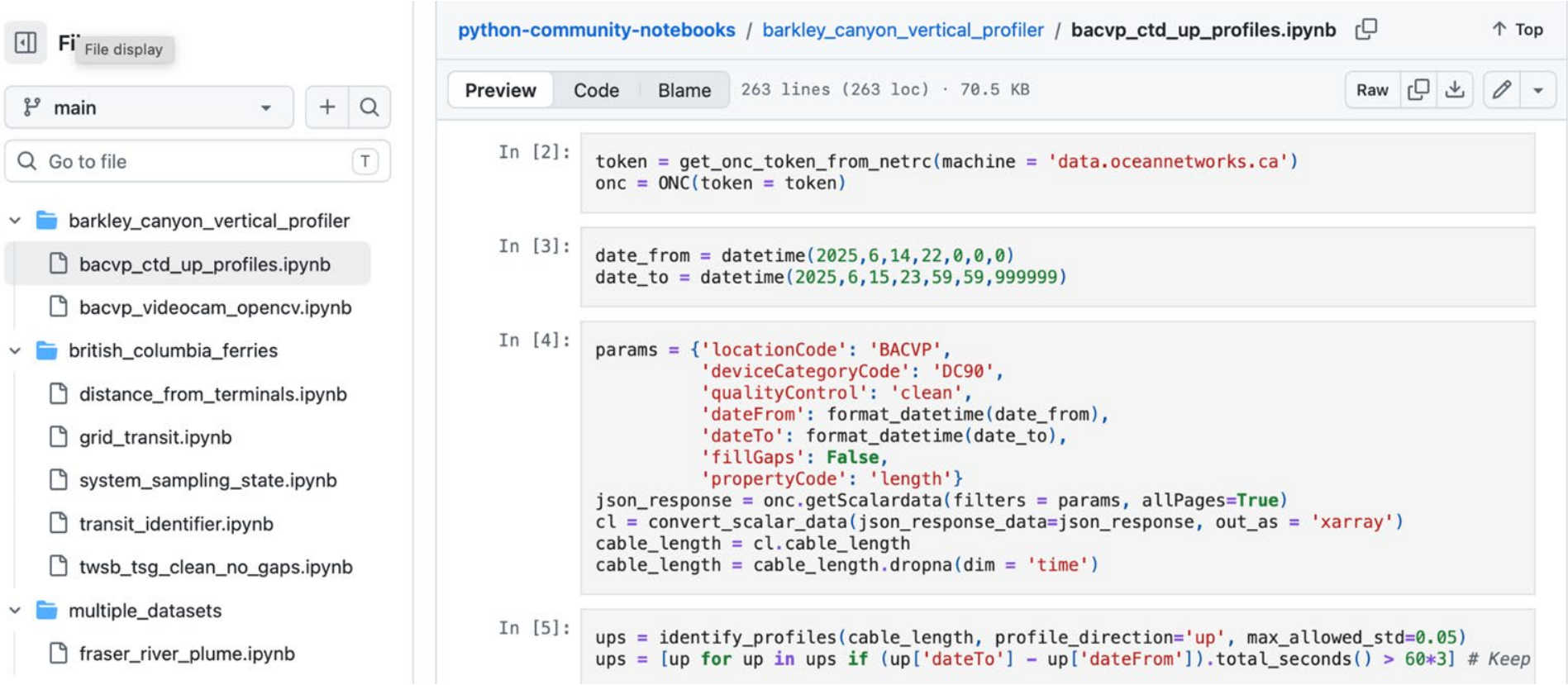
# Application Programming Interface for programmatic access to data



Fi File display

main

Go to file T

- barkley_canyon_vertical_profiler
  - bacvp_ctd_up_profiles.ipynb
  - bacvp_videocam_opencv.ipynb
- british_columbia_ferries
  - distance_from_terminals.ipynb
  - grid_transit.ipynb
  - system_sampling_state.ipynb
  - transit_identifier.ipynb
  - twsb_tsg_clean_no_gaps.ipynb
- multiple_datasets
  - fraser_river_plume.ipynb

python-community-notebooks / barkley_canyon_vertical_profiler / bacvp_ctd_up_profiles.ipynb

Top

Preview | Code | Blame | 263 lines (263 loc) · 70.5 KB | Raw

In [2]:
```
token = get_onc_token_from_netrc(machine = 'data.oceannetworks.ca')
onc = ONC(token = token)
```

In [3]:
```
date_from = datetime(2025,6,14,22,0,0,0)
date_to = datetime(2025,6,15,23,59,59,999999)
```

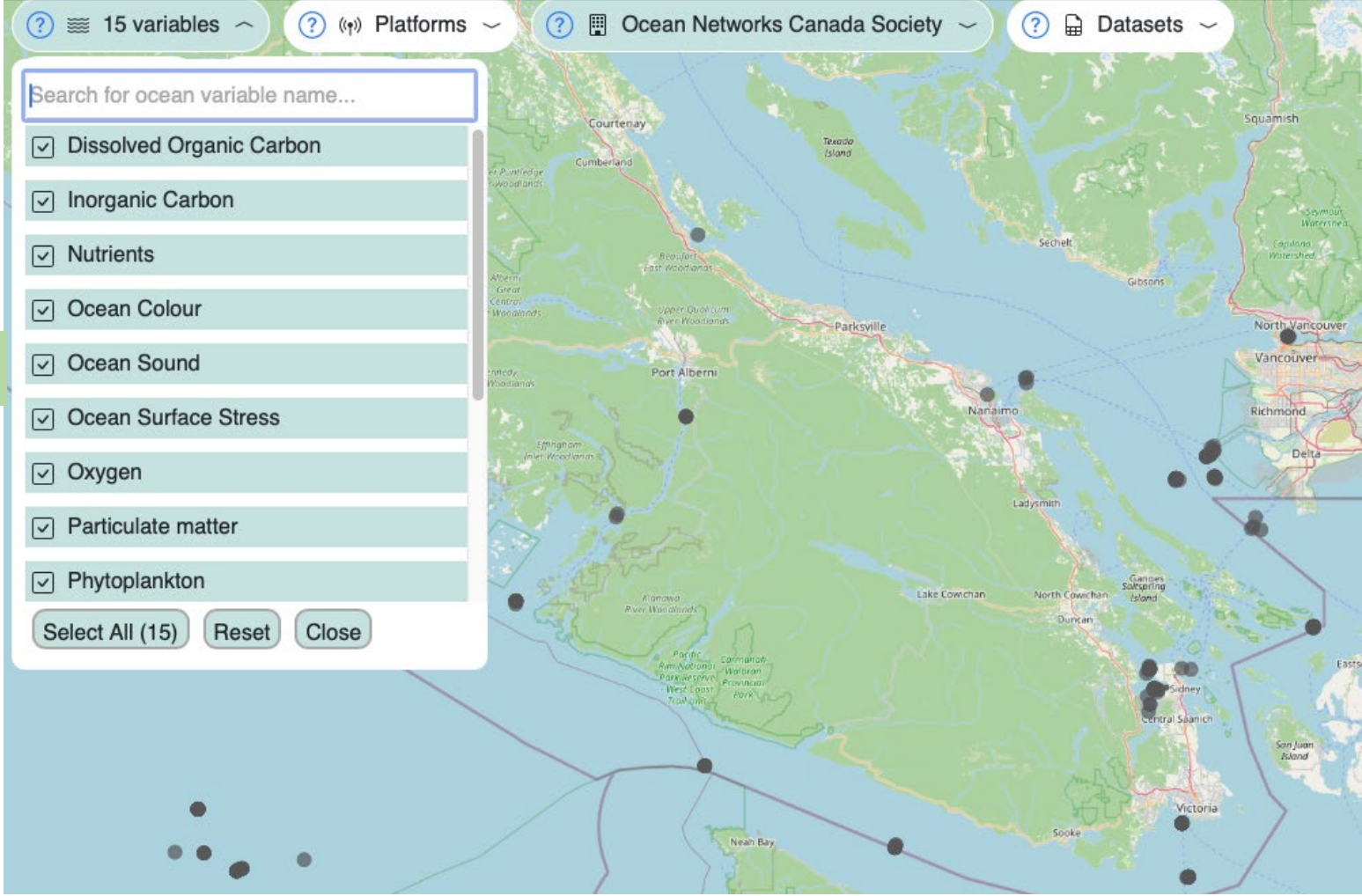
In [4]:
```
params = {'locationCode': 'BACVP',
          'deviceCategoryCode': 'DC90',
          'qualityControl': 'clean',
          'dateFrom': format_datetime(date_from),
          'dateTo': format_datetime(date_to),
          'fillGaps': False,
          'propertyCode': 'length'}
json_response = onc.getScalardata(filters = params, allPages=True)
cl = convert_scalar_data(json_response_data=json_response, out_as = 'xarray')
cable_length = cl.cable_length
cable_length = cable_length.dropna(dim = 'time')
```

In [5]:
```
ups = identify_profiles(cable_length, profile_direction='up', max_allowed_std=0.05)
ups = [up for up in ups if (up['dateTo'] - up['dateFrom']).total_seconds() > 60*3] # Keep
```

DATA
EXPLORER

explore.cioos.ca

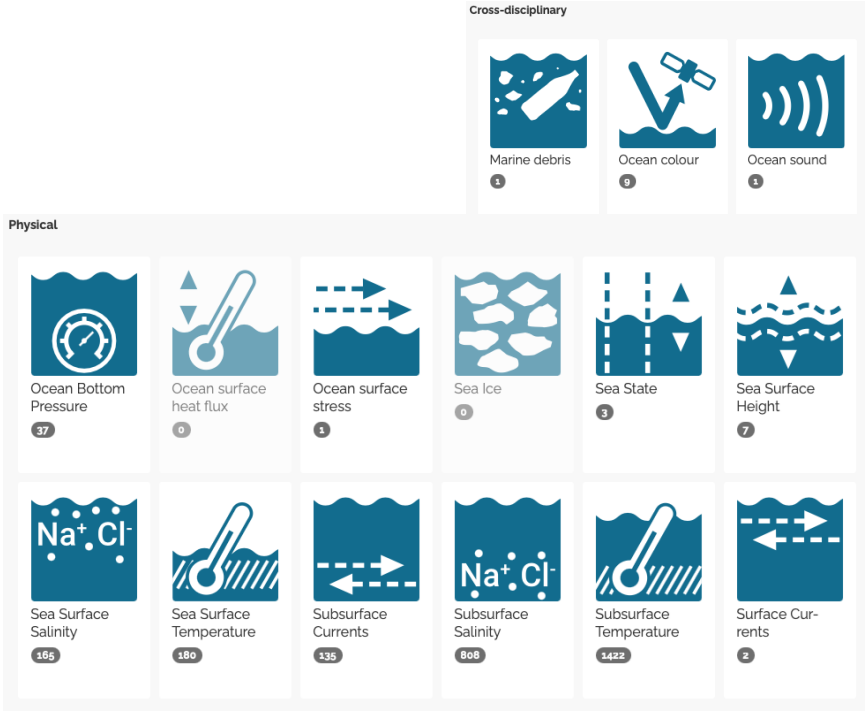
Interoperable data integration supporting FAIR data repositories

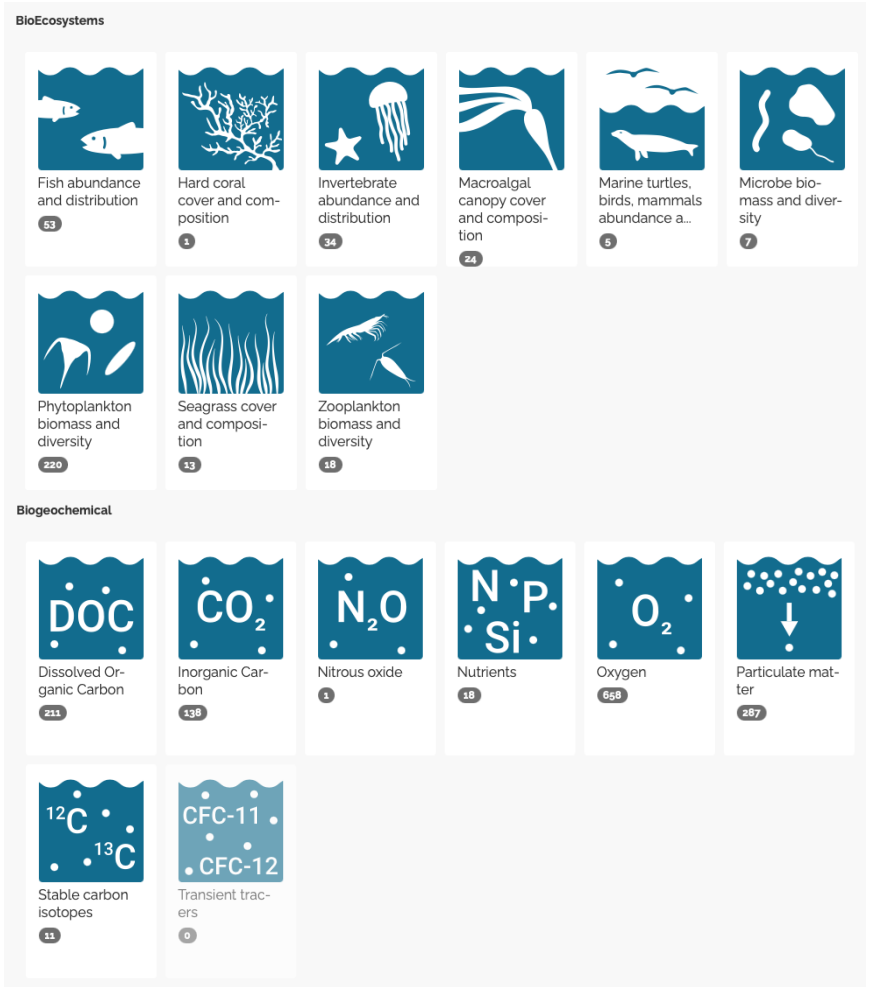



QEGCP"PGWYQTMU"ECPCFC"Yqtnf"Ngcfkpi"Fkueqxgtkgu"cv"c"Etkvkecn"Vko g

# Physical, Chemical, Biological parameters

## Wide variety of Essential Ocean Variable time series support wide variety of research questions

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# CIOOS PACIFIC

CIOOS RA Databases

FAIR and standardized data and metadata (ISO 19115)

CIOOS Data provider & user network

Academia

Government

OCEAN NETWORKS CANADA

Industry

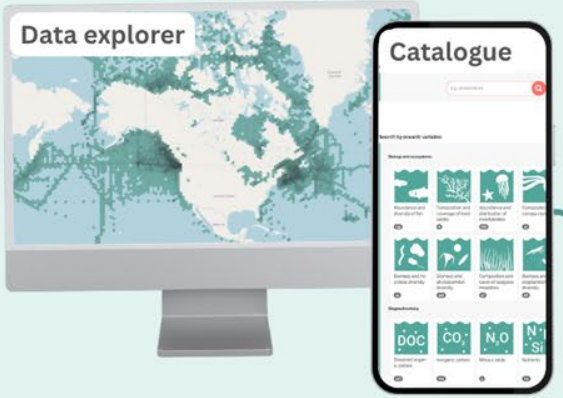
Indigenous

Recreation

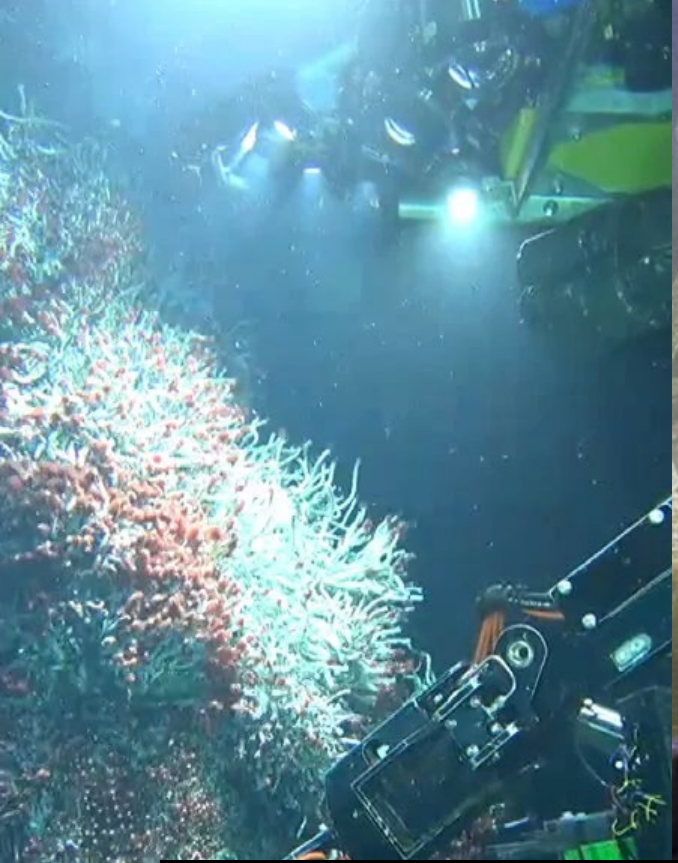
Regional data visualization tools

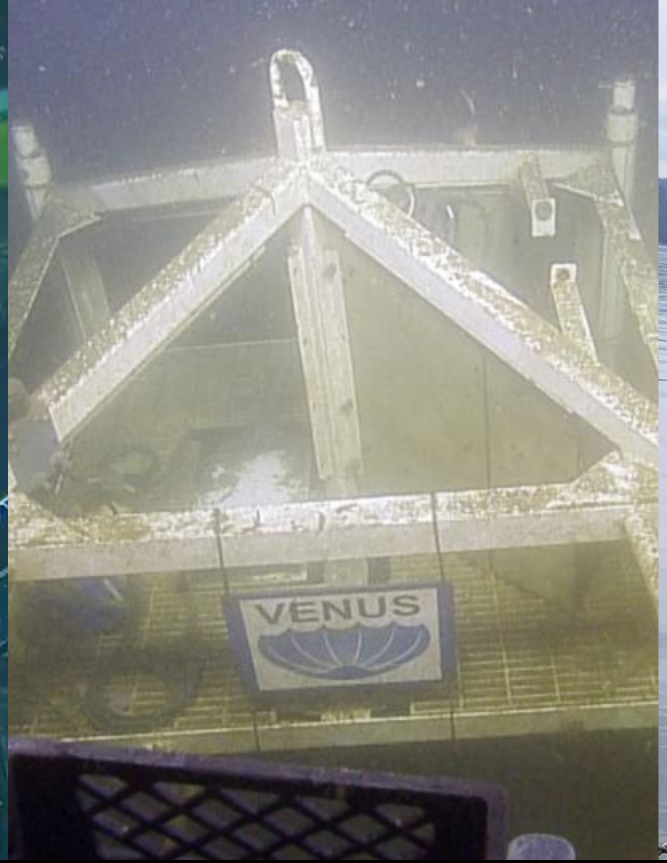


National discovery tools




Feedback

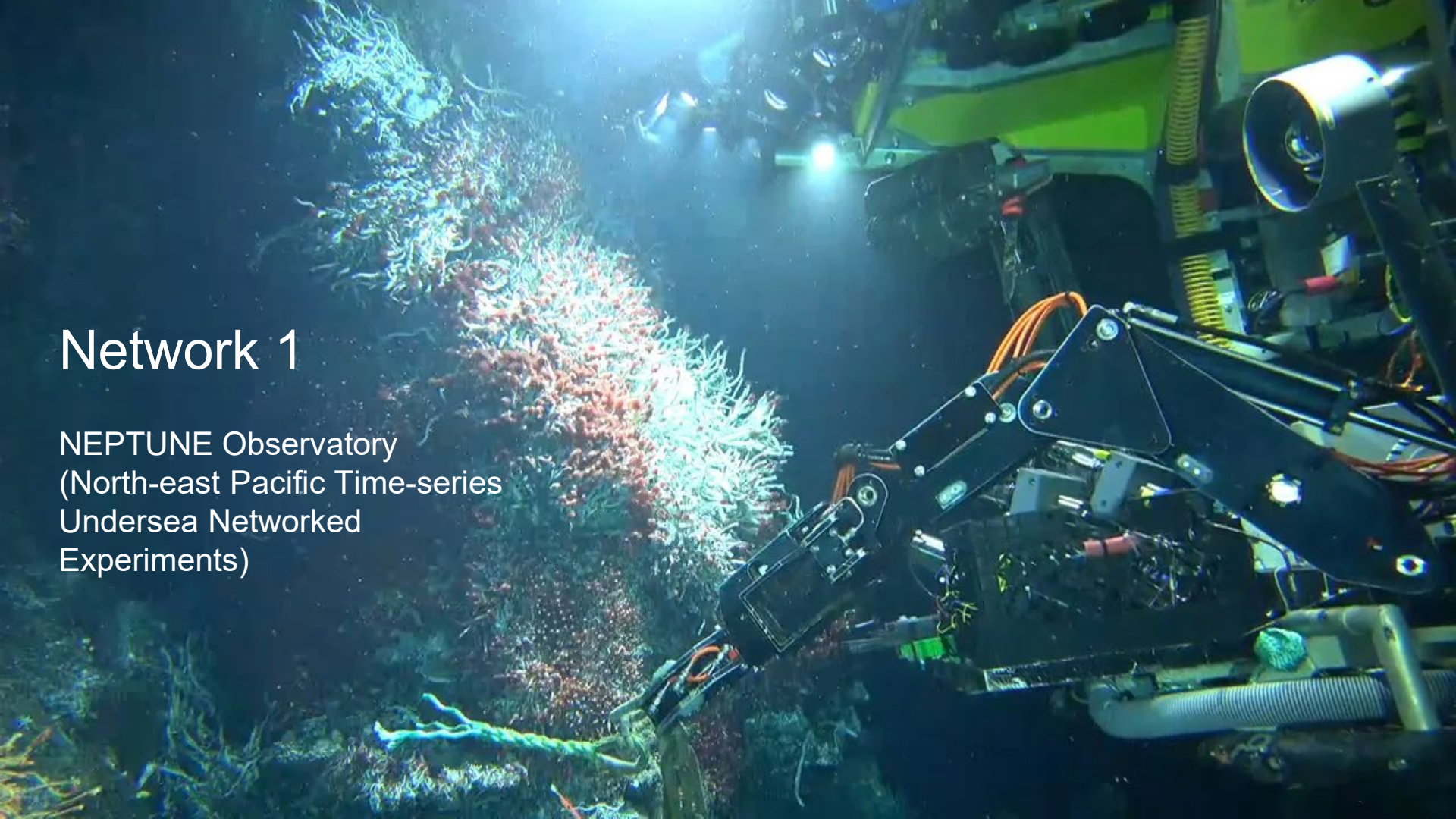






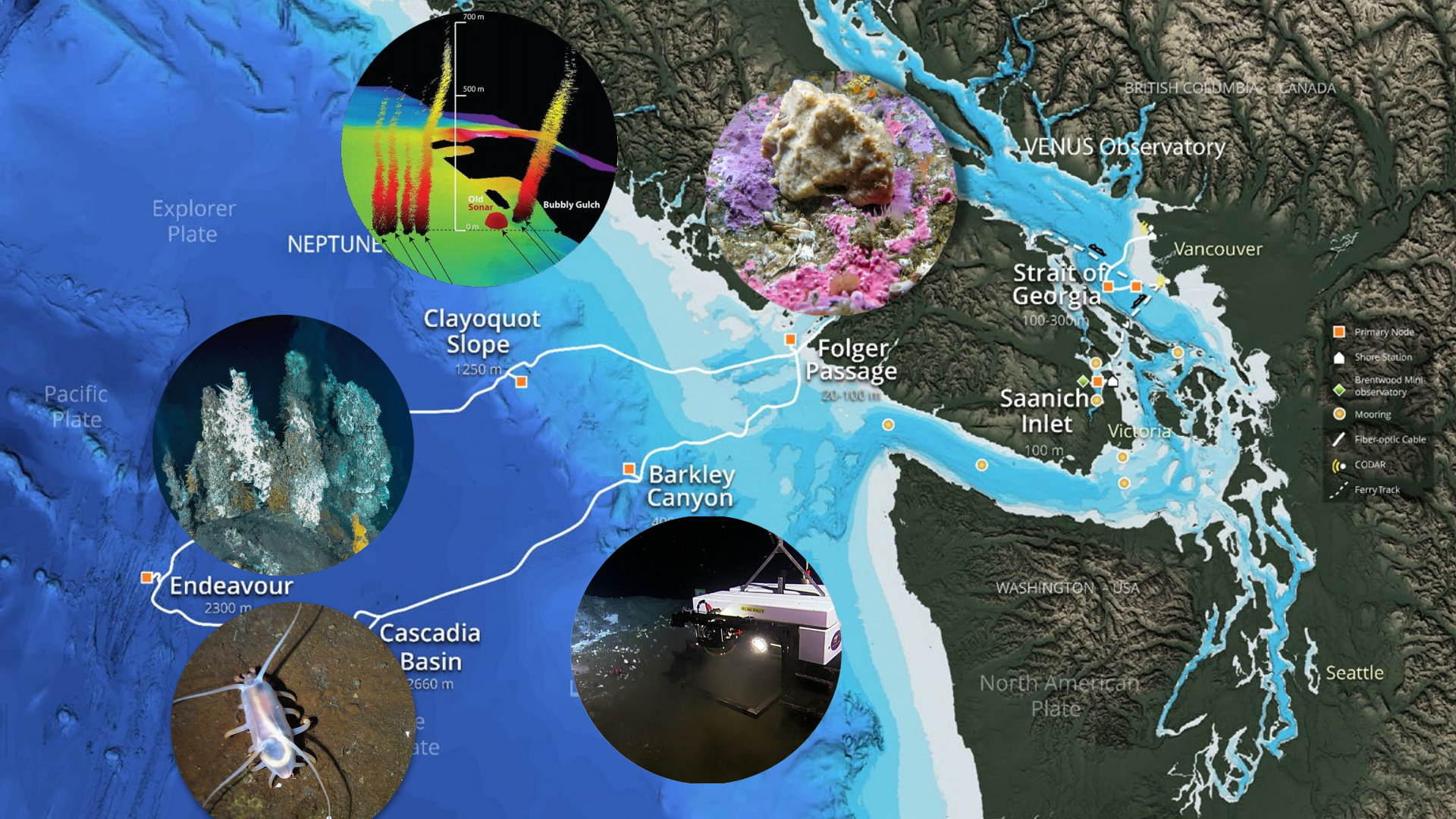

ONC operates ocean observatories across many oceans, running from the deep offshore to nearshore coastal communities, and all the data are freely and openly available.


OCEAN NETWORKS CANADA
SOUTHERN BRITISH COLUMBIA INFRASTRUCTURE
BRITISH COLUMBIA
Campbell River / Kwakwaka'wakw / Coast Salish Territory
Campbell River
Strait of Georgia
Squamish / Coast Salish Territory
VANCOUVER ISLAND
See Inset Map
Port Alberni / Nuu-chah-nulth Territory
Tofino / Nuu-chah-nulth Territory
China Creek
Nanaimo / Coast Salish Territory
Vancouver / Coast Salish Territory
Victoria / Coast Salish Territory
Juan de Fuca Strait
EXPLORER PLATE
Clayoquot Slope
1250 m
Middle Valley
2400 m
NEPTUNE Observatory
Barkley Canyon
400 m - 1000 m
Endeavour
2300 m
Cascadia Basin
2660 m
Tang.oxan - ɬaʔɑ̓ɣʷiqaʔak - Tsig̓is Marine Protected Area
PACIFIC PLATE
PACIFIC OCEAN
JUAN DE FUCA PLATE
NORTH AMERICAN PLATE
WASHINGTON - USA
VENUS Observing Systems
Burrard Inlet/ Tsleil-Waututh Nation
Vancouver/ Coast Salish Territory
Strait of Georgia
100 m - 300 m
Central Node
East Node
VANCOUVER ISLAND
Saanich Inlet
100 m
Kilometres
0 10 20 30 40
Coastal Community Observatory
Node
Shore Station
Mooring
RADAR
AIS Receiver (Ocean Networks Canada)
AIS Receiver (Canadian Coast Guard)
Geodesy Experiment
Fibre-optic Cable
Instrumented Ferry Route
Fault Line
Subduction Zone
Spreading Centre
Bathymetry (m)
0
-3500
N
W
E
S
100 km
A UNIVERSITY OF VICTORIA INITIATIVE
Data Sources: USGS Cascadia, Natural Resources Canada DEM, Canadian Hydrographic Service Bathymetry (license 2015-1001-1260-V), GeoBase Topography (Government of Canada, NOAA Agencies, NGDC, British Columbia Marine Conservation Analysis, Emergency Management BC, Alberni-Clayoquot Regional District, J.R. Delaney, D.S. Kelley, and D. Glickson, University of Washington (TN175Data), Ryan, W.B.F., S.M. Carbotte, J.O. Coplan, S. O'Hora, A. Melkonian, R. Arko, R.A. Weissel, V. Ferrini, A. Goodwillie, F. Nitsche, J. Bonczkowski, and R. Zemsky (2009), Global Multi-Resolution Topography synthesis, Geochem. Geophys. Geosyst., 10, Q03014, doi: 10.1029/2008GC002332. This product must not be used for navigation.
Datum: WGS84
Projection: Mercator
Last Updated: 16 June 2026



# Network 1

NEPTUNE Observatory
(North-east Pacific Time-series Undersea Networked Experiments)


700 m
500 m
Old Sonar
Bubbly Gulch
0 m
NEPTUNE
Explorer Plate
Pacific Plate
Clayoquot Slope
1250 m
Folger Passage
20-100 m
Barkley Canyon
Endeavour
2300 m
Cascadia Basin
2660 m
BRITISH COLUMBIA - CANADA
VENUS Observatory
Vancouver
Strait of Georgia
100-300 m
Saanich Inlet
100 m
Victoria
WASHINGTON - USA
Seattle
North American Plate
Primary Node
Shore Station
Brentwood Mini-observatory
Mooring
Fiber-optic Cable
CODAR
Ferry Track

# Network 2

VENUS Observatory
(Victoria Experimental
Network Under the Sea)




OCEAN NETWORKS CANADA
SOUTHERN BRITISH COLUMBIA INFRASTRUCTURE
BRITISH COLUMBIA
VANCOUVER ISLAND
Campbell River / Kwakwaka'wakw / Coast Salish Territory
Campbell River
Strait of Georgia
Squamish / Coast Salish Territory
See Inset Map
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China Creek
Nanaimo / Coast Salish Territory
Victoria / Coast Salish Territory
EXPLORER PLATE
Clayoquot Slope
1250 m
Middle Valley
2400 m
NEPTUNE Observatory
Barkley Canyon
400 m - 1000 m
Folger Passage
20 m - 100m
Juan de Fuca Strait
Tang.oxan - ɬaʔɑ̓ɣʷiqak - Tsig̓is Marine Protected Area
PACIFIC PLATE
Endeavour
2300 m
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JUAN DE FUCA PLATE
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PACIFIC OCEAN
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100 m - 300 m
Central Node
East Node
VANCOUVER ISLAND
Saanich Inlet
100 m
Kilometres
0 10 20 30 40
Coastal Community Observatory
Node
Shore Station
Mooring
RADAR
AIS Receiver (Ocean Networks Canada)
AIS Receiver (Canadian Coast Guard)
Geodesy Experiment
Fibre-optic Cable
Instrumented Ferry Route
Fault Line
Subduction Zone
Spreading Centre
Bathymetry (m)
0
-3500
N
W
E
S
100 km
A UNIVERSITY OF VICTORIA INITIATIVE
Data Sources: USGS Cascadia, Natural Resources Canada DEM, Canadian Hydrographic Service Bathymetry (license 2015-1001-1260-V), GeoBase Topography (Government of Canada, NOAA Agencies, NGDC, British Columbia Marine Conservation Analysis, Emergency Management BC, Alberni-Clayoquot Regional District, J.R. Delaney, D.S. Kelley, and D. Glickson, University of Washington (TN175Data), Ryan, W.B.F., S.M. Carbotte, J.O. Coplan, S. O'Hora, A. Melkonian, R. Arko, R.A. Weissel, V. Ferrini, A. Goodwillie, F. Nitsche, J. Bonczkowski, and R. Zemsky (2009), Global Multi-Resolution Topography synthesis, Geochem. Geophys. Geosyst., 10, Q03014, doi: 10.1029/2008GC002332. This product must not be used for navigation.
Datum: WGS84
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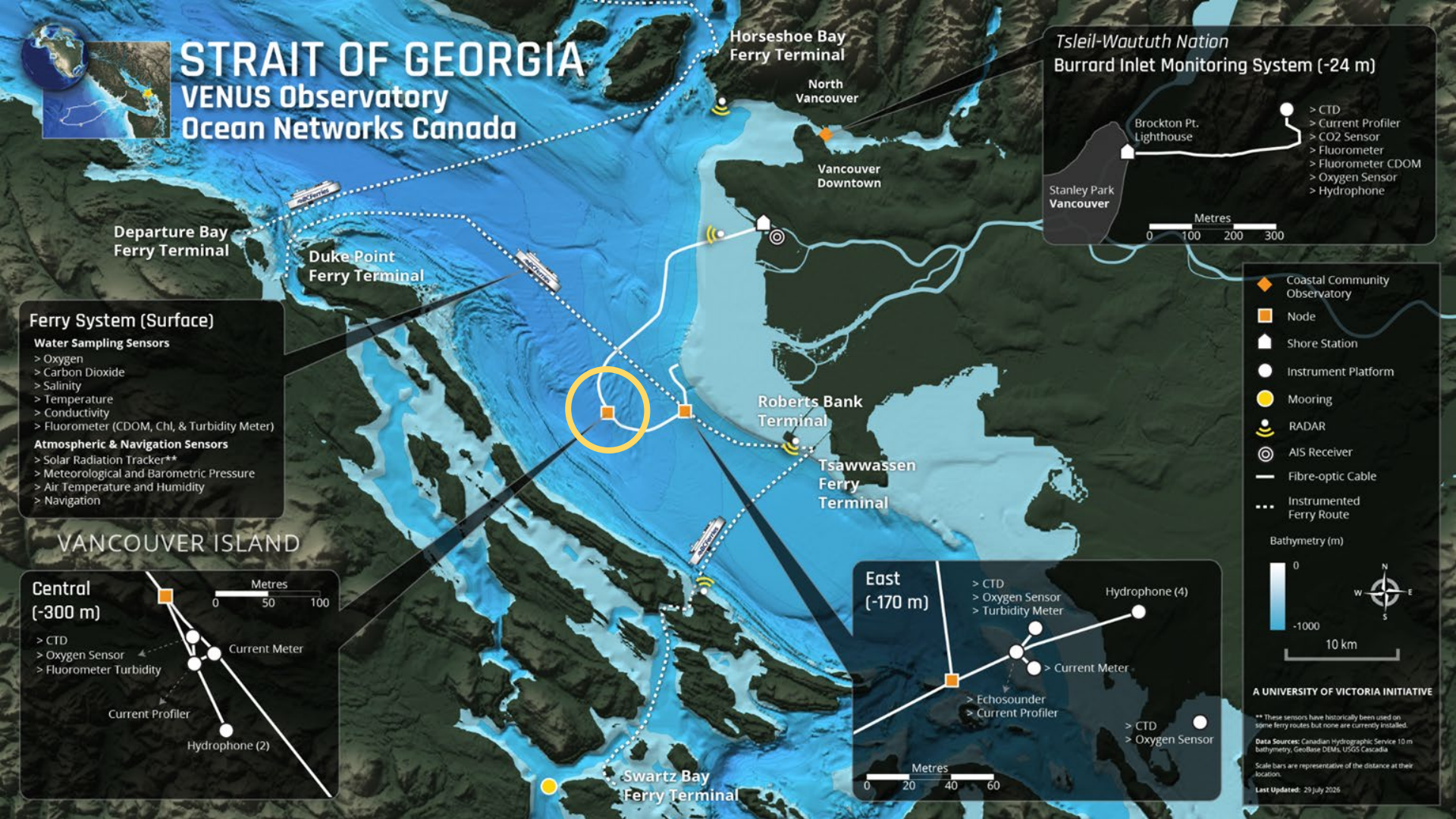
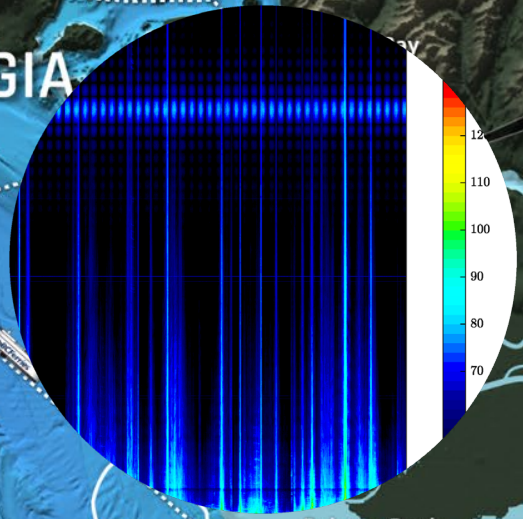
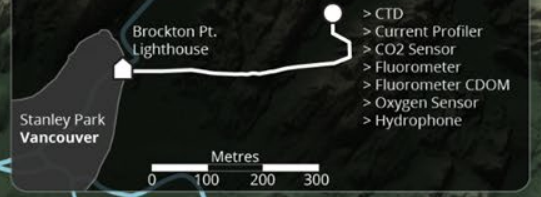

STRAIT OF GEORGIA
VENUS Observatory
Ocean Networks Canada
Horseshoe Bay Ferry Terminal
North Vancouver
Vancouver Downtown
Departure Bay Ferry Terminal
Duke Point Ferry Terminal
Roberts Bank Terminal
Tsawwassen Ferry Terminal
Swartz Bay Ferry Terminal
VANCOUVER ISLAND
Tsleil-Waututh Nation
Burrard Inlet Monitoring System (-24 m)
Brockton Pt. Lighthouse
Stanley Park
Vancouver
> CTD
> Current Profiler
> CO2 Sensor
> Fluorometer
> Fluorometer CDOM
> Oxygen Sensor
> Hydrophone
Metres
0 100 200 300
Ferry System (Surface)
Water Sampling Sensors
> Oxygen
> Carbon Dioxide
> Salinity
> Temperature
> Conductivity
> Fluorometer (CDOM, Chl, & Turbidity Meter)
Atmospheric & Navigation Sensors
> Solar Radiation Tracker**
> Meteorological and Barometric Pressure
> Air Temperature and Humidity
> Navigation
Central (-300 m)
Metres
0 50 100
> CTD
> Oxygen Sensor
> Fluorometer Turbidity
Current Meter
Current Profiler
Hydrophone (2)
East (-170 m)
> CTD
> Oxygen Sensor
> Turbidity Meter
Hydrophone (4)
> Current Meter
> Echosounder
> Current Profiler
> CTD
> Oxygen Sensor
Metres
0 20 40 60
Coastal Community Observatory
Node
Shore Station
Instrument Platform
Mooring
RADAR
AIS Receiver
Fibre-optic Cable
Instrumented Ferry Route
Bathymetry (m)
0
-1000
N
W
E
S
10 km
A UNIVERSITY OF VICTORIA INITIATIVE
** These sensors have historically been used on some ferry routes but none are currently installed.
Data Sources: Canadian Hydrographic Service 10 m bathymetry, GeoBase DEMs, USGS Cascadia
Scale bars are representative of the distance at their location.
Last Updated: 29 July 2026

# STRAIT OF GEORGIA
## VENUS Observatory
## Ocean Networks Canada






*Tsleil-Waututh Nation*
**Burrard Inlet Monitoring System (-24 m)**




Departure Bay
Ferry Terminal

Duke Point
Ferry Terminal

Roberts Bank
Terminal

Tsawwassen
Ferry
Terminal

Swartz Bay
Ferry Terminal

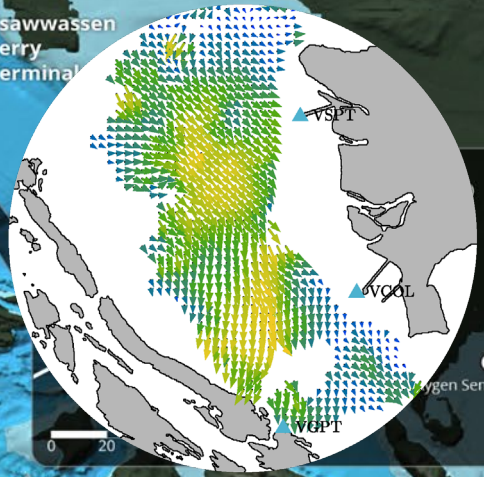
VANCOUVER ISLA

### Ferry System (Surface)

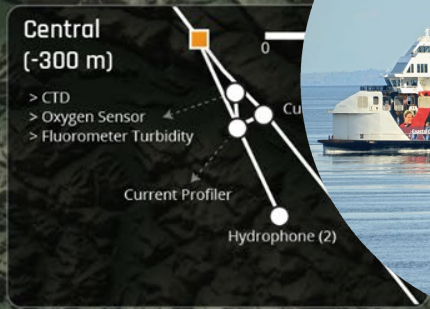
**Water Sampling Sensors**
> Oxygen
> Carbon Dioxide
> Salinity
> Temperature
> Conductivity
> Fluorometer (CDOM, Chl, & Turbidity Meter)

**Atmospheric & Navigation Sensors**
> Solar Radiation Tracker**
> Meteorological and Barometric Pressure
> Air Temperature and Humidity
> Navigation




### Central (-300 m)




Coastal Community Observatory
Node
Shore Station
Instrument Platform
Mooring
RADAR
AIS Receiver
Fibre-optic Cable
Instrumented Ferry Route

Bathymetry (m)
0
-1000




10 km

**A UNIVERSITY OF VICTORIA INITIATIVE**

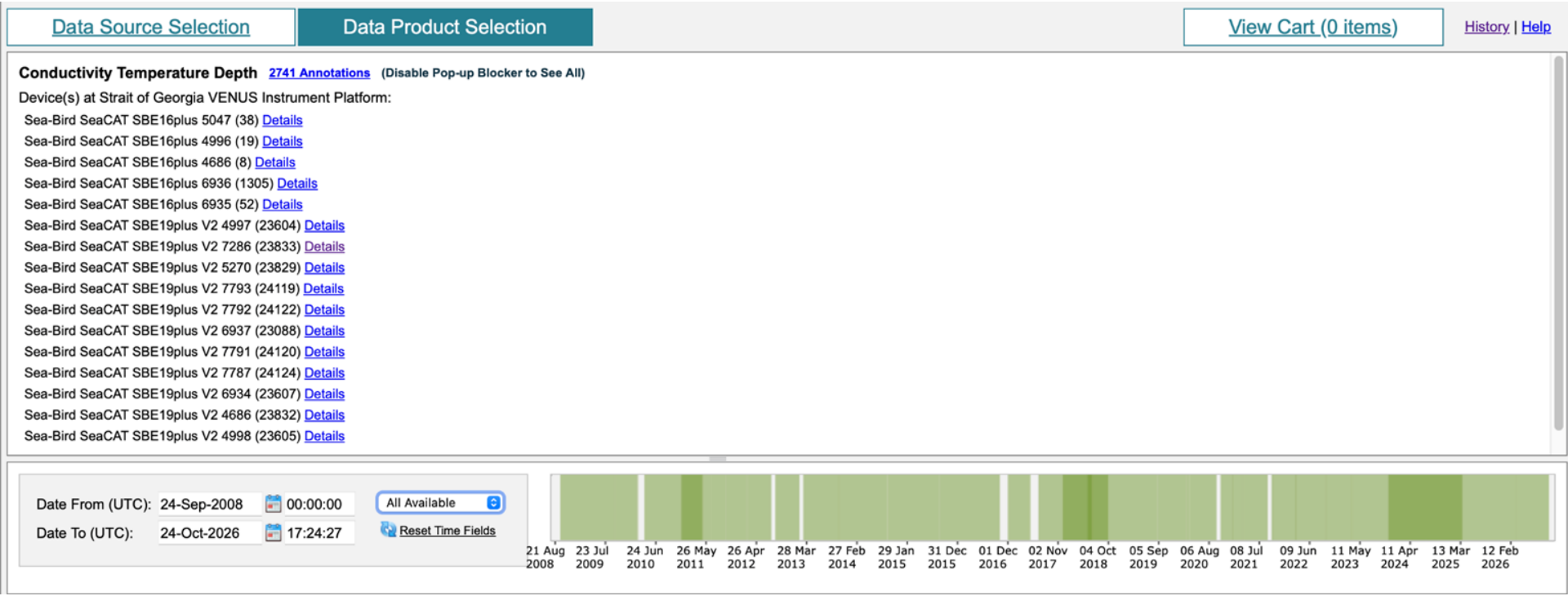
** These sensors have historically been used on some ferry routes but none are currently installed.

**Data Sources:** Canadian Hydrographic Service 10 m bathymetry, GeoBase DEMs, USGS Cascadia

Scale bars are representative of the distance at their location.

**Last Updated:** 29 July 2026

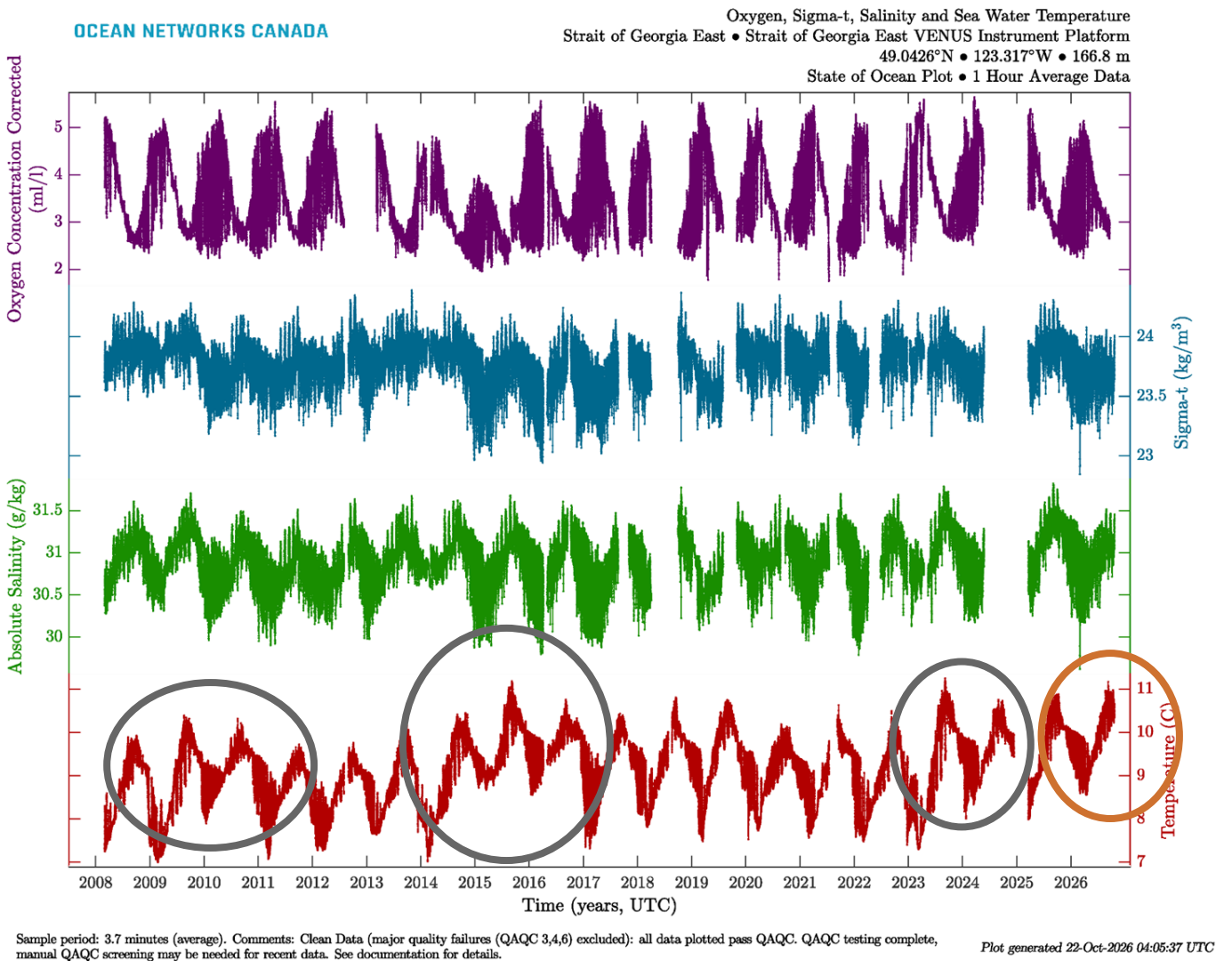
# Data Availability, Strait of Georgia 2008-2026




QEGCP"PGVYQTMU"ECPCFC""Yqtnf"Ngcfkpi"Fkueqxgtkgu"cv"c"Etkvkecn"Vko g

**Ocean Networks Canada time series of oxygen, density, salinity, temperature from Strait of Georgia, 2008-2026**

- Annual cycles
- ENSO and other longer cycles
- Anomalies





# Network 3

## Coastal Community Observatories


OCEAN NETWORKS CANADA
SOUTHERN BRITISH COLUMBIA INFRASTRUCTURE
BRITISH COLUMBIA
VANCOUVER ISLAND
Campbell River / Kwakwaka'wakw / Coast Salish Territory
Campbell River
Strait of Georgia
Squamish / Coast Salish Territory
Port Alberni / Nuu-chah-nulth Territory
Tofino / Nuu-chah-nulth Territory
China Creek
Nanaimo / Coast Salish Territory
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Juan de Fuca Strait
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EXPLORER PLATE
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Middle Valley
2400 m
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400 m - 1000 m
Folger Passage
20 m - 100m
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PACIFIC PLATE
PACIFIC OCEAN
Cascadia Basin
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JUAN DE FUCA PLATE
NORTH AMERICAN PLATE
Tang.oxan - ḥaḥaywiqak - Tsig̓is Marine Protected Area
VENUS Observing Systems
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100 m
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0 10 20 30 40
Coastal Community Observatory
Node
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Instrumented Ferry Route
Fault Line
Subduction Zone
Spreading Centre
Bathymetry (m)
0
-3500
N
W
E
S
100 km
A UNIVERSITY OF VICTORIA INITIATIVE
Data Sources: USGS Cascadia, Natural Resources Canada DEM, Canadian Hydrographic Service Bathymetry (license 2015-1001-1260-V), GeoBase Topography (Government of Canada, NOAA Agencies, NGDC, British Columbia Marine Conservation Analysis, Emergency Management BC, Alberni-Clayoquot Regional District, J.R. Delaney, D.S. Kelley, and D. Glickson, University of Washington (TN175Data), Ryan, W.B.F., S.M. Carbotte, J.O. Coplan, S. O'Hora, A. Melkonian, R. Arko, R.A. Weissel, V. Ferrini, A. Goodwillie, F. Nitsche, J. Bonczkowski, and R. Zemsky (2009), Global Multi-Resolution Topography synthesis, Geochem. Geophys. Geosyst., 10, Q03014, doi: 10.1029/2008GC002332. This product must not be used for navigation.
Datum: WGS84
Projection: Mercator
Last Updated: 16 June 2026

# Coastal Community Observatories



Cambridge Bay, Nunavut

# Co-observation with Indigenous Communities

## Enabled by ONC's Indigenous Engagement and Community-Based Monitoring teams



This photo is co-owned by the Nunatsiavut Government and Ocean Networks Canada, who are working in partnership to support community-based ocean research initiatives.
This specific project was an early-career training opportunity in collaboration with the Ocean Frontiers Institute's Sustainable Nunatsiavut Futures project.

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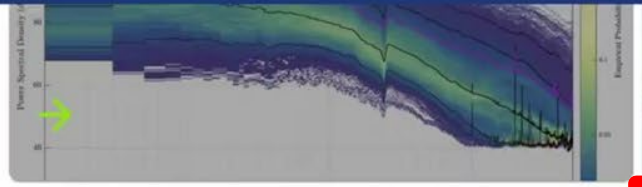
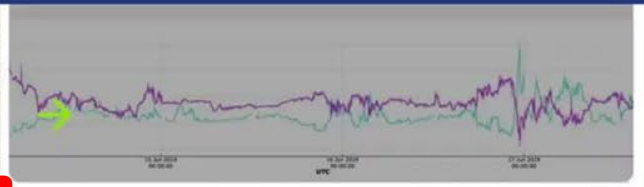
# Oceans 3.0 Data Portal

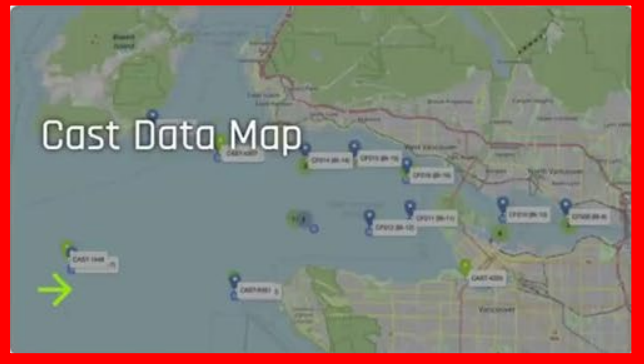
Search, preview, download and visualize data from cabled observatories, mobile platforms and autonomous instruments.











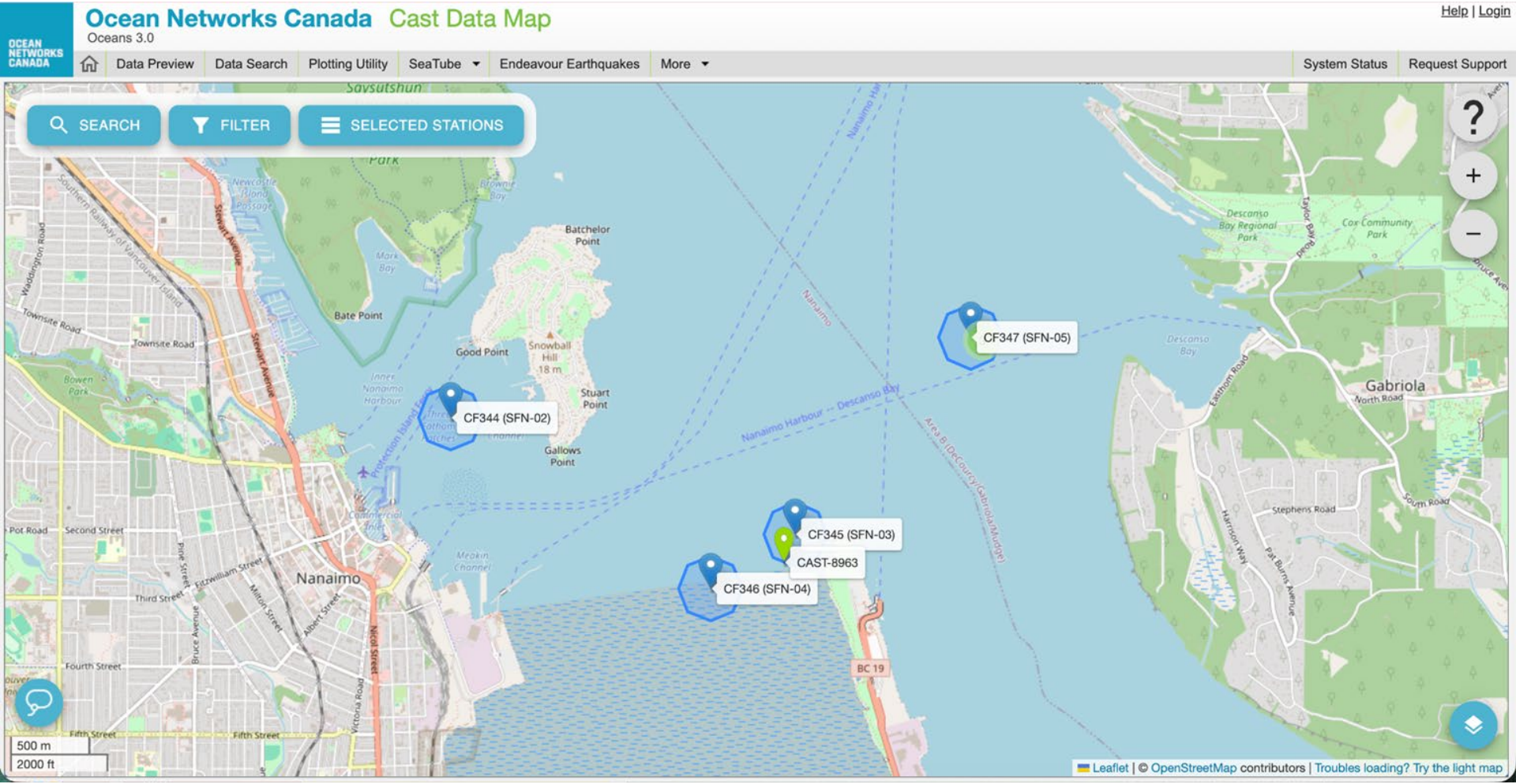








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CF344 (SFN-02)
CF345 (SFN-03)
CAST-8963
CF346 (SFN-04)
Nanaimo
Gabriola
Batchelor Point
Bate Point
Good Point
Snowball Hill 18 m
Stuart Point
Gallows Point
Nanaimo Harbour – Descanso Bay
Descanso Bay
Descanso Bay Regional Park
Cox Community Park
Stephens Road
Harrison Way
Pat Burns Avenue
Eathorn Road
South Road
North Road
Townsite Road
Stewart Avenue
Second Street
Third Street
Fourth Street
Fifth Street
Fitzwilliam Street
Pine Street
Bruce Avenue
Milton Street
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Victoria Road
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BC 19
500 m
2000 ft
Leaflet | © OpenStreetMap contributors | Troubles loading? Try the light map




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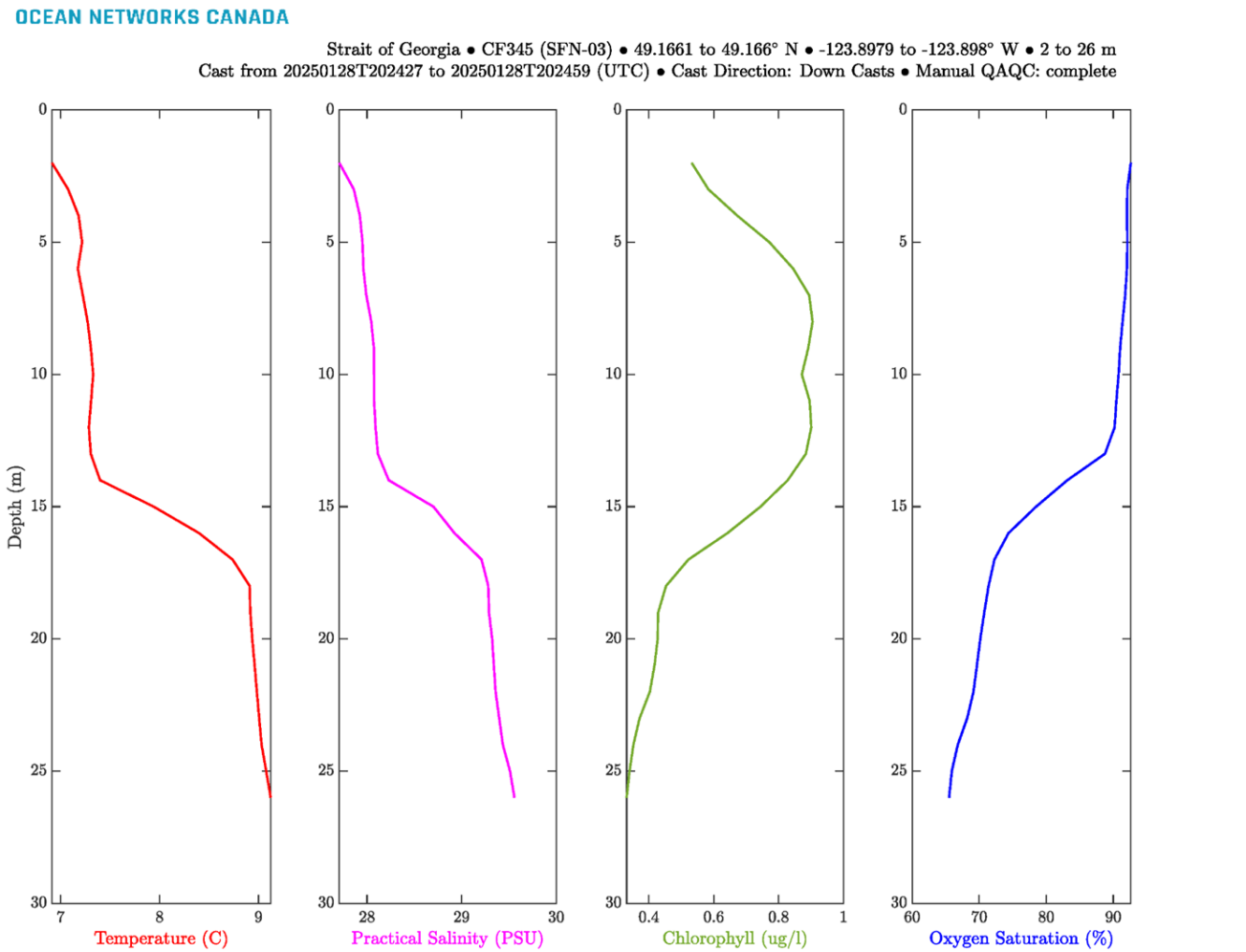


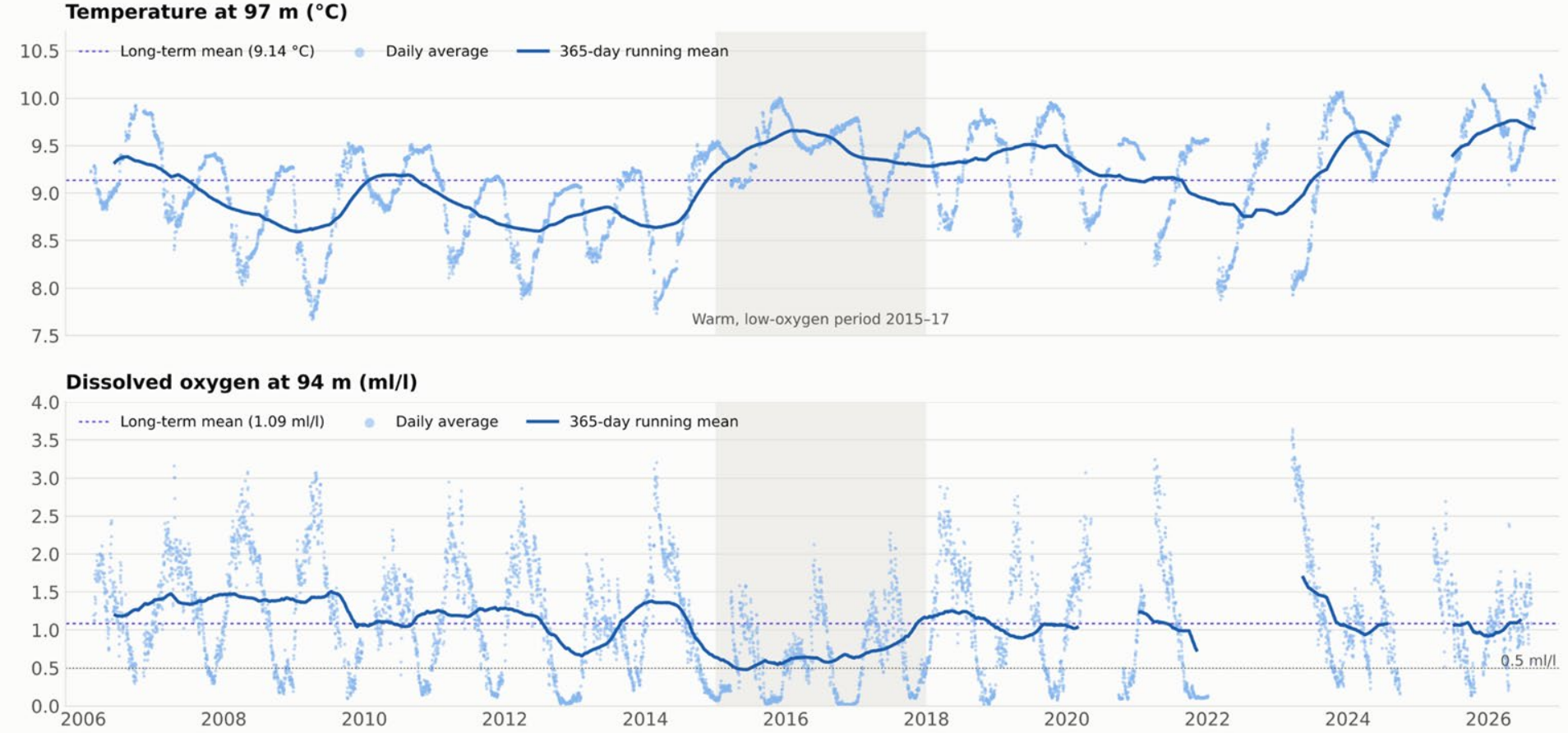

Comments: Snuneymuxw First Nation (owner); Ocean Networks Canada Society (custodian, distributor). Calculation of derived variables: Temperature is smoothed and scan-shifted. Temp Scan shift ahead = 0; Smoothing: 5-point running mean.; 25 median point filter applied to the Chlorophyll data.; Oxygen data shifted ahead by 18 scans.; All data binned into depth bins of: 1m.; Percent Good Acceptance Value: 70.;

*Plot generated 03-Jul-2026 13:06:05 UTC*



# Deep water at Patricia Bay (Saanich Inlet), 2006–2026: temperature and oxygen

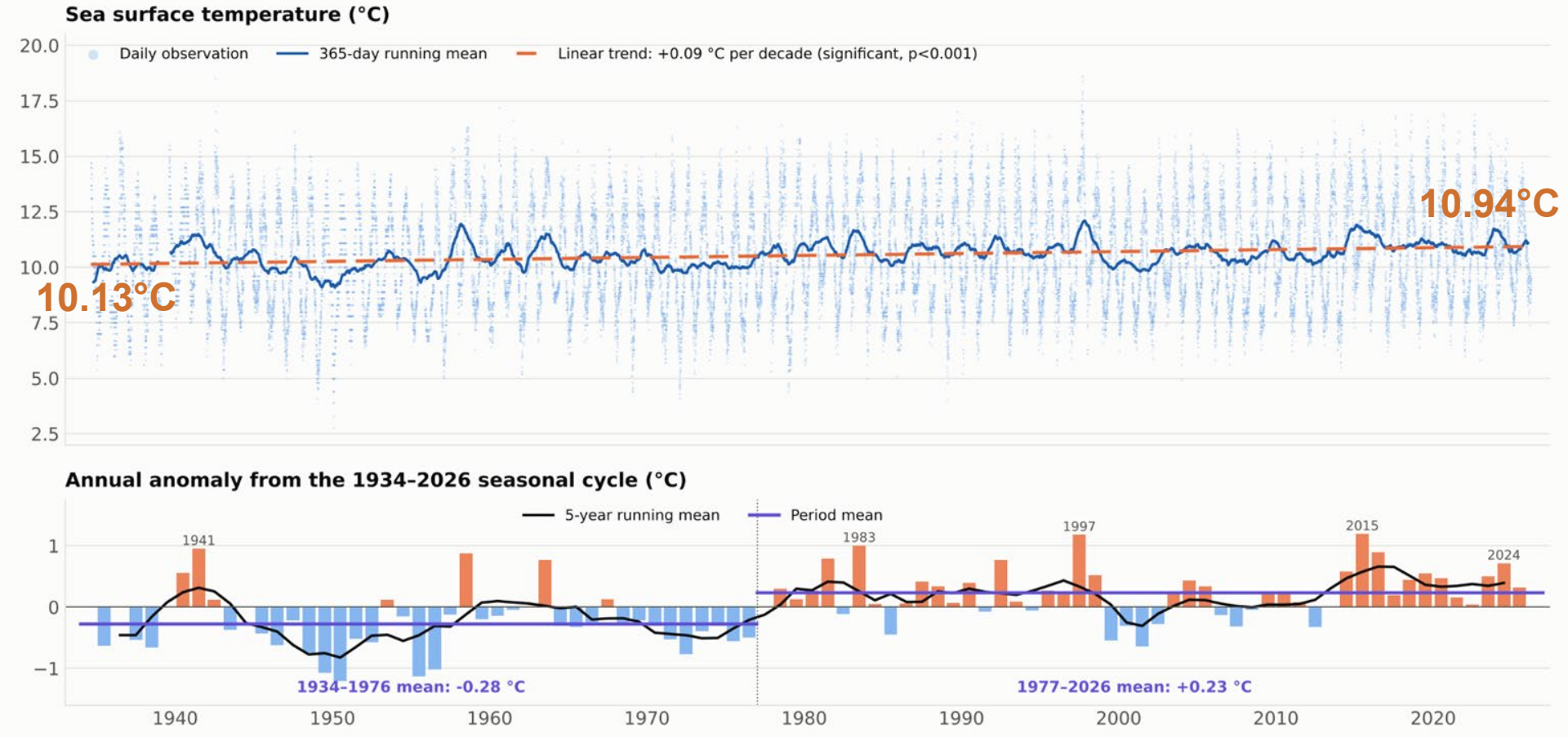
Monthly anomalies of the two are negatively correlated (r ≈ −0.55): warmer-than-usual water tends to hold less oxygen.



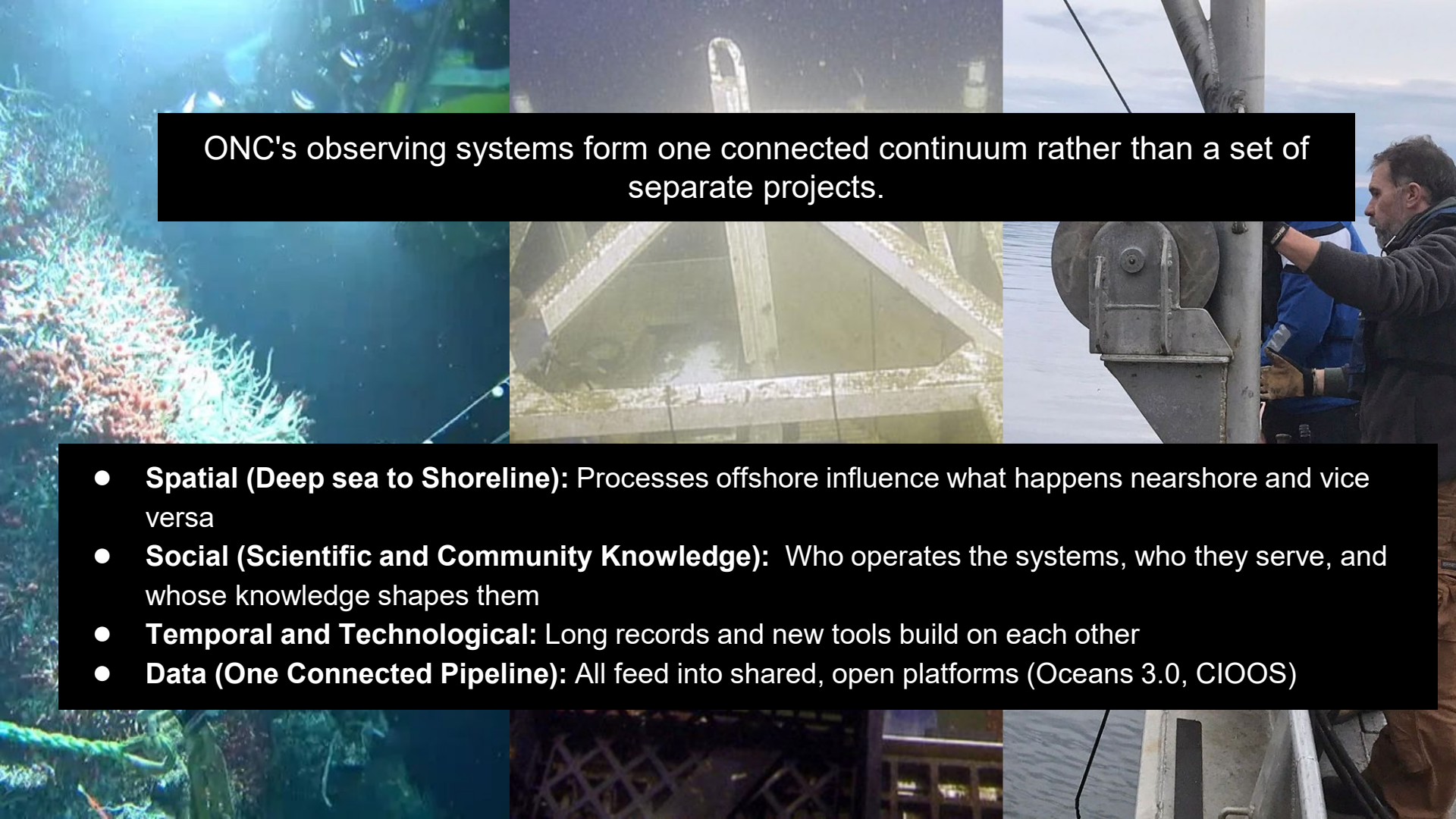

Data: Ocean Networks Canada Society, VENUS Instrument Platform. QC-cleaned 1-day averages (≥70% valid). Dotted line: long-term mean of all daily values.

# Amphitrite Point lightstation, sea surface temperature, 1934–2026

About +0.8 °C over 92 years, mostly as a step around 1977. Every year since 2014 has been warmer than the long-term average.



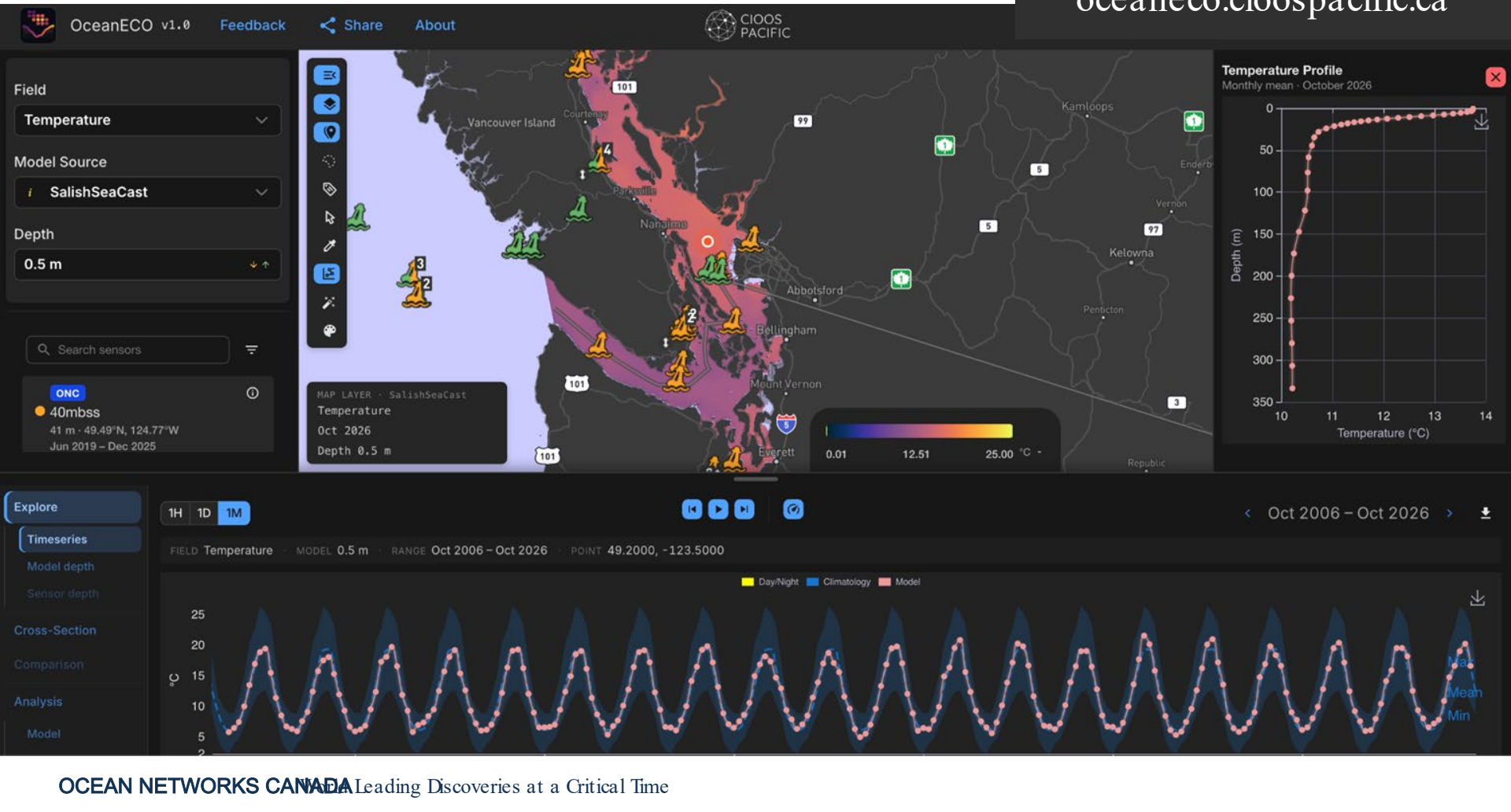

Data: DFO Institute of Ocean Sciences, BC Lightstation daily SST to Mar 2026 (DFO open data, May 2026 release). Months with ≥15 observations; years with ≥10 months. p corrected for autocorrelation.



ONC's observing systems form one connected continuum rather than a set of separate projects.

- **Spatial (Deep sea to Shoreline):** Processes offshore influence what happens nearshore and vice versa
- **Social (Scientific and Community Knowledge):** Who operates the systems, who they serve, and whose knowledge shapes them
- **Temporal and Technological:** Long records and new tools build on each other
- **Data (One Connected Pipeline):** All feed into shared, open platforms (Oceans 3.0, CIOOS)

oceaneco.cioospacific.ca



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# Takeaways

1. Integrated observing from abyss to shoreline
2. Community-led systems expand reach and relevance
3. Open, long-term data supports decisions and tool development in a changing ocean

University of Victoria

# Contacts & Further Info:
# linktr.ee/dwowens

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## Land and Sea Acknowledgement

We acknowledge and respect the Lək̓ʷəŋən (Songhees and Xʷsepsəm/Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land and sea continue to this day. We also acknowledge the Indigenous communities with whom we have the honour to partner on coastal monitoring and data management solutions.