OCEAN NETWORKS CANADA

Jupyter Notebooks for Accessing Ocean Data

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A UNIVERSITY OF VICTORIA INITIATIVE

About Us

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This workshop could not have been completed without the help of ONC's GIS team and Data Analytics & Quality team, specifically **Angela Schlesinger** and **Drew Snauffer**.

Special shout-out to **Sage Lichtenwalner** of Rutgers University for addition of data from the Ocean Observatories Initiative (OOI) into this case study.

Land Acknowledgement

We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the University of Victoria stands and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land and the ocean continue to this day.

CODE OF CONDUCT

Expected behavior

1 – Treat everyone with respect.

2 – Respect your fellow participants by using good practices for intercultural collaborations.

3 – Be mindful of your surroundings and of your fellow participants.

4 – Provide your true professional identity, affiliation, and, where appropriate, contact information, at registration, and during attendance and participatory sessions, as required.

5 – Respect copying and use of presented materials and ideas as indicated by AGU's Guidelines on Photography and Social Media, including knowing when you may need to obtain permission regarding copying materials.

6 – Respect the rules and policies of the meeting venue, hotels, AGU contracted facility, online platform, or any other venue.

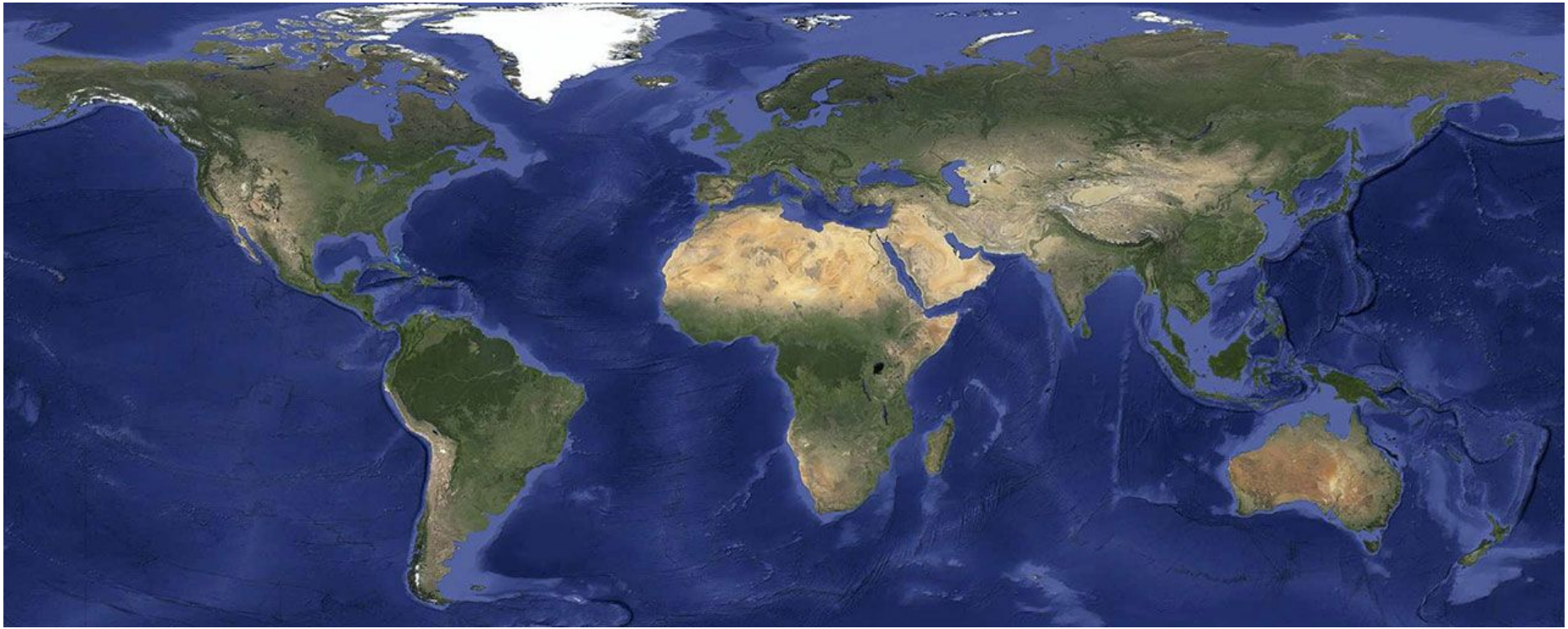
7 – Be Accountable: When we as organizers or participants fail to meet these guidelines, work together to identify problems and adjust policy and practice together.

AGU24 Learning Evaluation

https://bit.ly/3D0N49s

ONC survey:
https://www.surveymonkey.com/r/QCRM7CF

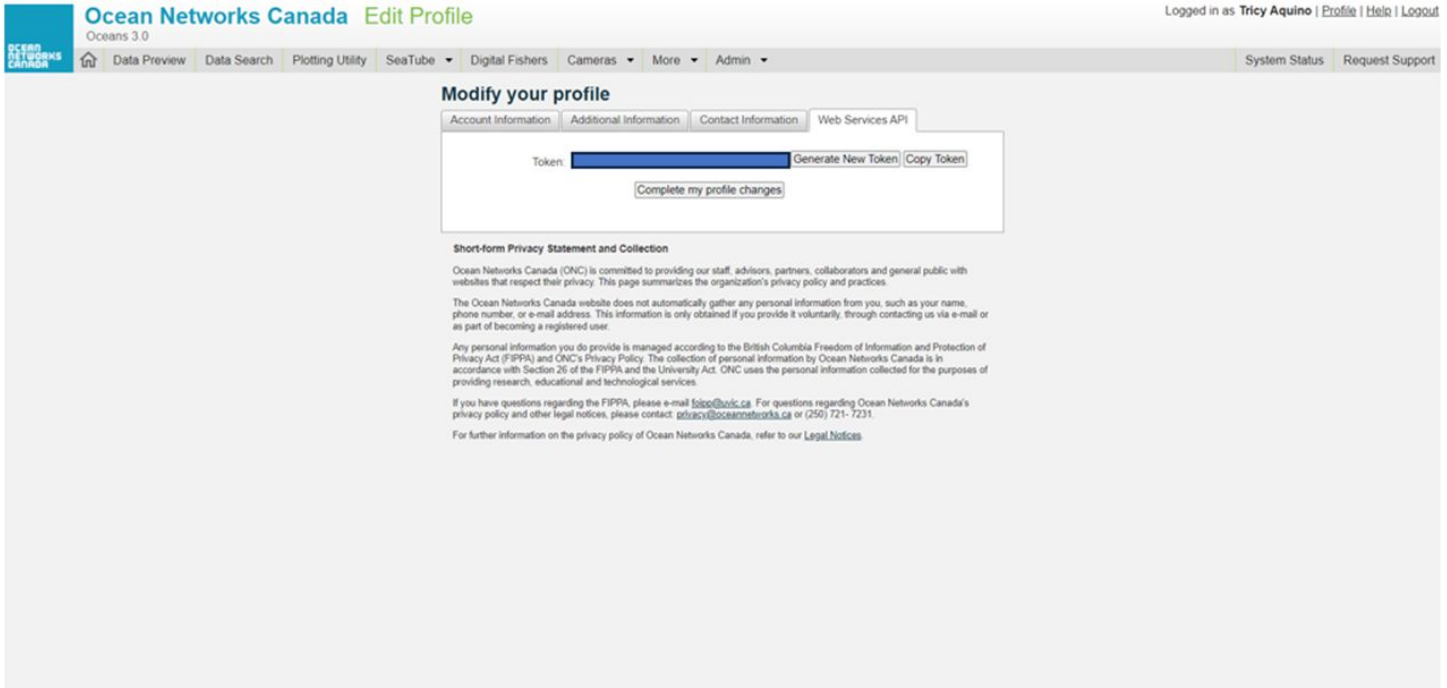
Where are you joining us from?



What brought you here?

Describe your experience using Python and Jupyter notebooks

Prerequisites

- Token available in your account profile at Oceans 3.0. To register for an account, go to this **link**.
- https://data.oceannetworks.ca/Registration
- 

Prerequisites

API Demo Cases

- Sign up for a free account at **Deepnote** and make sure to create a **workspace**.
- Once you have created an account and workspace, follow the steps below:
  1. Click on this link
  2. On the right side of the screen, click on the hamburger button and choose duplicate project.
  3. After clicking Duplicate project, you will be prompted with a screen asking for a workspace, choose your workspace and hit the Duplicate project button

OpenAPI Demo Cases

- Add ***JSON extension*** for different browser types (Firefox none required; JSON Formatter for Chrome, prettyJSON for Safari).

Agenda

8:35 Overview of Ocean Networks Canada (ONC) and Oceans 3.0 (*Dwight Owens)*

9:00 Oceans 3.0 Application Programming Interface (API) overview (*Tricy Aquino)*

9:20 Break

9:30 HANDS ON: Oceans 3.0 OpenAPI overview and demo *(Ed Mason)*

10:15 HANDS ON: Case Study: Honga Tonga volcanic eruption and tsunami (step by step API workflows for scalar data)

11:15 Break

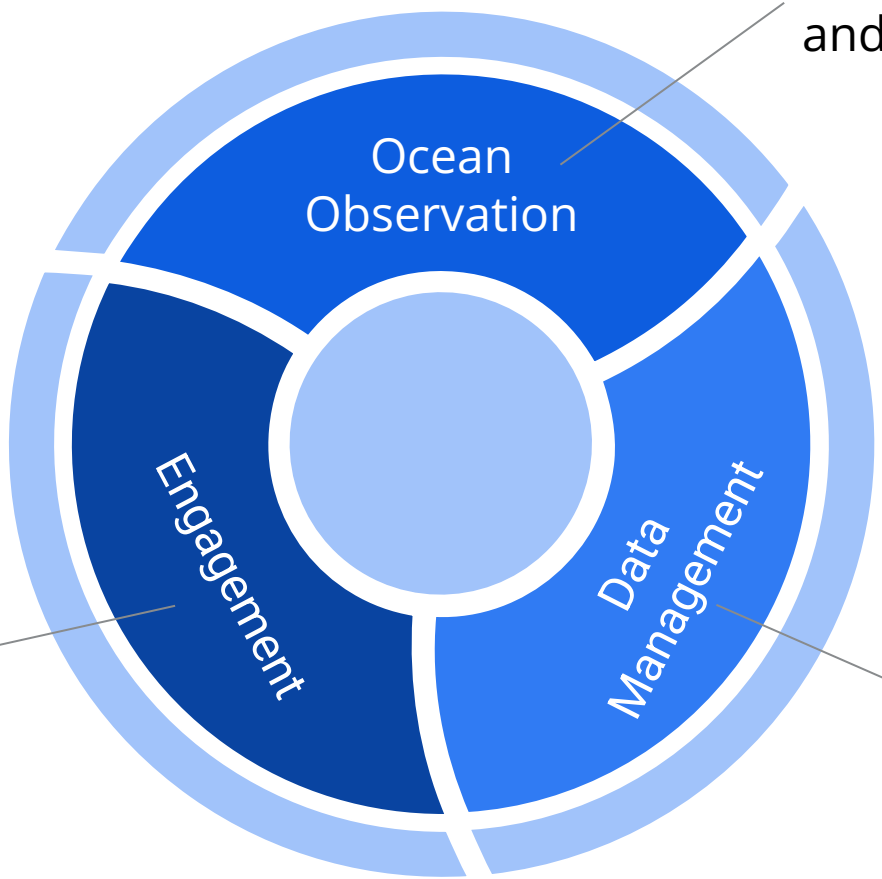
11:25 How to cite data from ONC? *(Sean Tippett)*

11:40 Q&A, Individual work


ocean
TITANS
Official Trailer
BEYOND THE ABYSS
Ocean Intelligence for a Sustainable Planet

ONC's Main Activities

Networks, infrastructure and instrumentation



Researchers, government, communities, educators, students

Oceans 3.0, API, OpenAPI

Oceans 3.0 in Numbers

12500+ Active sensors producing data;

640+ Instruments producing data daily;

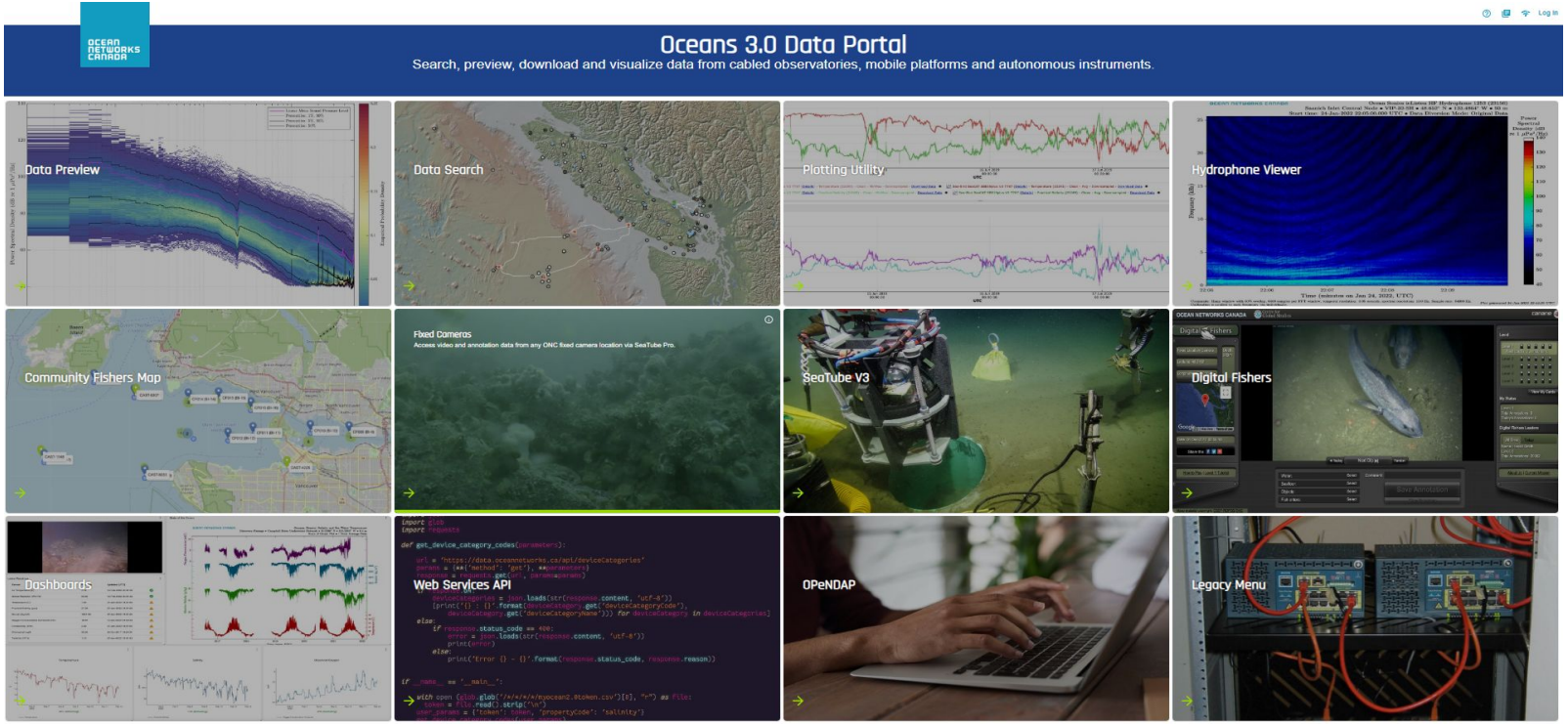
10,000+ Pre-generated plots produced daily;

10,500+ Average daily data requests;

410 GB Average volume of uncompressed data archived per day;

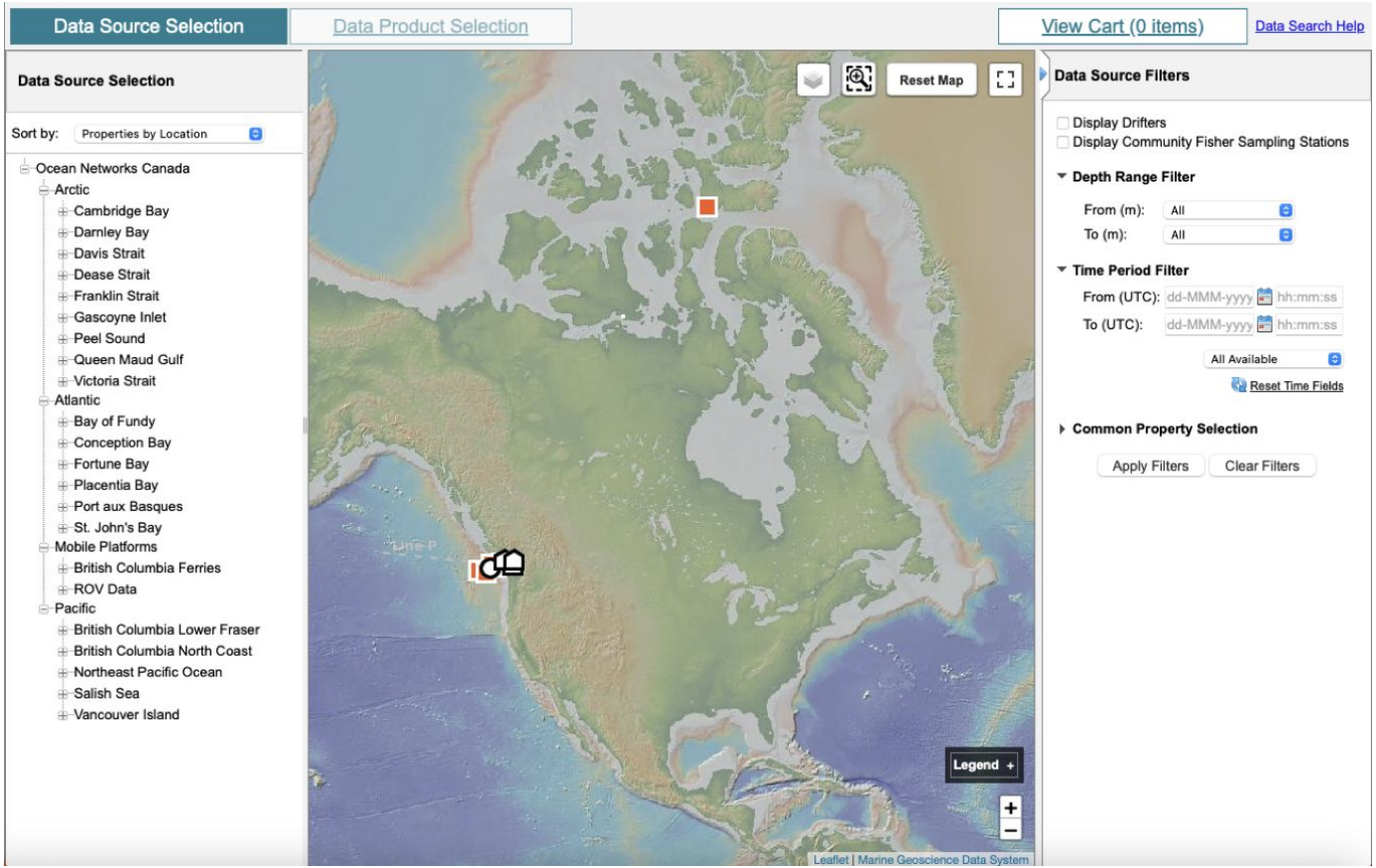
1.74 PB Total uncompressed volume of archived data.

Oceans 3.0 Main Applications



https://data.oceannetworks.ca/home

Data Search


Data Source Selection
Data Product Selection
View Cart (0 items)
Data Search Help
Data Source Selection
Sort by:
Properties by Location
Ocean Networks Canada
Arctic
Cambridge Bay
Darnley Bay
Davis Strait
Dease Strait
Franklin Strait
Gascoyne Inlet
Peel Sound
Queen Maud Gulf
Victoria Strait
Atlantic
Bay of Fundy
Conception Bay
Fortune Bay
Placentia Bay
Port aux Basques
St. John's Bay
Mobile Platforms
British Columbia Ferries
ROV Data
Pacific
British Columbia Lower Fraser
British Columbia North Coast
Northeast Pacific Ocean
Salish Sea
Vancouver Island
Reset Map
Legend
Leaflet | Marine Geoscience Data System
Data Source Filters
Display Drifters
Display Community Fisher Sampling Stations
Depth Range Filter
From (m):
All
To (m):
All
Time Period Filter
From (UTC):
dd-MMM-yyyy
hh:mm:ss
To (UTC):
dd-MMM-yyyy
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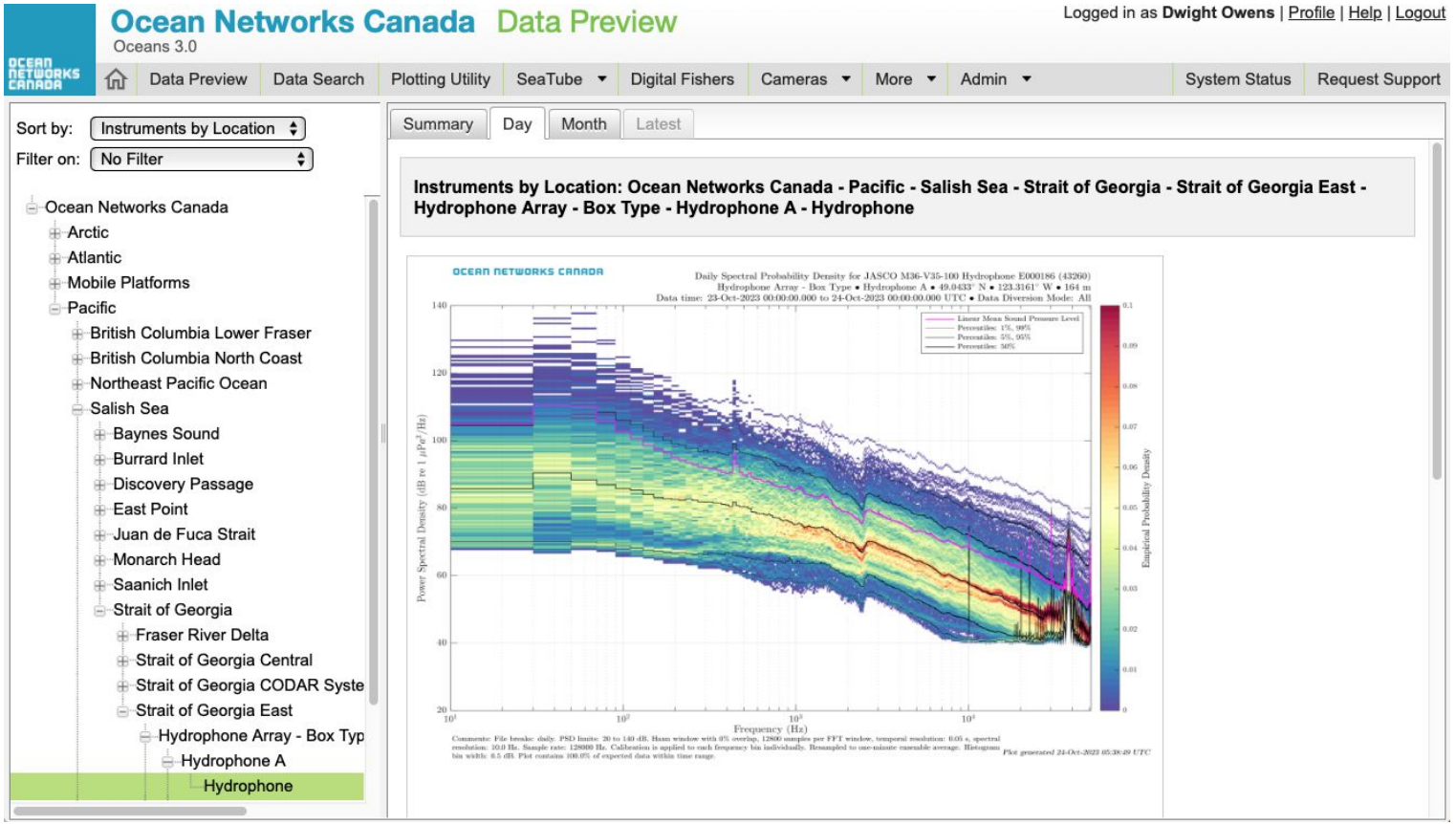
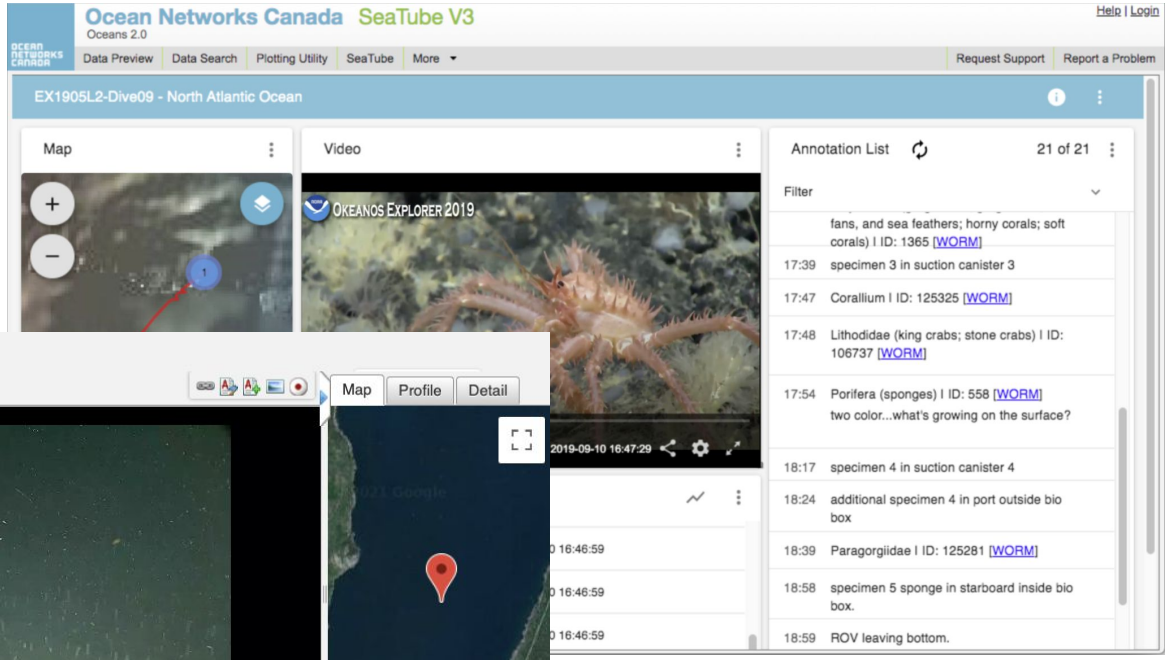
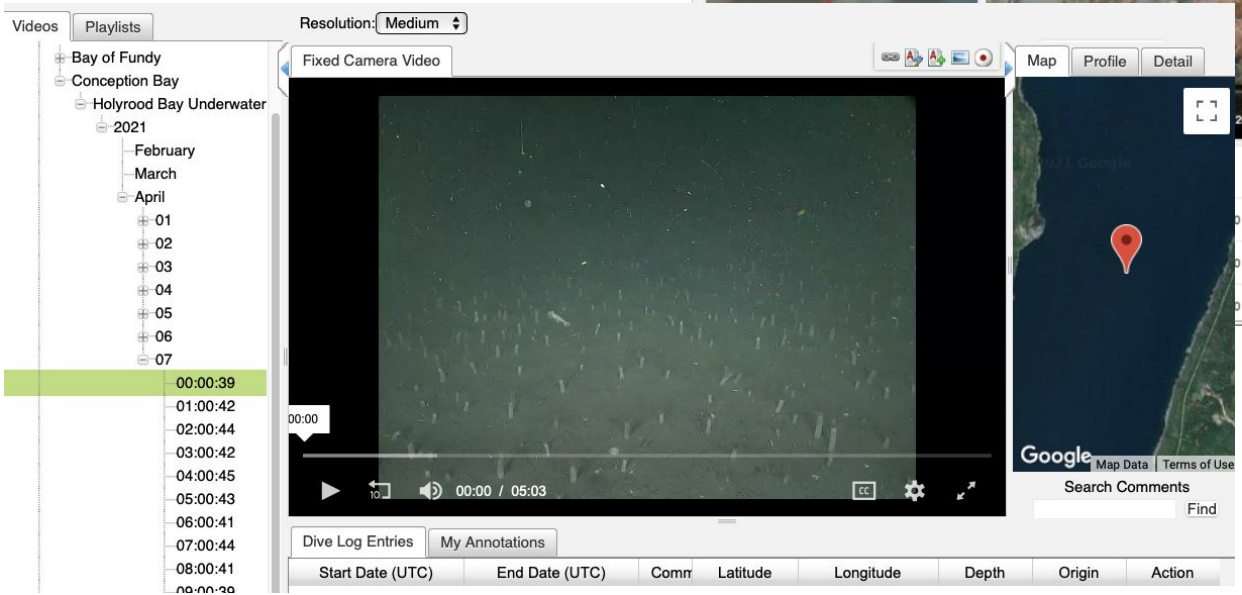
All Available
Reset Time Fields
Common Property Selection
Apply Filters
Clear Filters

Data Preview

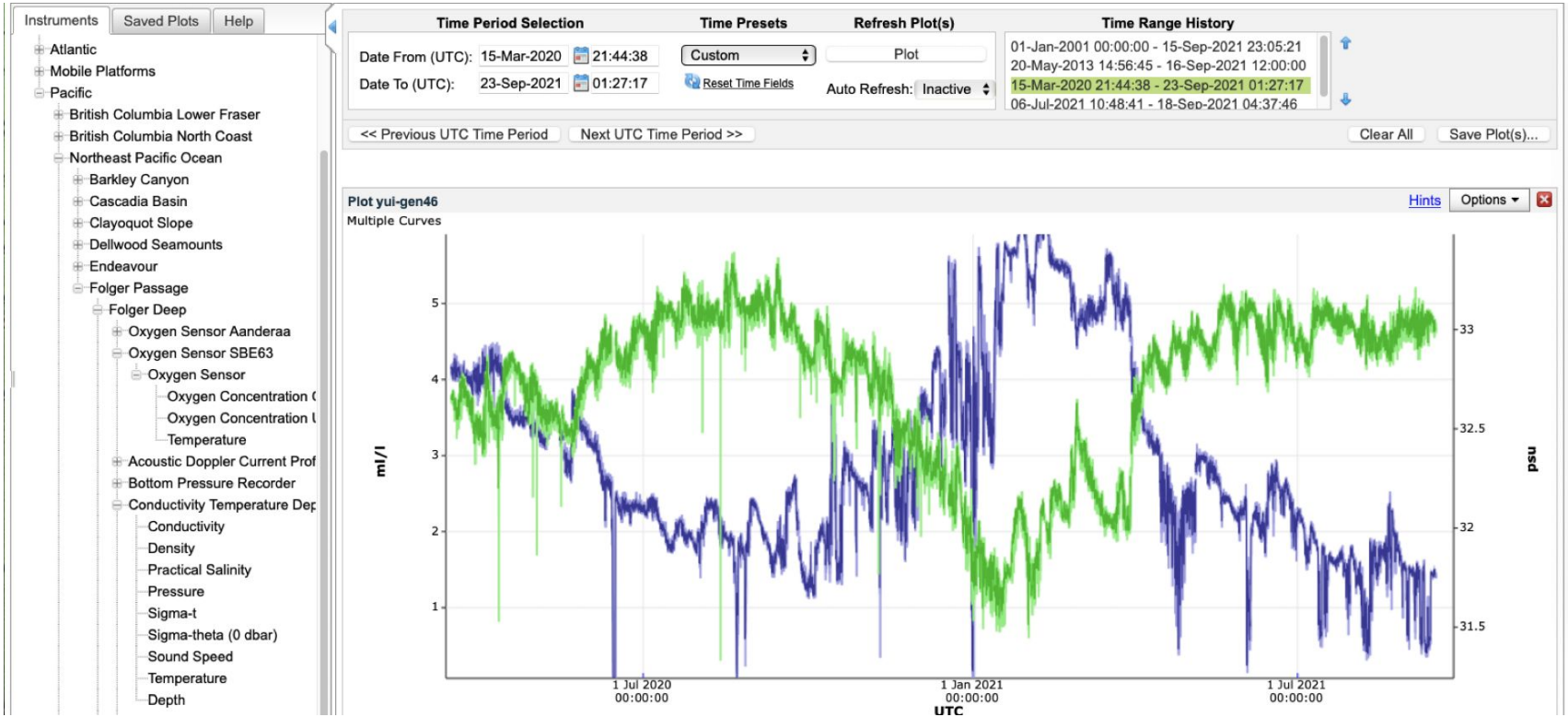


SeaTube


Ocean Networks Canada SeaTube V3
Oceans 2.0
Help | Login
Data Preview
Data Search
Plotting Utility
SeaTube
More
Request Support
Report a Problem
EX1905L2-Dive09 - North Atlantic Ocean
Map
Video
Annotation List
21 of 21
Filter
OKEANOS EXPLORER 2019
2019-09-10 16:47:29
fans, and sea feathers; horny corals; soft corals) I ID: 1365 [WORM]
17:39 specimen 3 in suction canister 3
17:47 Corallium I ID: 125325 [WORM]
17:48 Lithodidae (king crabs; stone crabs) I ID: 106737 [WORM]
17:54 Porifera (sponges) I ID: 558 [WORM] two color...what's growing on the surface?
18:17 specimen 4 in suction canister 4
18:24 additional specimen 4 in port outside bio box
18:39 Paragorgiidae I ID: 125281 [WORM]
18:58 specimen 5 sponge in starboard inside bio box.
18:59 ROV leaving bottom.

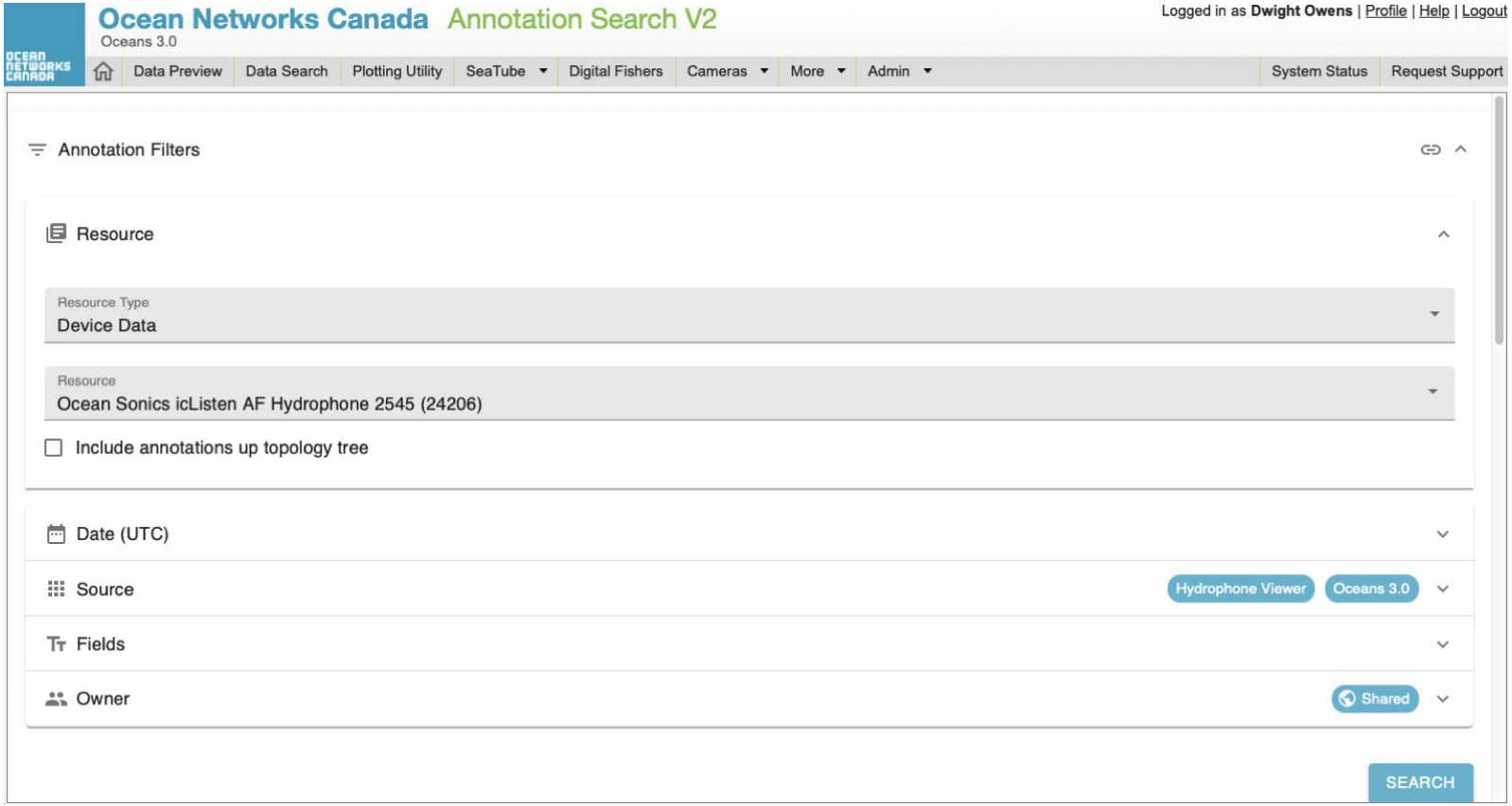

Videos
Playlists
Resolution: Medium
Bay of Fundy
Conception Bay
Holyrood Bay Underwater
2021
February
March
April
01
02
03
04
05
06
07
00:00:39
01:00:42
02:00:44
03:00:42
04:00:45
05:00:43
06:00:41
07:00:44
08:00:41
Fixed Camera Video
00:00 / 05:03
Map
Profile
Detail
Google
Map Data
Terms of Use
Search Comments
Find
Dive Log Entries
My Annotations
Start Date (UTC)
End Date (UTC)
Comm
Latitude
Longitude
Depth
Origin
Action

Plotting Utility

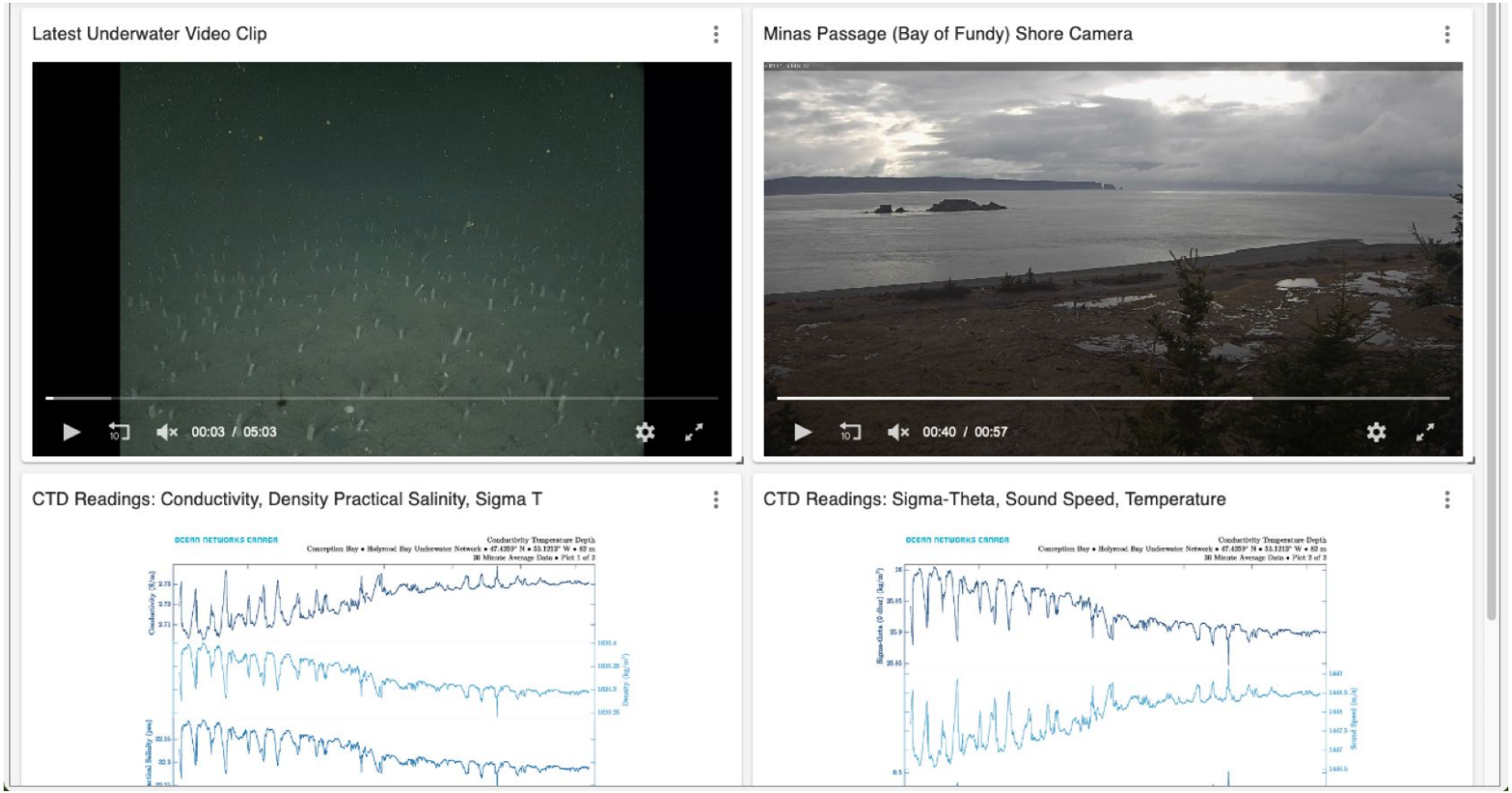


Hydrophone Data Search

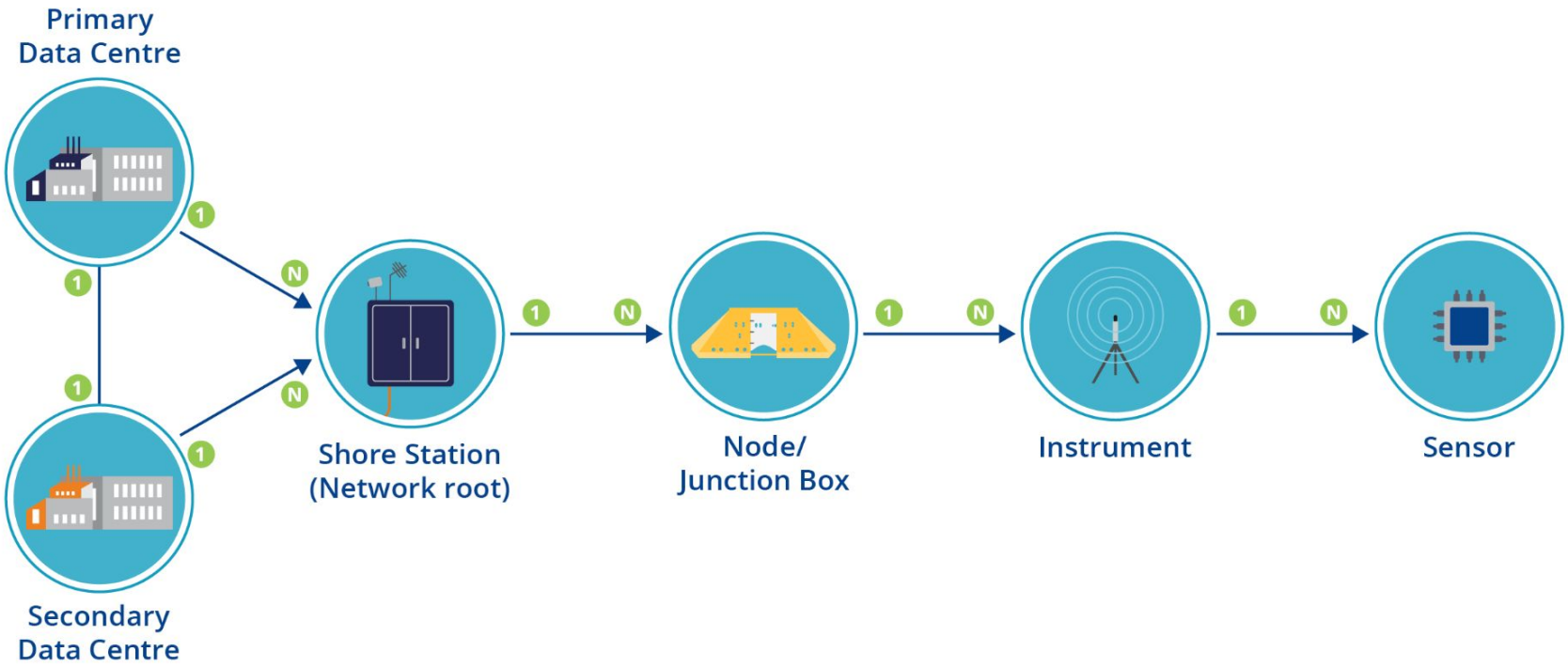
Annotations Search



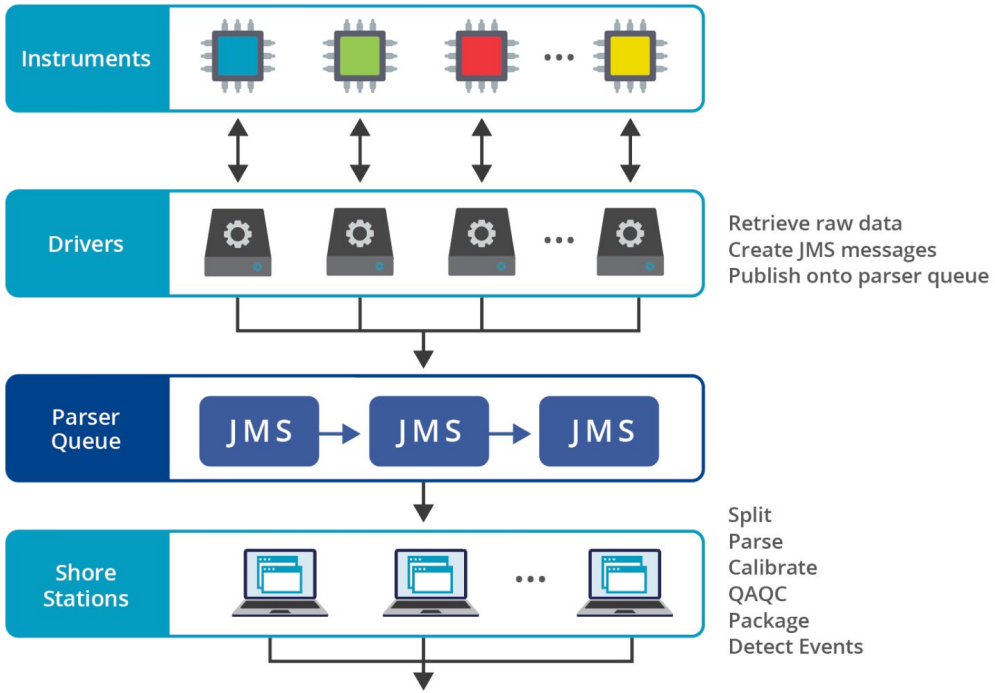
Data Dashboards

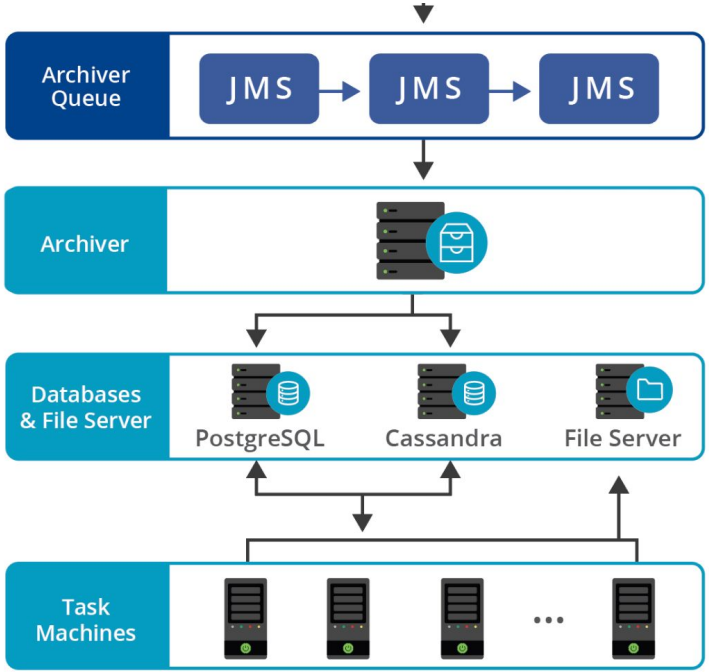


Oceans 3.0 Infrastructure Hierarchy



Data Acquisition and Archival

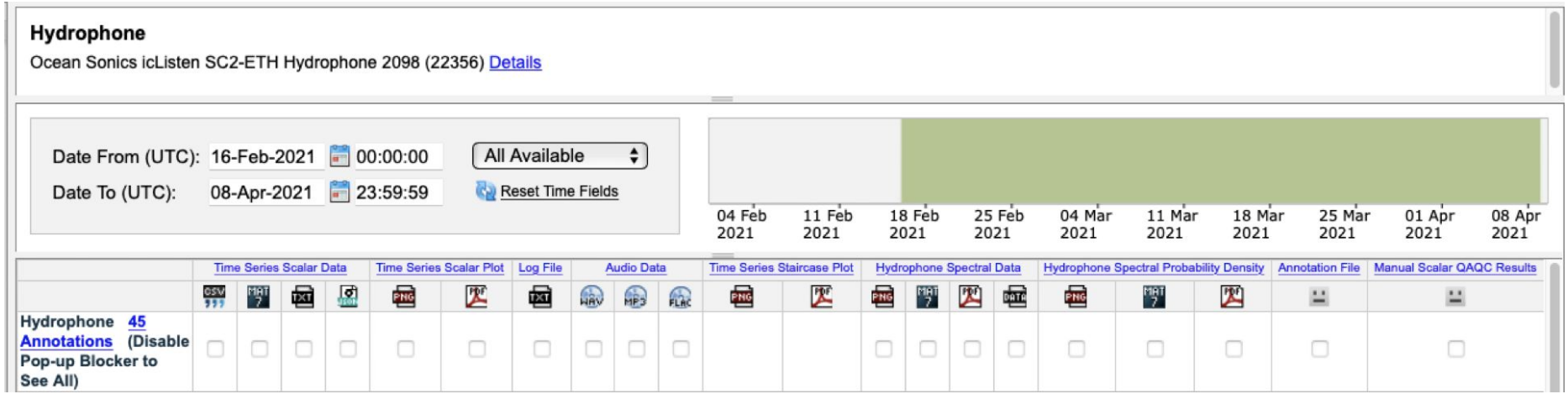




Data Products

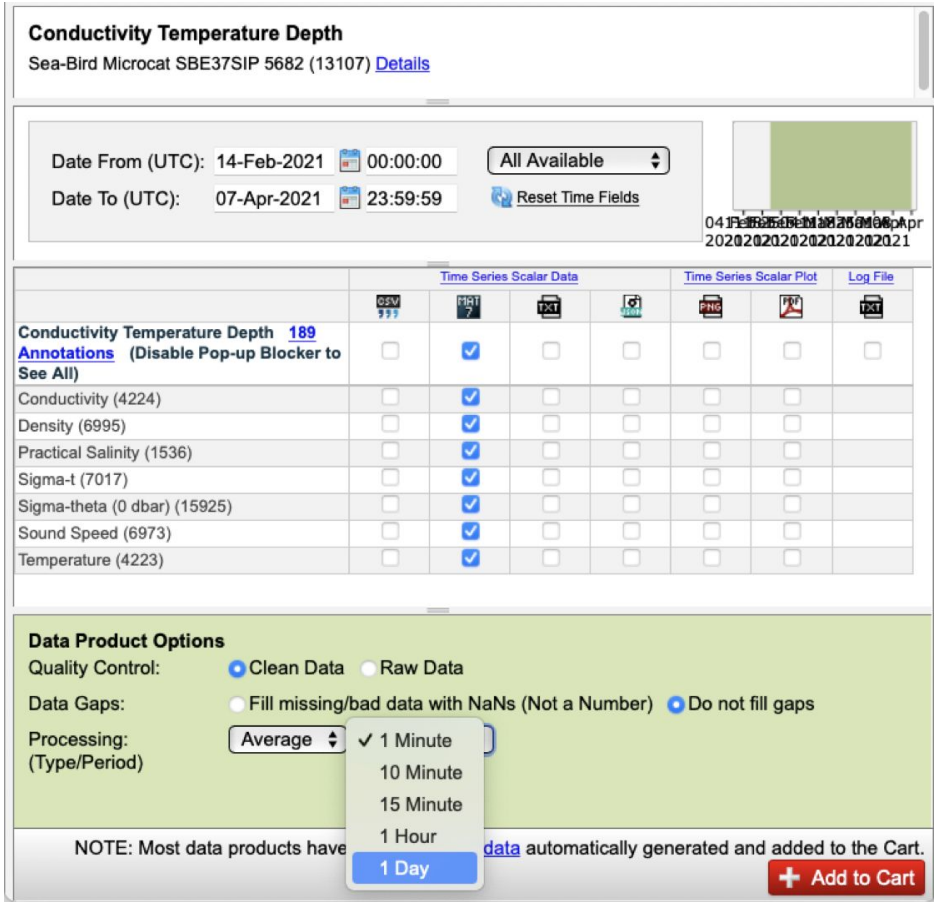
- Hundreds of different varieties of data products currently available
- Generated within Oceans 3.0 by Java or MATLAB
- Usually generated on demand
- Some generated from scalar values in the databases
- Some are generated from complex array-based data files
- Some generated from both scalar and complex data
- https://wiki.oceannetworks.ca/display/DP/Data+Products+Home

Data Product Examples

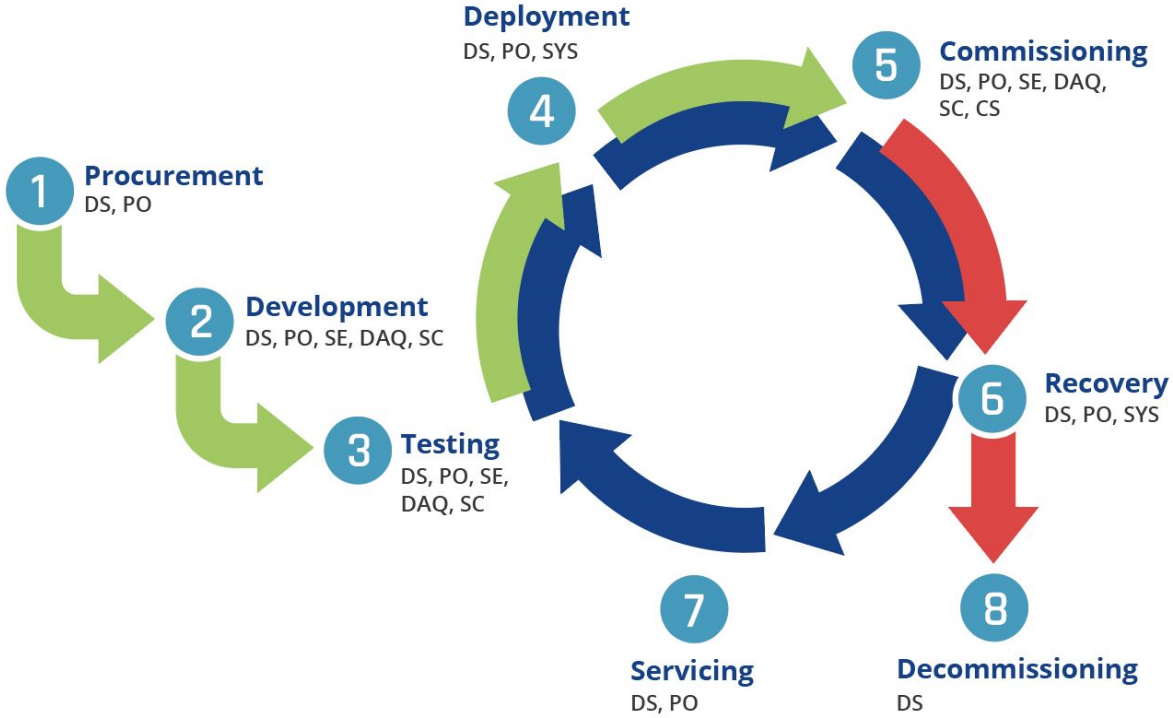


Processing Options

- Cleaning
- Averaging
- Min-Max
- Standard Deviation
- De-tiding
- Special Options



Quality Assurance / Quality Control (QAQC)



QARTOD: Quality Assurance of Real Time Ocean Data

1. Every real-time observation must be accompanied by a **quality descriptor**.
2. Some level of **automated real-time quality test** for all observations.
3. Quality flags and quality test descriptions must be sufficiently **described** in the accompanying metadata.
4. Observers should independently **verify or calibrate a sensor** before deployment.
5. Observers should **describe their method / calibration** in the metadata.
6. Observers should **quantify the level of calibration accuracy** and the associated expected error bounds.
7. **Manual checks** on the automated procedures, the real-time data collected and the status of the observing system must be provided by the observer on a timescale appropriate to ensure the integrity of the observing system.

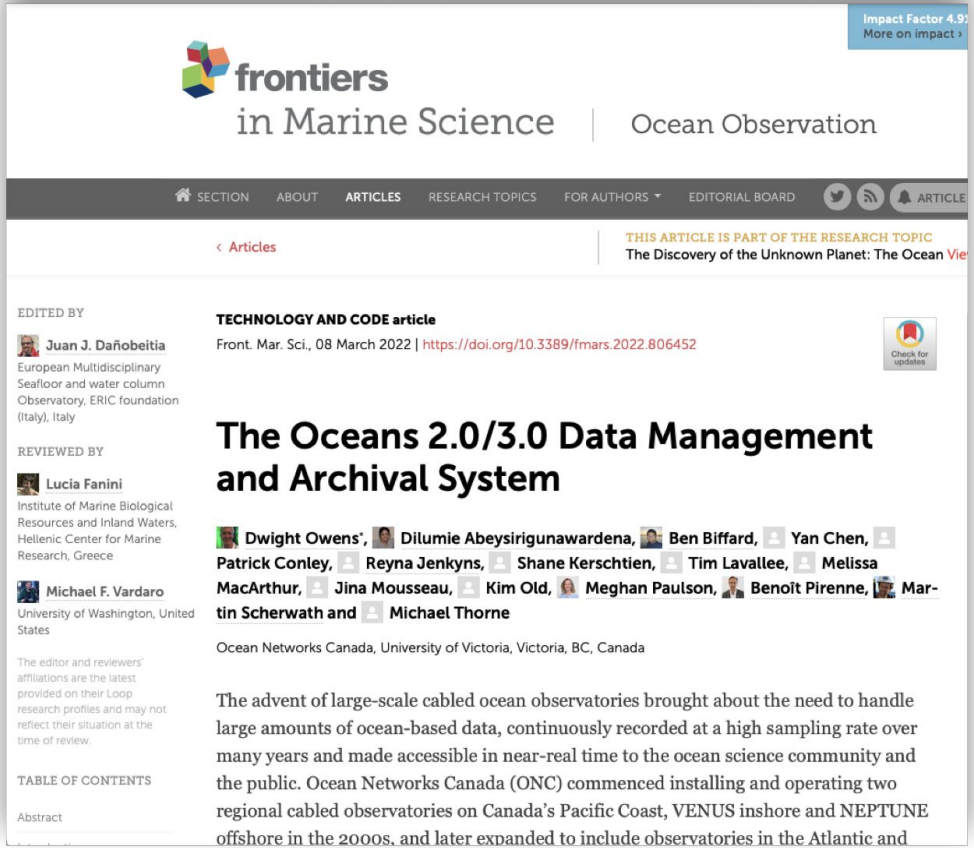
Three QAQC methods

1. **Real-time automated tests**
    - To catch failures, major spikes/dropouts

2. **Delayed-mode automated tests**
    - Spikes, gradient (after 2 sample periods)
    - Stuck values (after 3 hours)

3. **Manual tests**
    - Performed by data specialists
    - Periodic testing and flagging

Learn more about Oceans 3.0



frontiers in Marine Science | Ocean Observation

Impact Factor 4.9
More on impact ›

SECTION ABOUT ARTICLES RESEARCH TOPICS FOR AUTHORS EDITORIAL BOARD ARTICLE

‹ Articles

THIS ARTICLE IS PART OF THE RESEARCH TOPIC
The Discovery of the Unknown Planet: The Ocean Vie

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Abstract

TECHNOLOGY AND CODE article

Front. Mar. Sci., 08 March 2022 | https://doi.org/10.3389/fmars.2022.806452

Check for updates

The Oceans 2.0/3.0 Data Management and Archival System

Dwight Owens*, Dilumie Abeysirigunawardena, Ben Biffard, Yan Chen, Patrick Conley, Reyna Jenkyns, Shane Kerschtien, Tim Lavallee, Melissa MacArthur, Jina Mousseau, Kim Old, Meghan Paulson, Benoît Pirenne, Martin Scherwath and Michael Thorne

Ocean Networks Canada, University of Victoria, Victoria, BC, Canada

The advent of large-scale cabled ocean observatories brought about the need to handle large amounts of ocean-based data, continuously recorded at a high sampling rate over many years and made accessible in near-real time to the ocean science community and the public. Ocean Networks Canada (ONC) commenced installing and operating two regional cabled observatories on Canada's Pacific Coast, VENUS inshore and NEPTUNE offshore in the 2000s, and later expanded to include observatories in the Atlantic and

https://www.frontiersin.org/articles/10.3389/fmars.2022.806452/full

API Overview

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Introduction to API

- **Definition**

  API (Application Programming Interface):

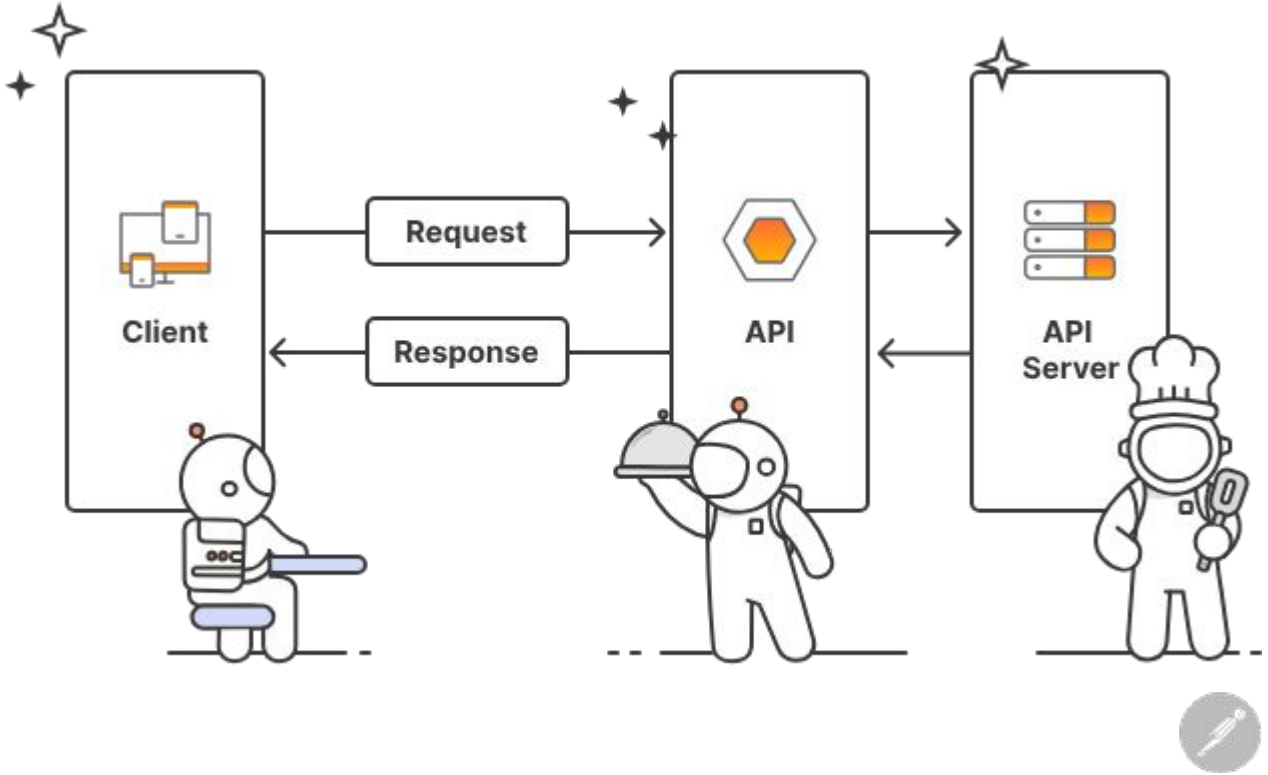
  - enables machine-to-machine or cloud-to-cloud communication
  - allows access to the functionality and data of other applications without needing to understand their internal workings.

- **Who uses APIs?**
  - Data Scientists
  - Data Analysts
  - Developers
  - Cloud service providers

Benefits of API

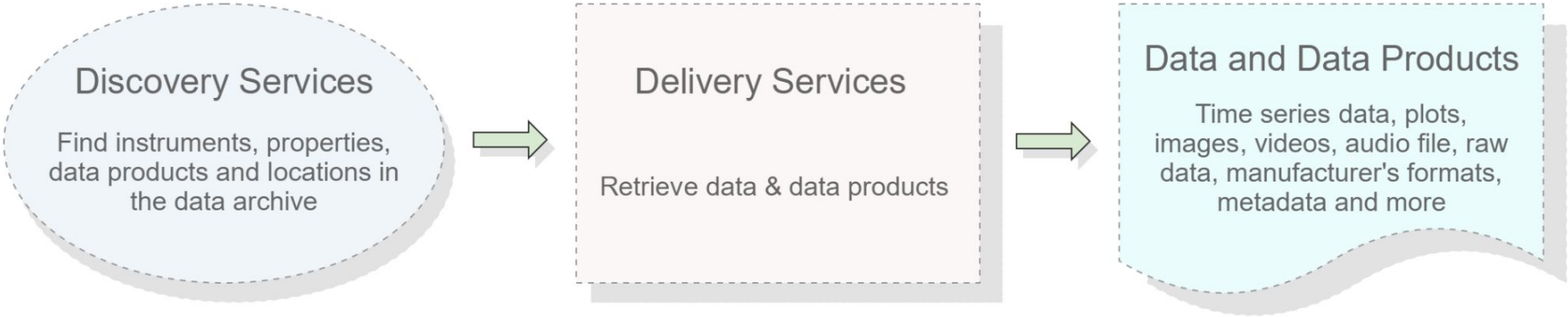
1. Data Access
2. Automation
3. Real-Time Data
4. Integration
5. Collaboration

How does an API work?



Source: https://www.postman.com/what-is-an-api/

Discovery, Delivery, Data



Discovery Services

ONCs API

Delivery Services

ONCs API

Real-Time

`scalarData`

`rawData`

Data Product Delivery

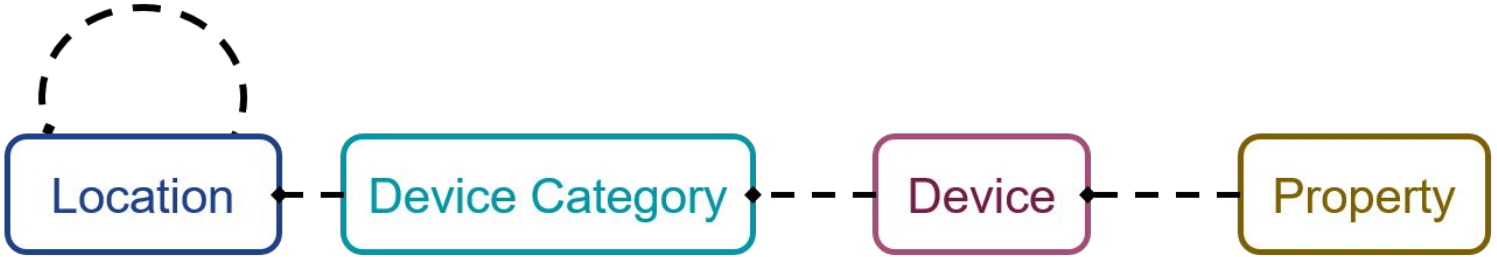
`dataProductDelivery`

Archive Files

archiveFiles

API Codes

API elements (locations, devices, etc.) are identified by a code, not an id number.

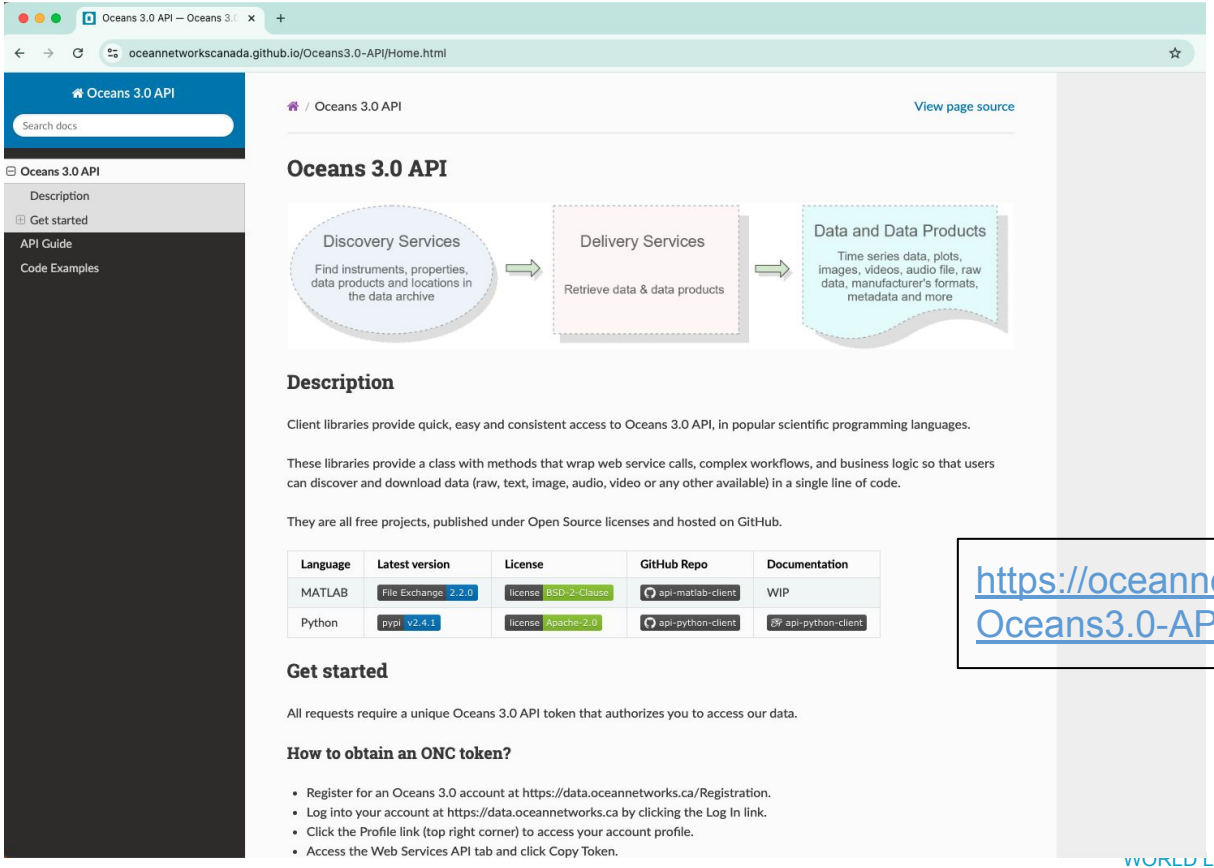


Methods of Data Delivery

ONCs API

API Web Services	API Endpoint	Required Parameters
Scalar data and raw data https://data.oceannetworks.ca/api/scalardata https://data.oceannetworks.ca/api/rawdata	Location	token, locationCode, deviceCategoryCode
	Device	token, deviceCode
Archive files https://data.oceannetworks.ca/api/archivefiles	Location	token, locationCode, deviceCategoryCode
	Device	token, deviceCode
	Download	token, filename
Data Product Delivery https://data.oceannetworks.ca/api/dataProductDelivery	Request	token, dataProductCode, extension, dateFrom, dateTo
	Run	token, dpRequestId
	Download	token, dpRunId, index, deleteFile

Where to find information about ONCs API



https://oceannetworkscanada.github.io/Oceans3.0-API/Home.html

Break

10 minutes

OCEAN NETWORKS CANADA


10:00

Hands-on:
OpenAPI Overview and Demo

OCEAN NETWORKS CANADA

Troubleshooting

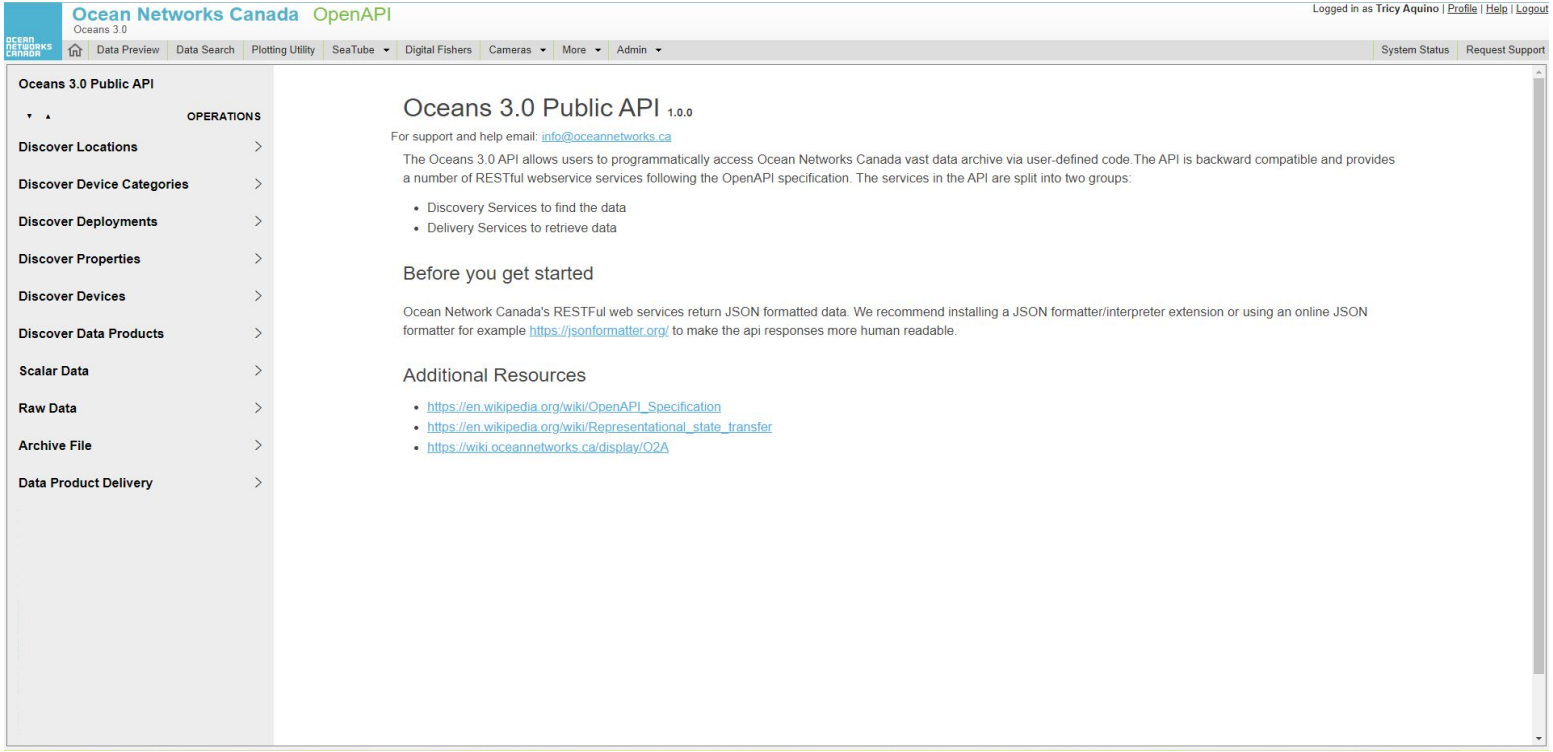
- If you need assistance, please raise your hand or speak up and one of us will attend to your question.
- Please follow along with everything throughout the workshop unless otherwise stated.

Introduction to OpenAPI Specification

OpenAPI Specification (formerly Swagger Specification):

- A format used to describe, produce, and consume RESTFul web services
  - Independent requests.
  - Resource based design (HTTP compatible)
  - Scalable and flexible.
- Defines the structure and syntax of REST API's
- Describes an API in its entirety:
  - Endpoints
  - Methods
  - Authentication and Security
  - Request and Response Formats
  - Data schema

Oceans 3.0 OpenAPI



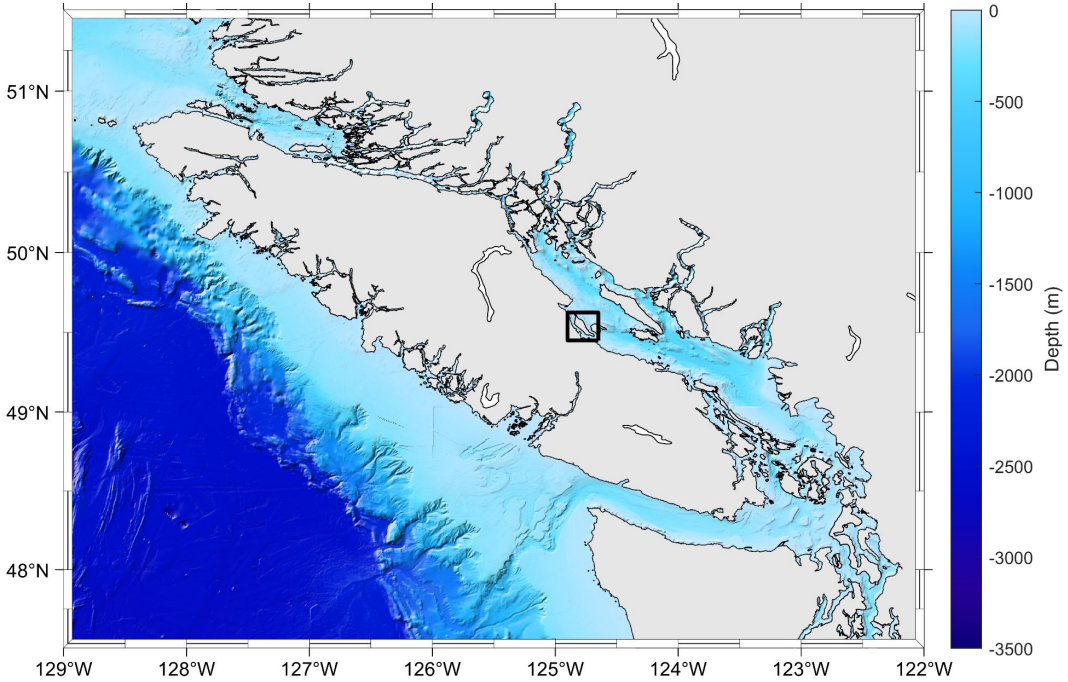
Link to - https://data.oceannetworks.ca/OpenAPI

Your turn!

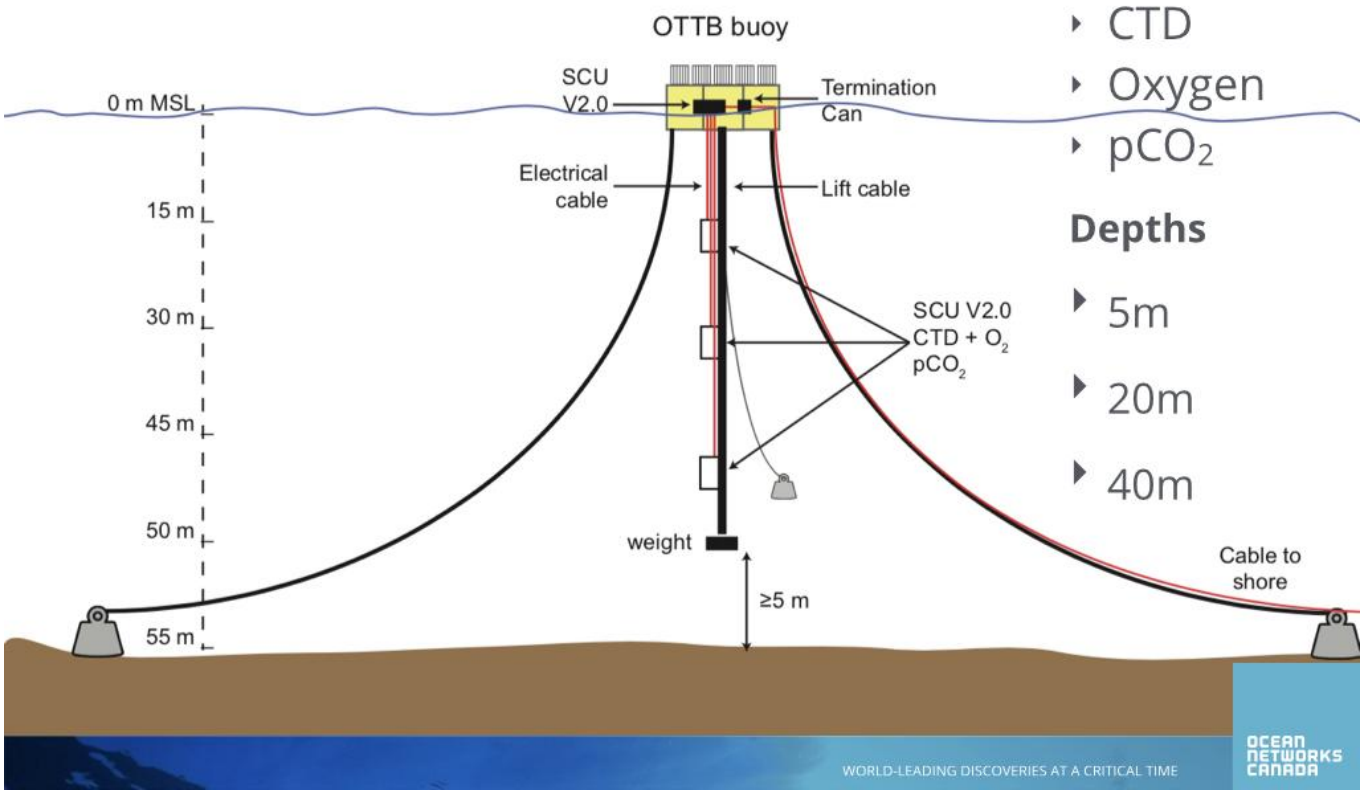
- You will be asked 8 questions, for which you will have to use the OpenAPI to discover the answers.
- Make a note of your answers however you like:
  - On paper.
  - In a word document.
  - Remember them (?)
- We'll switch back to Menti to see how we got on!

Baynes Sound:

- Baynes Sound is a narrow channel situated between Denman Island and Vancouver Island .



OCEAN ACIDIFICATION MOORING INSTALLED IN BAYNES SOUND



Science instruments

- Met station
- CTD
- Oxygen
- pCO_2

Depths

- 5m
- 20m
- 40m

Questions:

1. What is the location code for the Baynes Sound Mooring?
2. What is the location code for the platform at 40 mbss on the mooring?
3. On January 1st 2024, how many "children" did the mooring site have?
4. What is the device category code for the CO2 sensor at 40 mbss?
5. What is the deployment start date of the current CO2 Sensor at 40 mbss?
6. What is the property code for temperature from the CTD at 5 mbss?
7. What is the device ID of the CTD currently deployed at 5 mbss?
8. What does TSSP stand for as a data product code?
    a. Bonus 1: What does TSSD stand for?
    b. Bonus 2: What is the total file size (in kb) of the Log File collected on July 7th 2024 by the CTD at 5 mbss?

ONC’s API Client Library Prerequisites

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Troubleshooting

- Common error: Error 401 - this means you need to input your personal token into the code for it to run
- If you need assistance, please raise your hand or speak up and one of us will attend to your question.
- Python Glossary Items - https://docs.python.org/3/glossary.html.
- Please follow along with everything throughout the workshop unless otherwise stated.

API Call Prerequisites

Install ONC Library

```
#access to system-specific parameters and functions
import sys

!{sys.executable} -m pip install --upgrade onc -q #ensures the command uses the pip associated with that environment
```

Library Imports

```
#import all libraries needed to run your codes
from onc import ONC
import json
import pandas as pd
import os
```

API Call Prerequisites, cont.

Request Parameters

```
# Request air pressure data from Campbell River Shore Station
# The codes for the parameters are found on the links provided or using OpenAPI

onc = ONC(token= os.environ['TRICY_TOKEN'])       # Enter your token here

requestParameters = {'locationCode':'CRSS',                  # Define the location to use; Campbell River Shore Station
                     'deviceCategoryCode':'METSTN',         # Define the device category to use; Meteorogical Station -
                     'sensorCategoryCodes':'pressure1',     # Define the sensor category to use; The absolute air press
                     'qualityControl':'clean',              # Define the quality control to use; See https://wiki.ocean
                     'dateFrom':'2022-01-15T00:00:00.000Z', # Starting date and time for requested data (From Date)
                     'dateTo':'2022-01-17T00:00:00.000Z'}   # Ending date and time for requested data (To Date)



response = onc.getDirectByLocation(requestParameters)      # Make the request using the parameters
```

Case Study

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API and python with Oceans 3.0 data

Objectives:

- Learn how to download data using the **scalar data** service
- Learn how the Oceans 3.0 API is Interoperable with data from the Ocean Observatories Initiative
- Be able to perform some basic manipulations of the API downloaded data using python code

Overview: practice using API in a case studies

- Honga Tonga volcanic eruption and tsunami (step by step API workflows for scalar data)

Optional case studies for advanced students

- **Arctic** (complete API workflows with audio and scalar data)
- **Acoustic Doppler Current Profiler** (ADCP) (complete API workflows focusing on manipulation of scalar data)

Data: will be using clean data (data that has passed different quality control checks)

Raw and Clean data

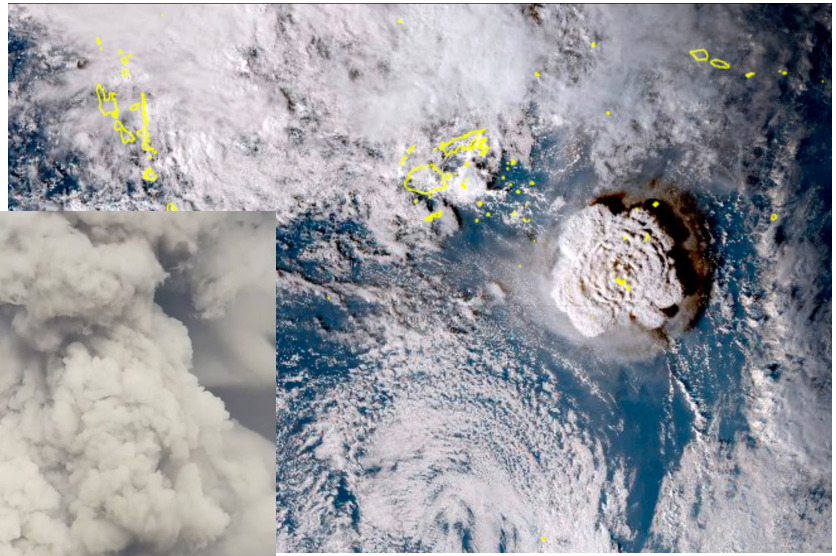
Raw Data

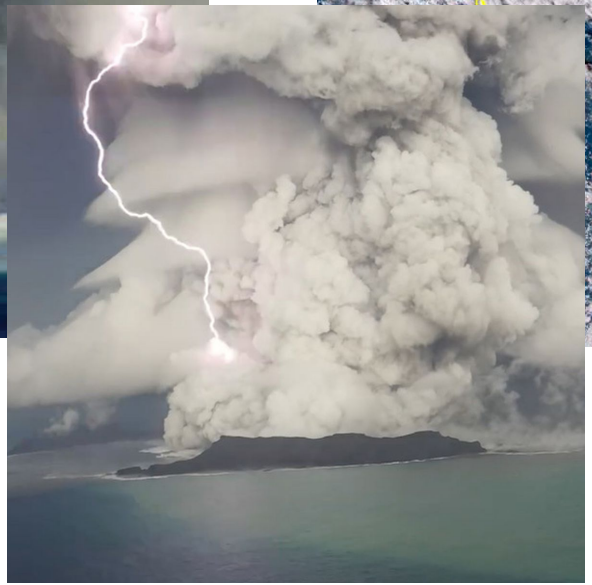
A quality control option that supplies raw data in the data products: no action is taken to modify the data. In general, all scalar data is associated with a quality control flag. These flags are stored adjacent to the data values.

Clean Data

A quality control option that will cause any data values with quality control failures to be replaced with NaNs. If the do not fill data gaps option is selected, data values with quality control failures will be removed. For all data products, when resampling with the clean option, any data with quality control failures are removed prior to the resampling (this rule applies to all resampling types: average, min/max, etc).

Hunga Tonga volcanic eruption & tsunami

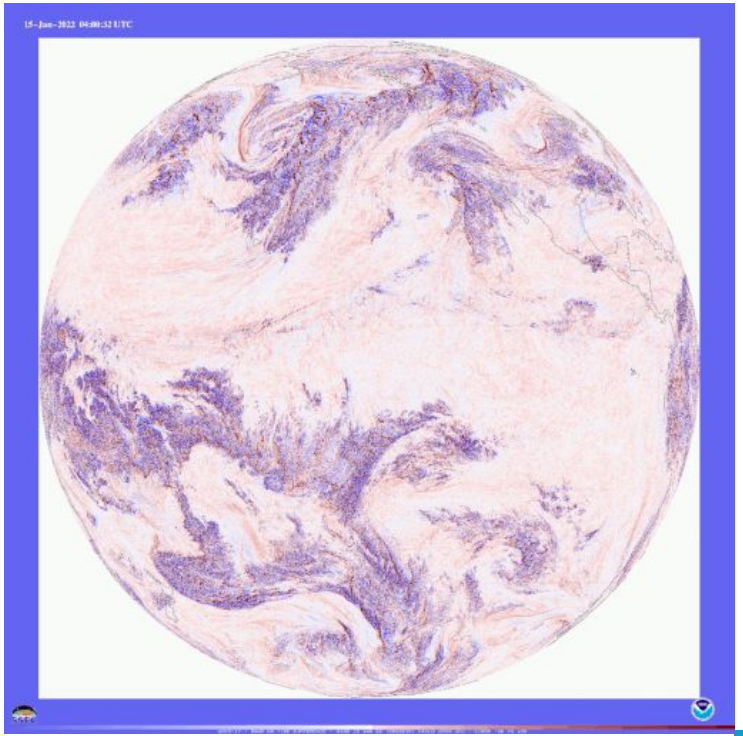




Hunga Tonga volcanic eruption & tsunami

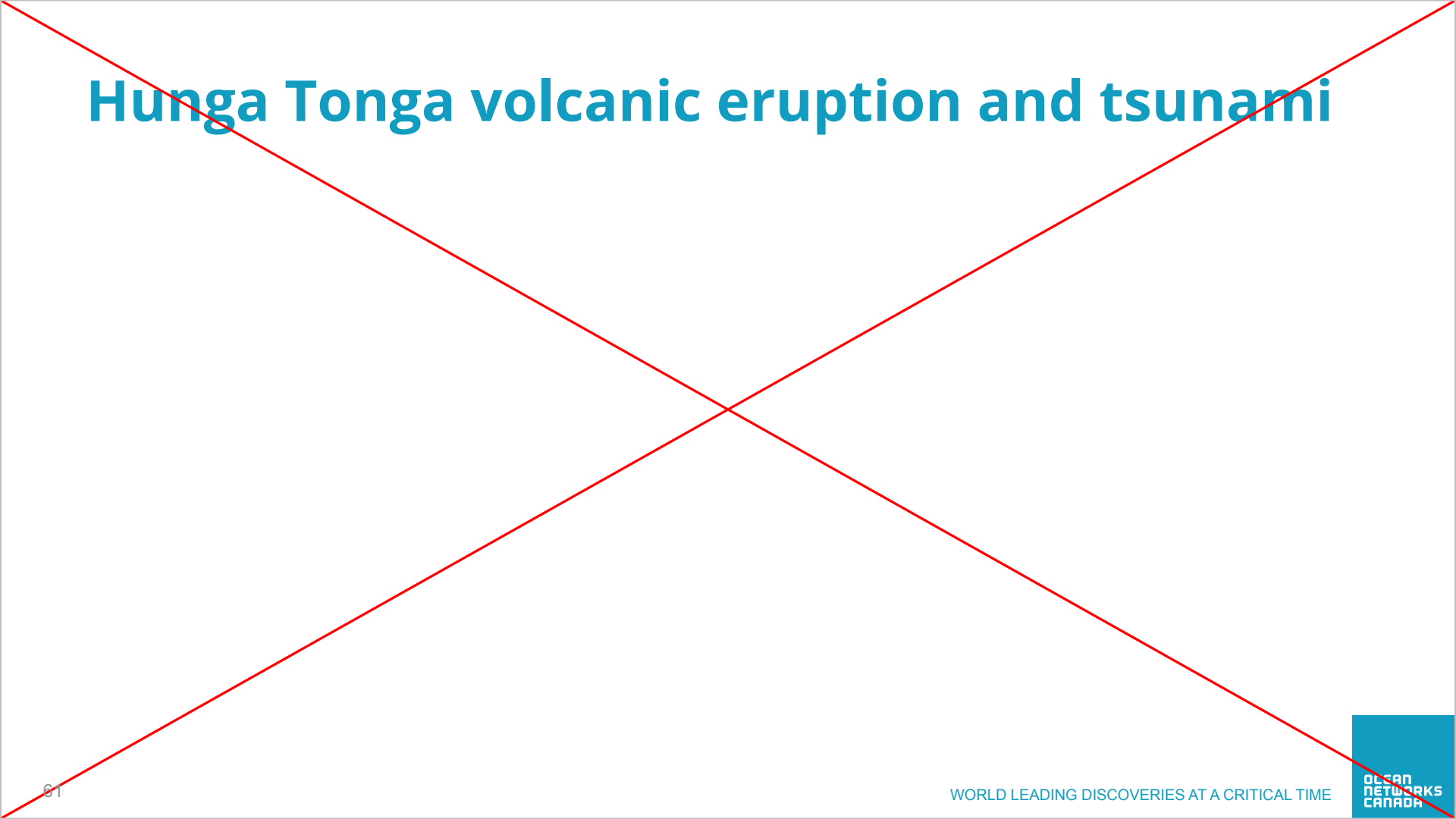
January 15th 2022 (04:14 UTC)

Undersea volcano erupted causing a pressure wave in the atmosphere and also generating a tsunami



Atmospheric waves from eruption

Hunga Tonga volcanic eruption and tsunami



Hunga Tonga volcanic eruption & tsunami

This case study combines data from Ocean Networks Canada and the US Ocean Observatories Initiative

Jupyter Notebooks we will be using:

1. Absolute air pressure
2. Seafloor Pressure
3. De-tided seafloor pressure (DART (Deep ocean Assessment and Reporting of Tsunamis) sensor)

How to access the Notebooks:

Link to notebooks: AGU 2024 Jupyter Notebooks

If you need assistance, please ask!

Break

10 minutes

OCEAN NETWORKS CANADA


10:00

ONC Data Citation

OCEAN NETWORKS CANADA

What is Data Citation?

Data citation is the practice of referencing data products used in research. A data citation includes key descriptive information about the data, such as the title, source, and responsible parties.

Joint Declaration of Data Citation Principles

Importance

Credit and Attribution

Evidence

Unique Identification

Access

Persistence

Specificity and Verifiability

Interoperability and Flexibility

Data Citation Synthesis Group: Joint Declaration of Data Citation Principles. Martone M. (ed.) San Diego CA: FORCE11; 2014 https://doi.org/10.25490/a97f-egyk

Data Citations 101: Persistent Identifier (PID)

A persistent identifier (PID) is a long-lasting reference to a document, person, file, web page, or other object (real or digital)

Components of a PID:

- A unique **identifier**
- A **service** that resolves the identifier to the object - even if its location changes
- **Metadata** about the object

A type of PID commonly used in scholarly communication contexts is a DOI (Digital Object Identifier) and DataCite is an example of a non-profit organisation that provides persistent identifiers (DOIs) for research data and other research outputs.

How to cite data at ONC?

Citing data is just like citing a journal article:

Typical journal citation

Chatzievangelou D, Thomsen L, Doya C, Purser A and Aguzzi J (2022) Transects in the deep: Opportunities with tele-operated resident seafloor robots. Front. Mar. Sci. 9:833617. doi: 10.3389/fmars.2022.833617

ONC dataset citation

Ocean Networks Canada Society. 2022. *Fraser River Delta Upper Slope Acoustic Doppler Current Profiler 300 kHz Deployed 2022-03-11*. Ocean Networks Canada Society. https://doi.org/10.34943/8a8882c3-3755-4b3a-bdef-caf9d503872d.

Data Citation Components

Creator (PublicationYear). Title. Publisher. Identifier

- Ocean Networks Canada Society. 2022. Fraser River Delta Upper Slope Acoustic Doppler Current Profiler 300 kHz Deployed 2022-03-11. Ocean Networks Canada Society. https://doi.org/10.34943/8a8882c3-3755-4b3a-bdef-caf9d503872d.

Author or Creator: The people or organizations responsible for the intellectual work to develop a data set.

Public Release Date: When the particular version of the data set was first made available for use (and potential citation) by others.

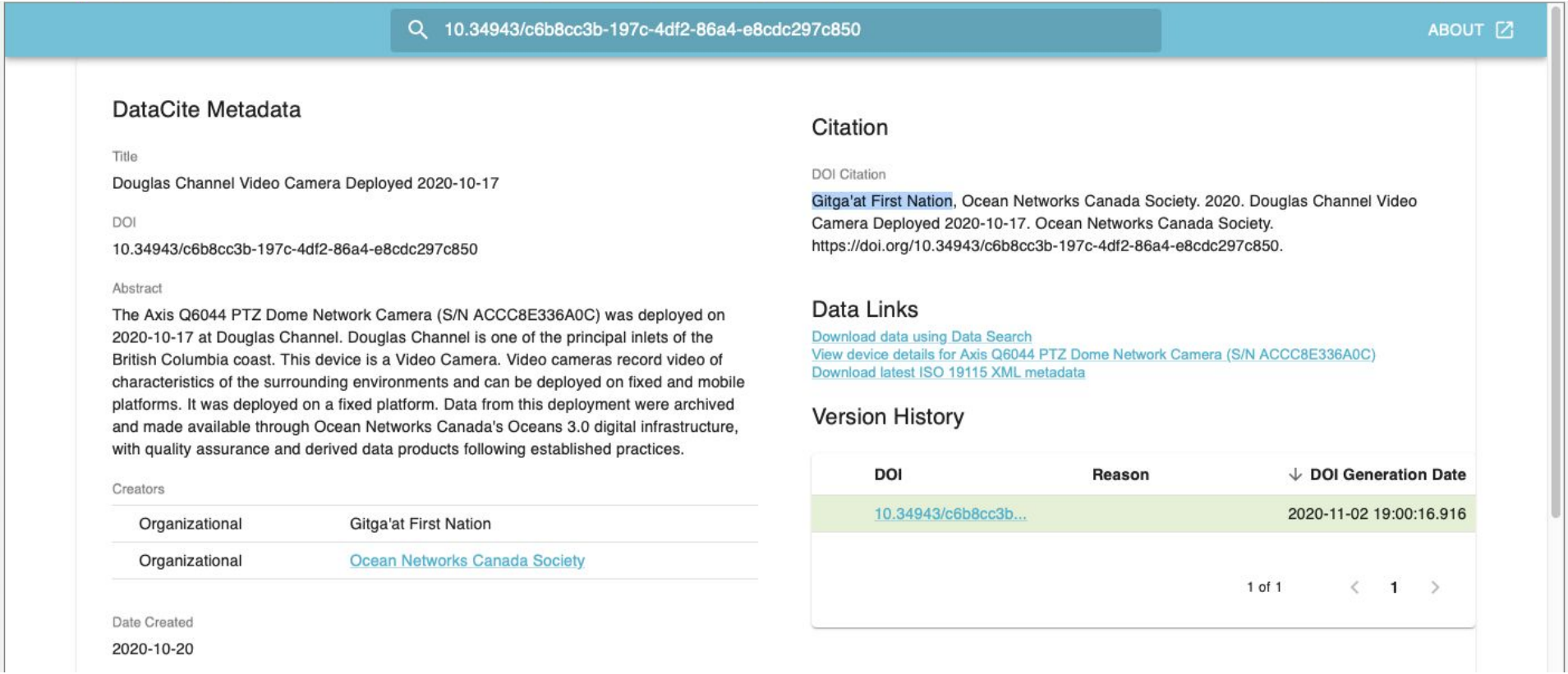
Title: The formal title of the data set, not the project or a related publication.

Publisher/Repository: The name of the entity that holds or produces the data.

Resolvable Persistent Identifier: The unique identifier that provides the ability to access the data.

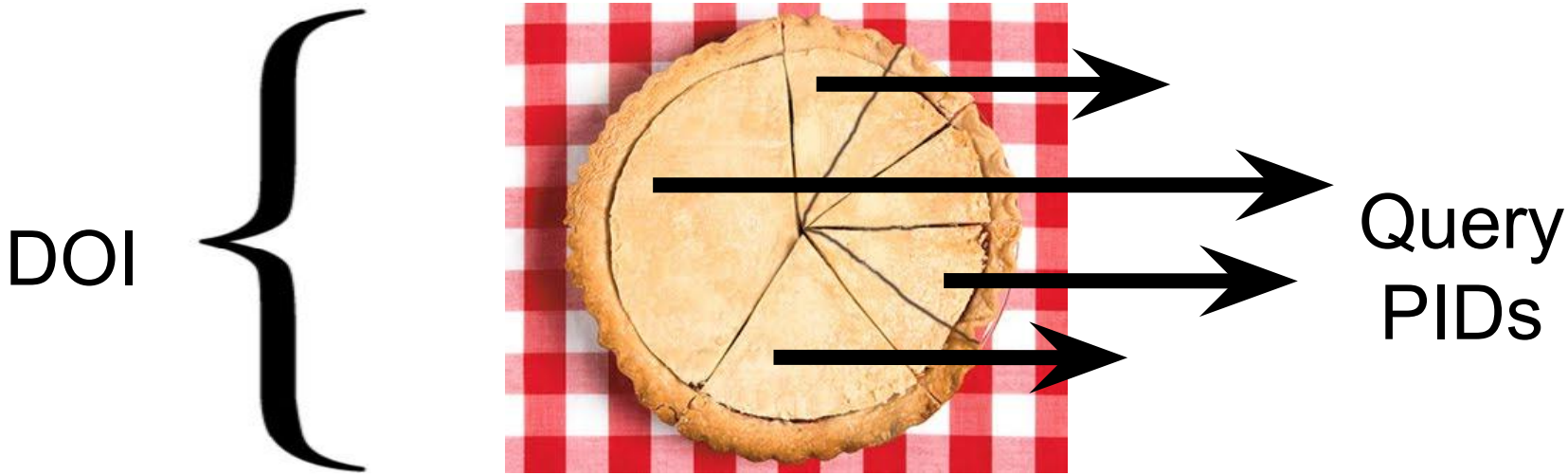
Access Date: Because data can be dynamic and changeable in ways that are not always reflected in release dates and versions, it is important to indicate when online data were accessed.

DOI Dataset Landing Page



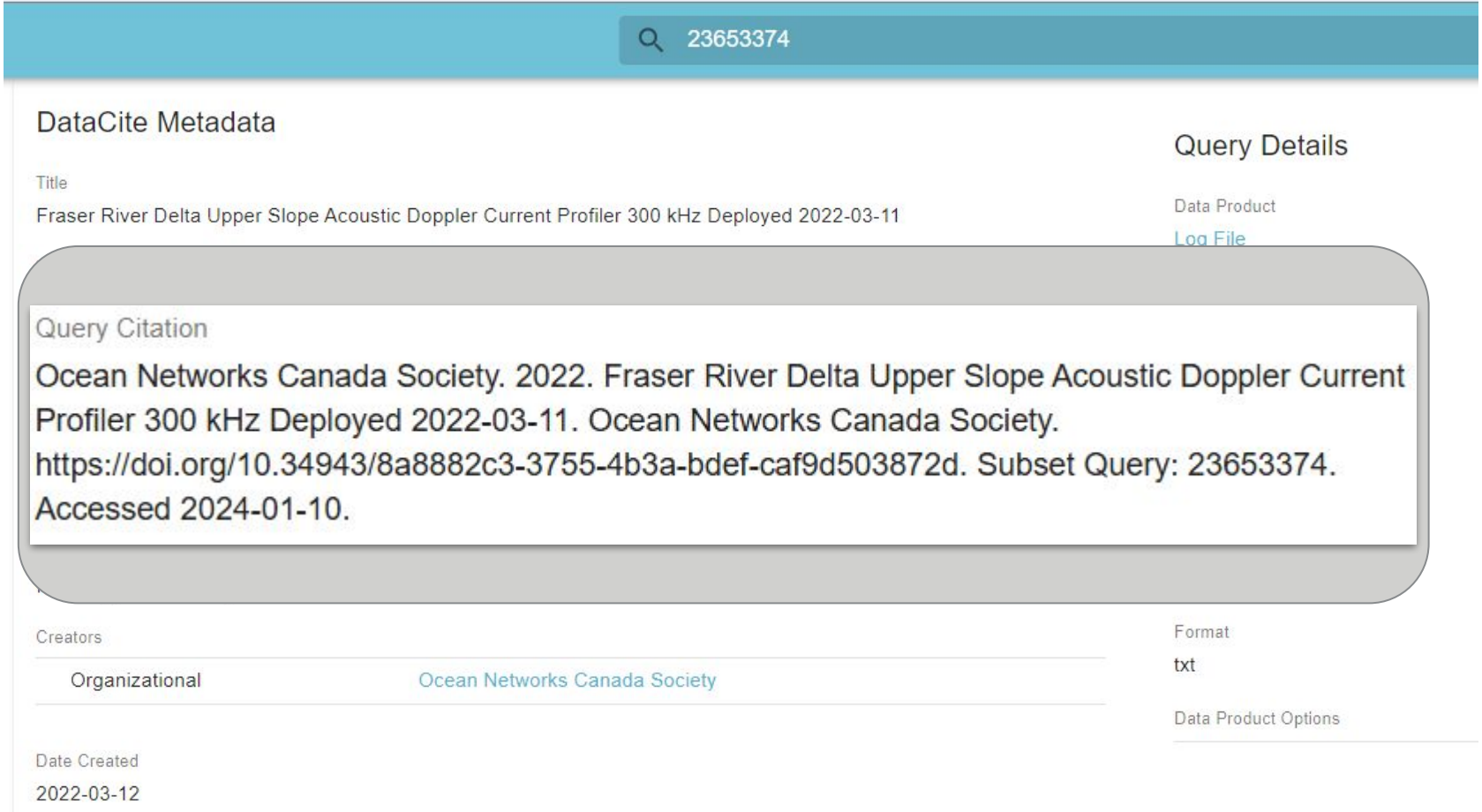
https://data.oceannetworks.ca/DatasetLandingPage?doidataset=10.34943/c6b8cc3b-197c-4df2-86a4-e8cdc297c850

Query PIDs



- Every data search (query) in Oceans 3.0 is **saved** in the database and labeled with its own **local identifier**, the '**Query PID**'
- Query PIDs can be used like a DOI in the Oceans 3.0 Landing Page Resolver, to retrieve a landing page with **additional details** specific to that exact search

Query PID Dataset Landing Page



https://data.oceannetworks.ca/DatasetLandingPage?doidataset=23653374

Search History Tool

Link to Oceans 3.0 https://data.oceannetworks.ca/SearchHistory
Documentation https://wiki.oceannetworks.ca/display/O2KB/Search+History

Path	Search ID	Data Product	Date From	Date To	Options	Query Date	Search S...
Ocean Networks Canada > Pacific > Salish Sea > Strait of Georgia > Fraser River Delta > Fraser River Delta Upper Slope > Delta Dynamics Laboratory	37518243	Log File	2022-03-11 0...	2022-04-04 0...	No options found	2024-01-10 1...	Data Search

Query PID	Device	Date From	Date To	Site ID	Dataset DOI	Copy Citation
23653374	RDI Workhorse Monitor ADCP...	2022-03-11 20:42:58	2022-04-04 00:00:00	1026960	10.34943/8a8882c3-3755-4b3...	

Path	Search ID	Data Product	Date From	Date To	Options	Query Date	Search S...
Ocean Networks Canada > Arctic > Cambridge Bay > Underwater Network	37517738	Time Series Scalar Data	2018-07-26 0...	2018-08-04 0...	Fill missing/bad data with NaNs (Not a Number), Clean Data, None	2024-01-10 1...	Data Search

Query PID	Device	Date From	Date To	Site ID	Dataset DOI	Copy Citation
23653371	ASL Shallow Water Ice Profile...	2018-07-26 20:58:00	2018-08-04 00:00:00	1004299	10.34943/5f5cb349-d2fd-4841...	

Path	Search ID	Data Product	Date From	Date To	Options	Query Date	Search S...
Ocean Networks Canada > Pacific > Salish Sea > Discovery Passage > Campbell River Shore Station	37506413	Time Series Scalar Data	2017-09-12 0...	2018-01-05 2...	Fill missing/bad data with NaNs (Not a Number), Clean Data, None	2024-01-09 2...	Data Search

Query PID	Device	Date From	Date To	Site ID	Dataset DOI	Copy Citation
23642047	Lufft WS501 (S/N 192.1216.1...	2017-09-12 06:51:47	2018-01-05 22:02:50	1000522	10.34943/5491fb80-ef03-4cb8...	

Web Services: Citation Text

DOIs and Query PIDs can also be used with the **Oceans 3.0 API** to retrieve the data citation formatted according to the [ESIP Data Citation Guidelines for Earth Science Data, v.2]:

DOI

https://data.oceannetworks.ca/api/citationText?method=get&doi=10.34943/8a8882c3-3755-4b3a-bdef-caf9d503872d

Query PID

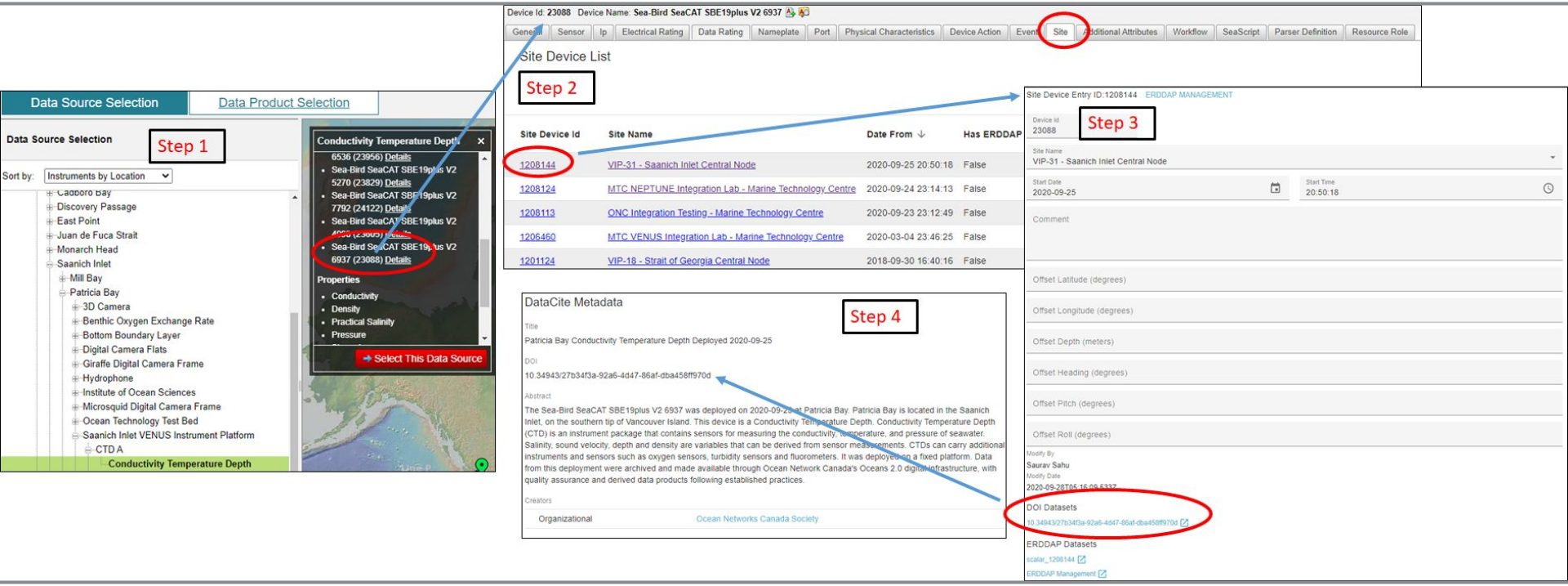
https://data.oceannetworks.ca/api/citationText?method=get&queryPid=23653374

DOIs can also be accessed via the following in a Jupyter Notebook

```
response = requests.get(url,params=requestParameters)
requestInfo = json.loads(str(response.content,'utf-8'))
requestInfo['citations']
```

```
> ['Ocean Networks Canada Society. 2022. Fraser River Delta Upper Slope Acoustic
Doppler Current Profiler 300 kHz Deployed 2022-03-11. Ocean Networks Canada Society.
https://doi.org/10.34943/8a8882c3-3755-4b3a-bdef-caf9d503872d.']
```

Another Method of Finding Citations in Data Search



https://wiki.oceannetworks.ca/display/DP/Data+Citations#DataCitations-DatasetLandingPage

Referencing ONC itself (not datasets)

Guidance for citing ONC Oceans 3.0 digital infrastructure

If you are referencing ONC's digital infrastructure, such as the tools and functions in Oceans 3.0:

Owens D, Abeysirigunawardena D, Biffard B, Chen Y, Conley P, Jenkyns R, Kerschtien S, Lavallee T, MacArthur M, Mousseau J, Old K, Paulson M, Pirenne B, Scherwath M and Thorne M (2022) The Oceans 2.0/3.0 Data Management and Archival System. Front. Mar. Sci. 9:806452. doi: 10.3389/fmars.2022.806452

https://www.frontiersin.org/articles/10.3389/fmars.2022.806452/full

Guidance for citing ONC data repository (entity)

Use the below citation if you are referring to Ocean Networks Canada data repository services:

Ocean Networks Canada's Oceans 3.0; editing status 2024-10-07; re3data.org - Registry of Research Data Repositories. http://doi.org/10.17616/R3RW43 last accessed: YYYY-MM-DD

AGU24 Learning Evaluation

https://bit.ly/3D0N49s

ONC survey:
https://www.surveymonkey.com/r/QCRM7CF

Question & Answer Period

Please reach out to ue-officer@oceannetworks.ca for any further questions about a specific data and/or services.

OCEAN NETWORKS CANADA

THANK YOU!

Ocean Networks Canada is Funded by the Canada Foundation for Innovation, the Government of Canada, Natural Resources Canada, Fisheries & Oceans Canada, CANARIE, the Government of British Columbia, the University of Victoria, and many others.

@ocean_networks OceanNetworksCanada Visit: **oceannetworks.ca**

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