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BSED: Beaufort Sea Engineering Database

Louis Poirier

National Research Council of Canada

Ocean, Coastal and River Engineering

NOGF, Oct. 12, 2017

NRC's Ocean, Coastal and River Engineering

PROGRAMS

Marine Vehicles

Arctic

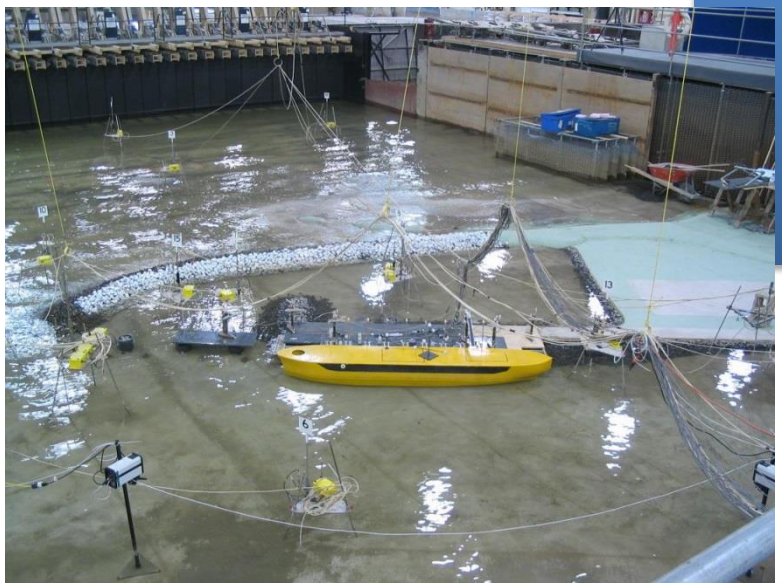
Marine Infrastructure, Energy and Water Resources

Marine Infrastructure, Energy and Water Resources

Lead: Andrew Cornett andrew.cornett@nrc-cnrc.gc.ca

Research Thrusts:

- **Marine infrastructure**
- **Renewable energy**
- **Water resources**



OBJECTIVES

Optimize the design of marine infrastructure

Improve the management of water resources

Accelerate the commercial viability of Canadian marine renewable energy technologies

Marine vehicles Program

Lead: Fraser Winsor fraser.winsor@nrc-cnrc.gc.ca

Research Thrusts:

- **Reduced cost of marine operations**
- **Safe and economic Arctic and offshore O&G operations**
- **Building a sustainable, competitive Canadian shipbuilding industry**

OBJECTIVES

Reduce fuel consumption
Reduce vessel design costs
Maximize the value of capital investment
Reduce risk

Arctic Program

Lead: Anne Barker anne.barker@nrc-cnrc.gc.ca

Research thrusts:

- **Resource development**
- **Northern transportation**
- **Marine safety technologies**
- **Community infrastructure**

OBJECTIVE

Ensure sustainable, low-impact development of the North while increasing the quality of life for Northerners

Arctic Program R&D Activities

Resource Development

- Ice loads on offshore structures
- Oil spill detection, forecasting and bioremediation
- Engineering datasets for offshore regulators and industry
- Ice characterization for design

Northern Transportation

- Shipping risk assessment system
- Pack ice forecasting for operations
- Ice- and winter-roads under climate change conditions

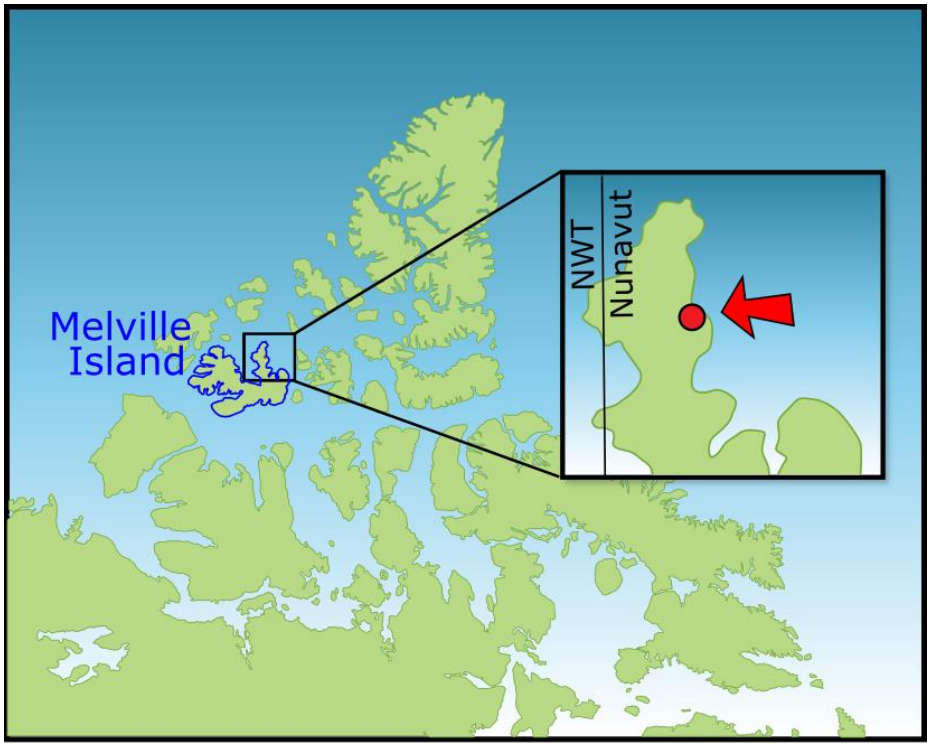
Marine Safety

- Next generation personal protective equipment
- Next generation life-saving appliances
- Operations to support evacuation and rescue

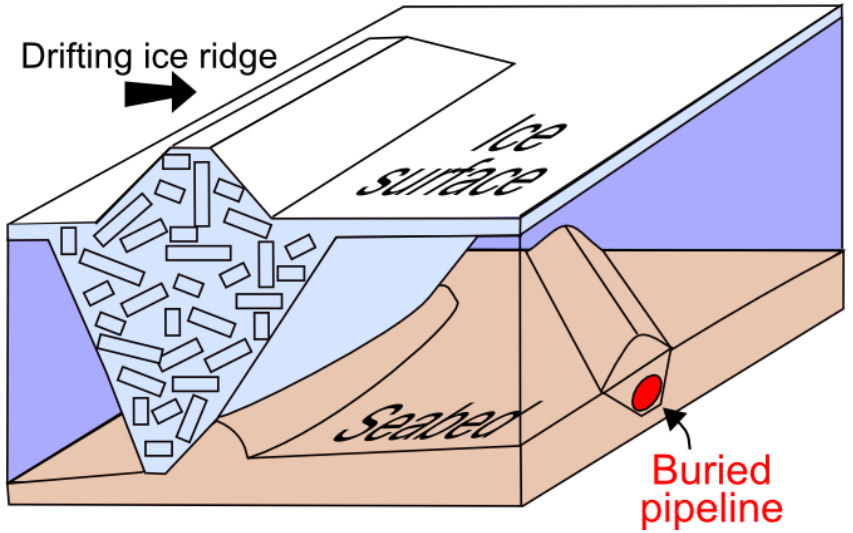
Community Infrastructure

- Northern building standards
- Water and wastewater technologies
- Building envelope, lighting and energy efficiency
- Foundations in permafrost
- In-situ bioremediation

Field Work: The Drake subsea pipeline

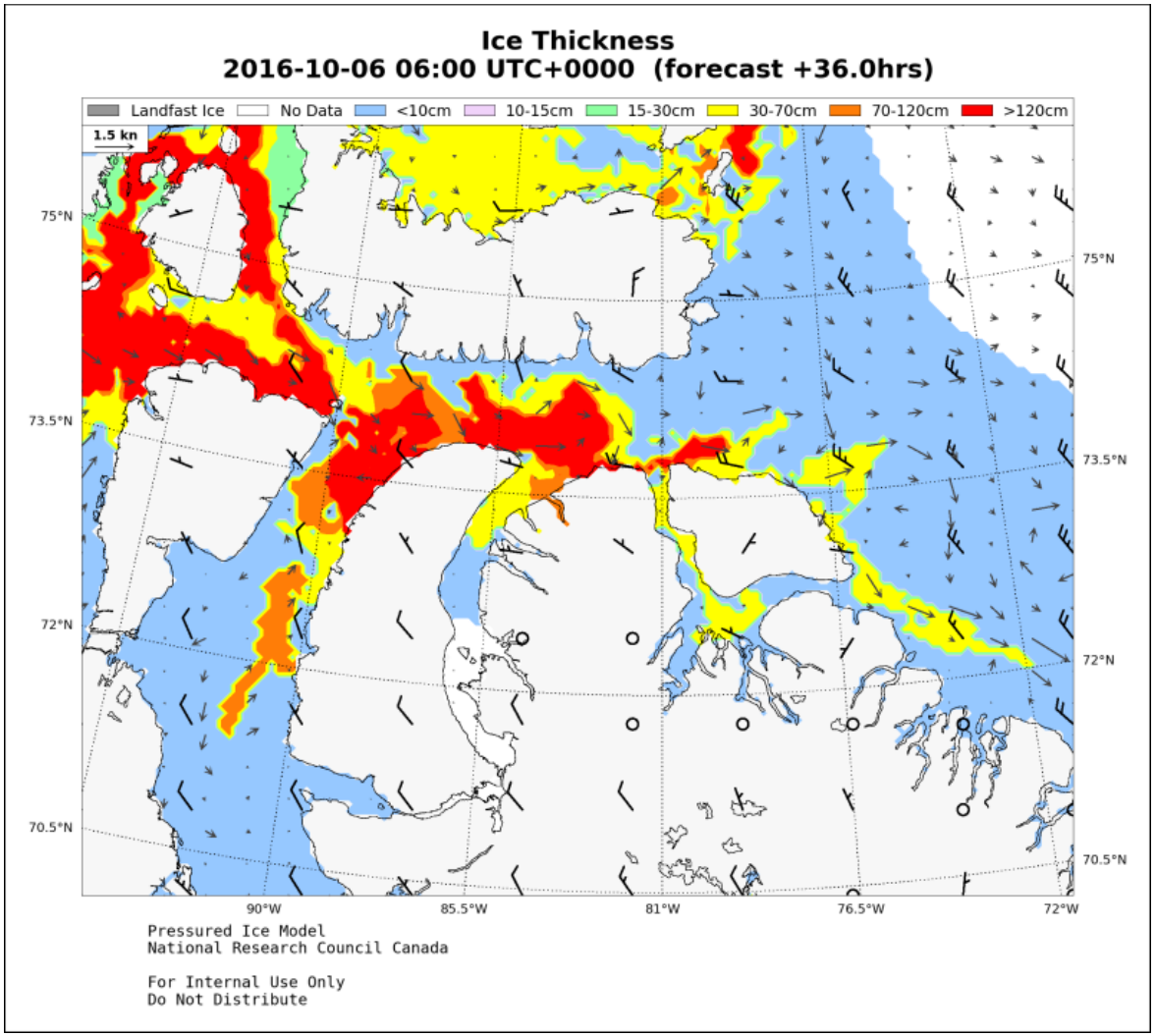


Field investigation (2020)
Outcome: To guide design of future pipelines.

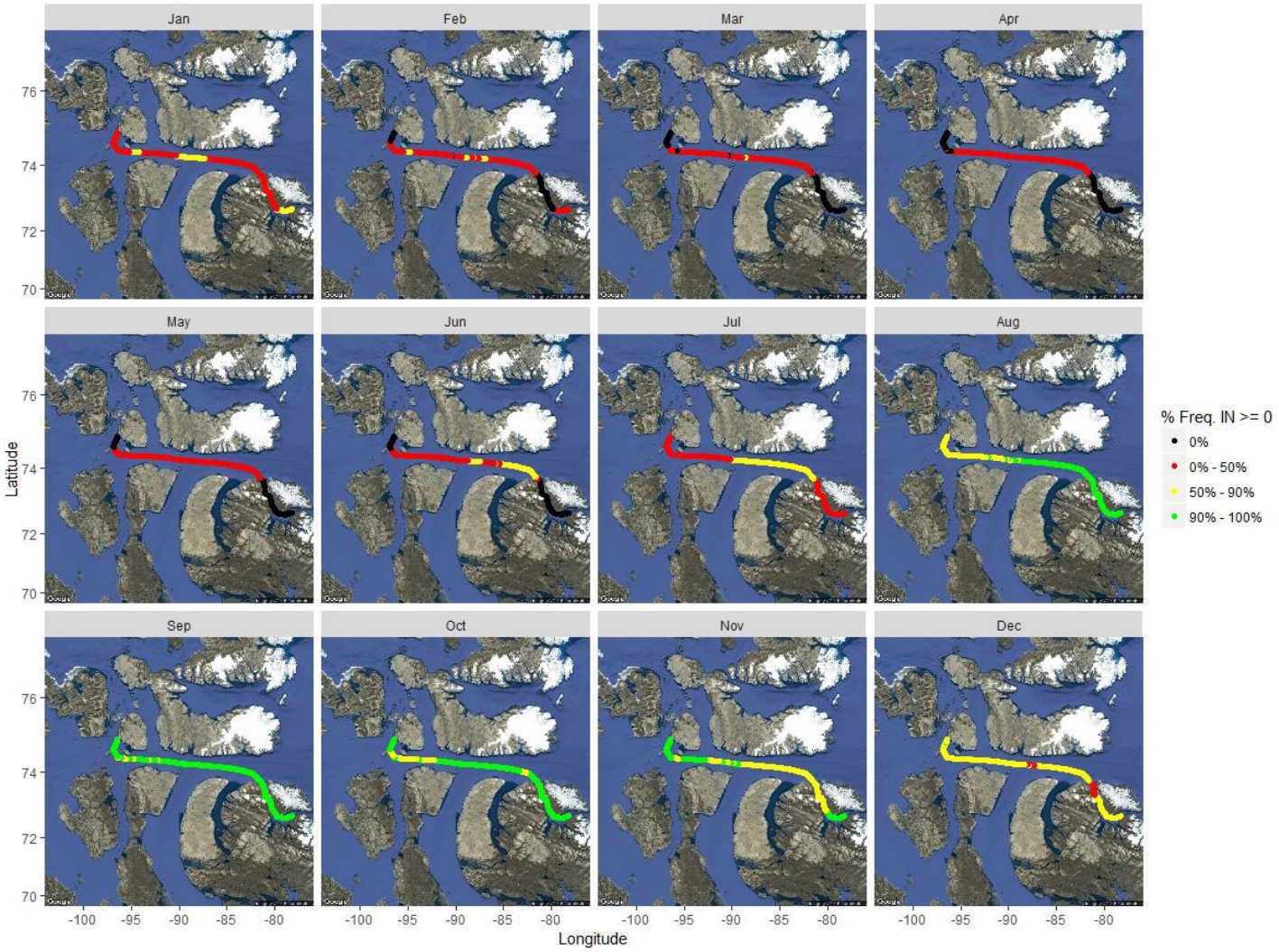


Cold Weather Laboratories: Safety at Sea

Numerical Models: Pack Ice Drift Forecasting

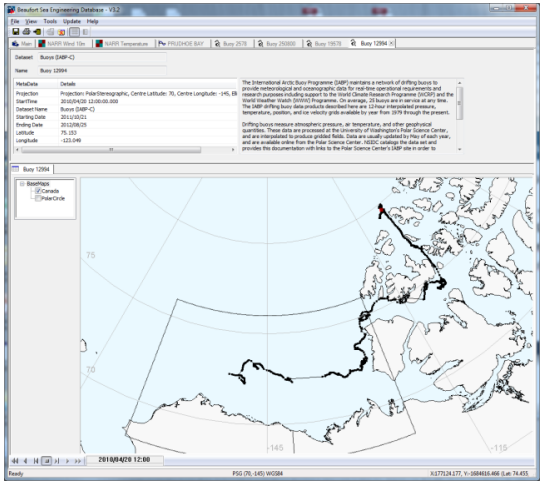


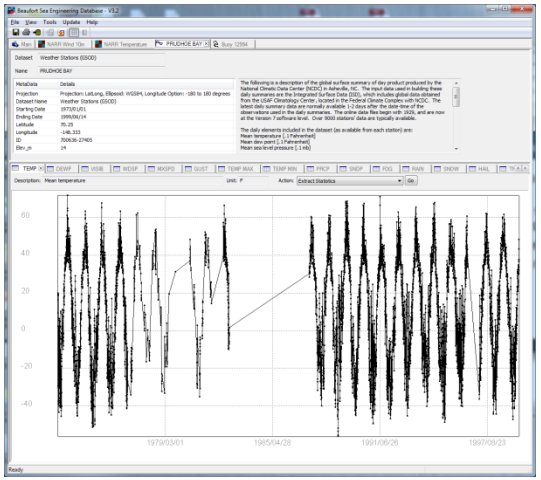
Databases: CASRAS

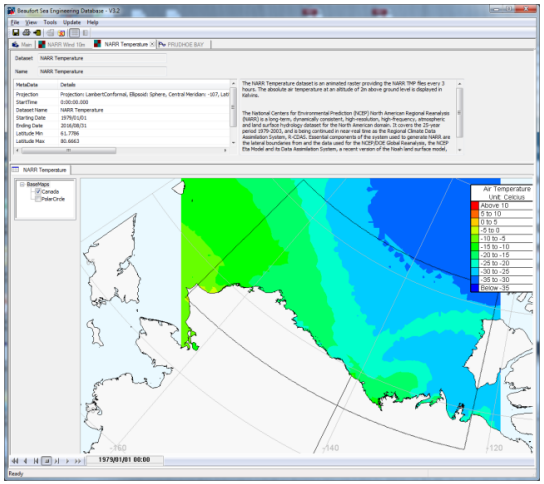


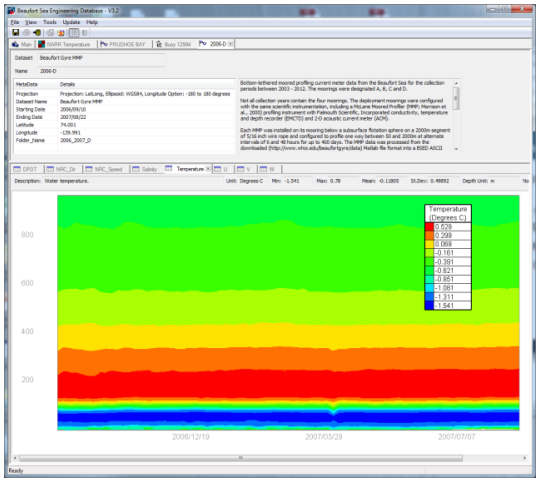
BSED 3.2 Datasets

- 84 datasets
- 11 dataset categories
- 211 GB
- Over 200 000 files
- 9 data types









Current BSED Datasets

Bathymetry	
1.1	Bathymetric Chart (IBCAO)
1.2	ArcticNet Basemaps
1.3	ArcticNet Beaufort Shelf
Buoys	
2.1	ArcticNet Beacons
2.2	SEDNA Buoys
2.3	Buoys (IABP-C)
Community and Infrastructure	
3.1	Arctic Infrastructure, Airports
3.2	Community Conservation Plans
3.3	Arctic Infrastructure, Ports

Hazardous Ice	
4.1	Extreme Ice Features
4.2	Extreme Ice Features, Historical
4.3	Historical Ice Islands
4.4	Ice Island Surveys: Southern Beaufort Sea
4.5	NRC Ice Ridges Dataset
4.6	NRC MY Ice Dataset
4.7	NRC Old Ice Borehole Strength
4.8 - 4.11	IceBridge topography

Ice Charts	
5.1 - 5.2	CIS Ice Atlas [2]
5.3	CIS Ice Atlas – Frequency of old ice
5.4	CIS Ice Atlas – Frequency of old ice greater than 4 tenths
5.5	CIS Ice Atlas - Frequency of sea ice
5.6	CIS Ice Atlas - Median ice concentration
5.7	CIS Ice Atlas - Median ice concentration when ice is present
5.8	CIS Ice Atlas - Median old ice concentration
5.9	CIS Ice Atlas - Predominant Ice Type
5.10	CIS Daily Ice Charts
5.11	CIS Historical
5.12	CIS Regional Western Arctic
5.13	NIC Arctic
5.14	Polar Continental Shelf Project
5.14a	POLARIS: Polar Operational Limit Assessment Risk Indexing System

Current BSED Datasets

Ice Motion	
6.1	Moored Upward Looking Sonar - Ice Velocity
6.2	Ice Velocity (IABP-D)
6.3 - 6.6	Polar Pathfinder [4]
6.7	MEaSURES-06
6.8	GlobICE
Ice Properties	
7.1	ArcticNet HEMI
7.2	CIS Ice Thickness
7.3	Hourly Ice Observations (Molikpaq)
7.4	Ice Concentration MMAB
7.5	Ice Thickness - HEMI flight
7.6	Moored Upward Looking Sonar - Ice Draft
7.7	IceBridge
7.8	Ice Load Catalogue
7.9	Submarine Upward Looking Sonar - Ice Draft

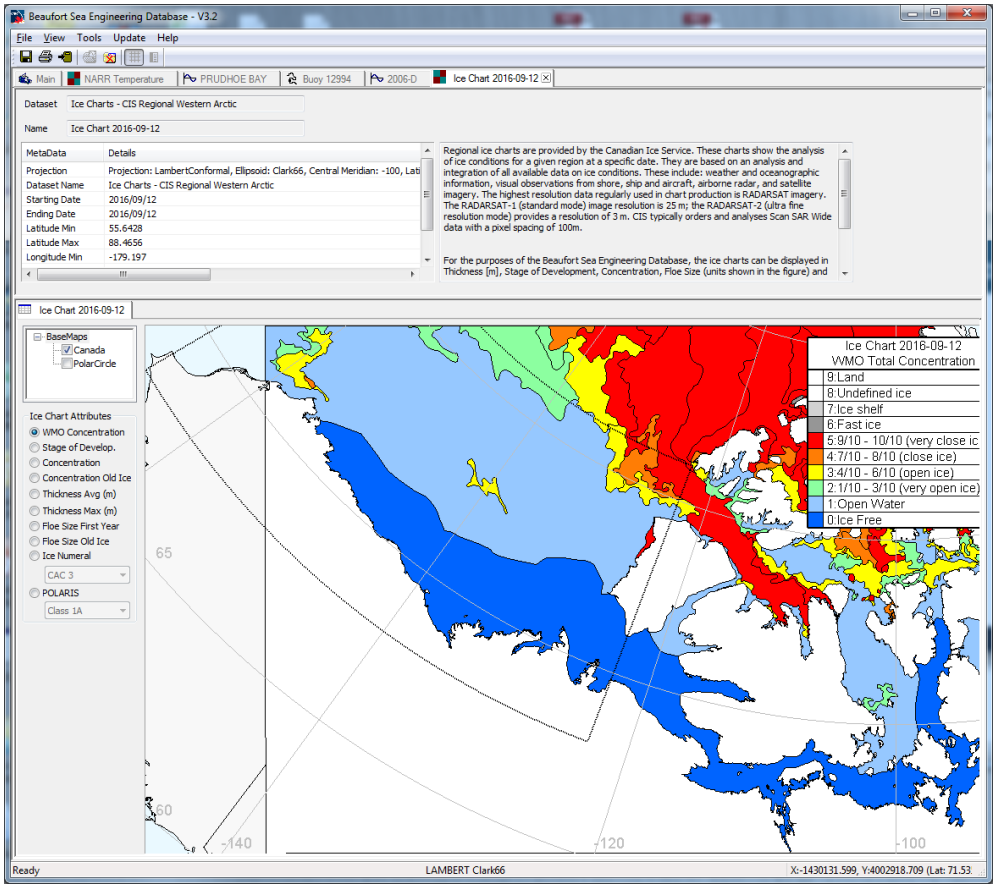
MetOcean	
8.1	Air Pressure (IABP-AB)
8.2	Beaufort Gyre MMP
8.3	CASES Mooring ADCP Sensor Data
8.4	CASES Mooring RCM Currents
8.5 - 8.7	MDLT: Mean Lowest Daily Low Temperature [3]
8.8 - 8.12	North American Regional Reanalysis [5]
8.13	Tide Stations
8.14	Weather Stations (CDCD)
8.15 - 8.16	Weather Stations [2]
8.17	Wind & Wave Hindcast

Navigation	
9.1	Shipping Safety Control Zones
9.2	Nautical Charts Canada
9.3	Nautical Charts USA
9.4	Arctic Data
Stakeholders	
10.1	Frontier Well Sites
10.2	Oil and Gas Rights

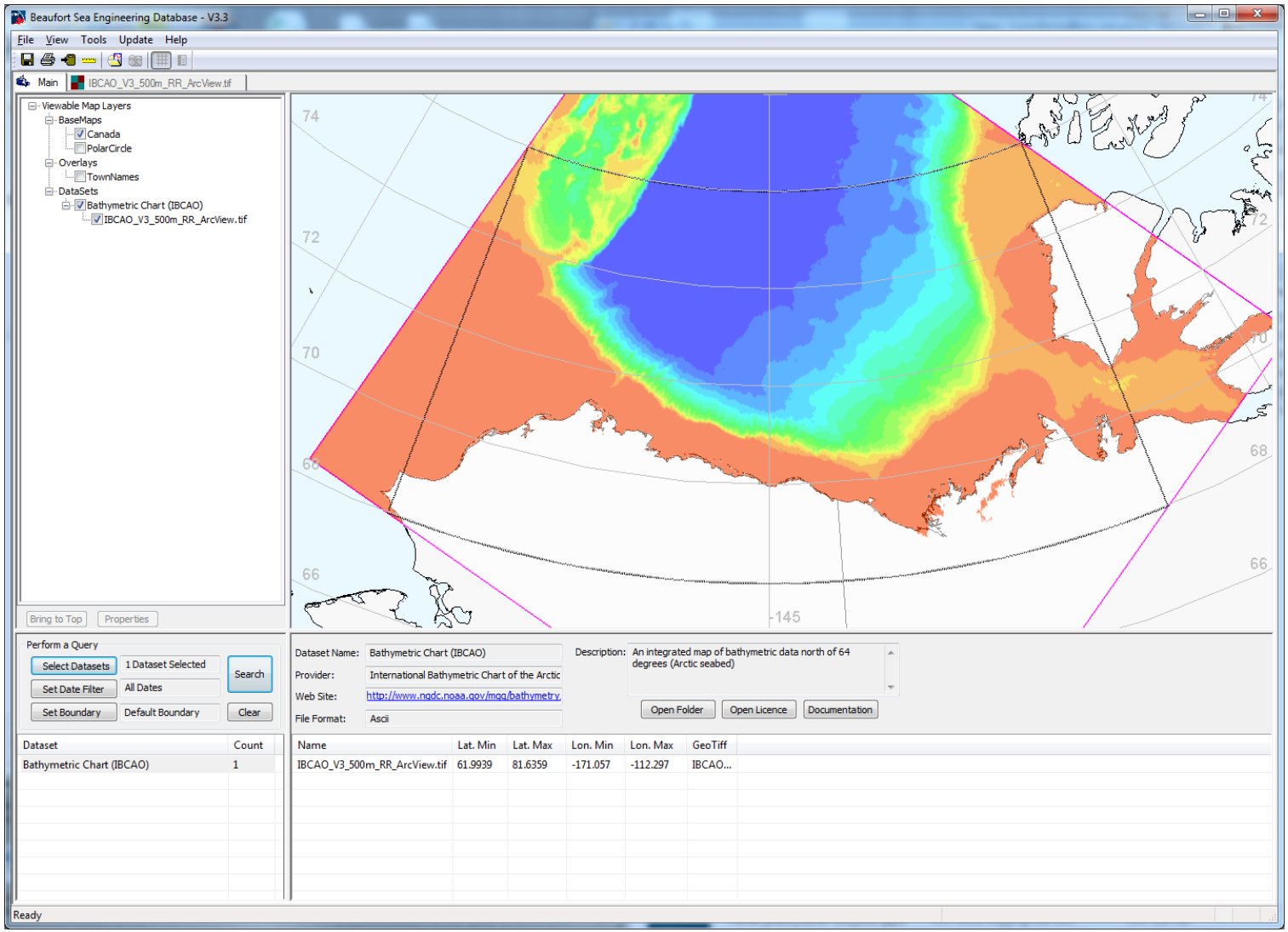
Subsurface	
11.1	Artificial Islands
11.2	Geotechnical Data (ESELog'ESEBase)
11.3	Geological Provinces of the World
11.4 - 11.6	Geological Map of the Arctic [3]
11.7	OCS Study Areas (Sub-Sea Data)
11.8	OCS Study Borings
11.9	OCS Study Boulder Patch
11.10	OCS Study Earthquakes
11.11	OCS Study Ice Gouge
11.12	OCS Study Strudel Scour
11.13	Soils Map

BSED - Current and Future

- 5 new datasets were added to the database this year
- 43 updateable datasets
- 2 more years are remaining in the current phase of the project



BSED interface



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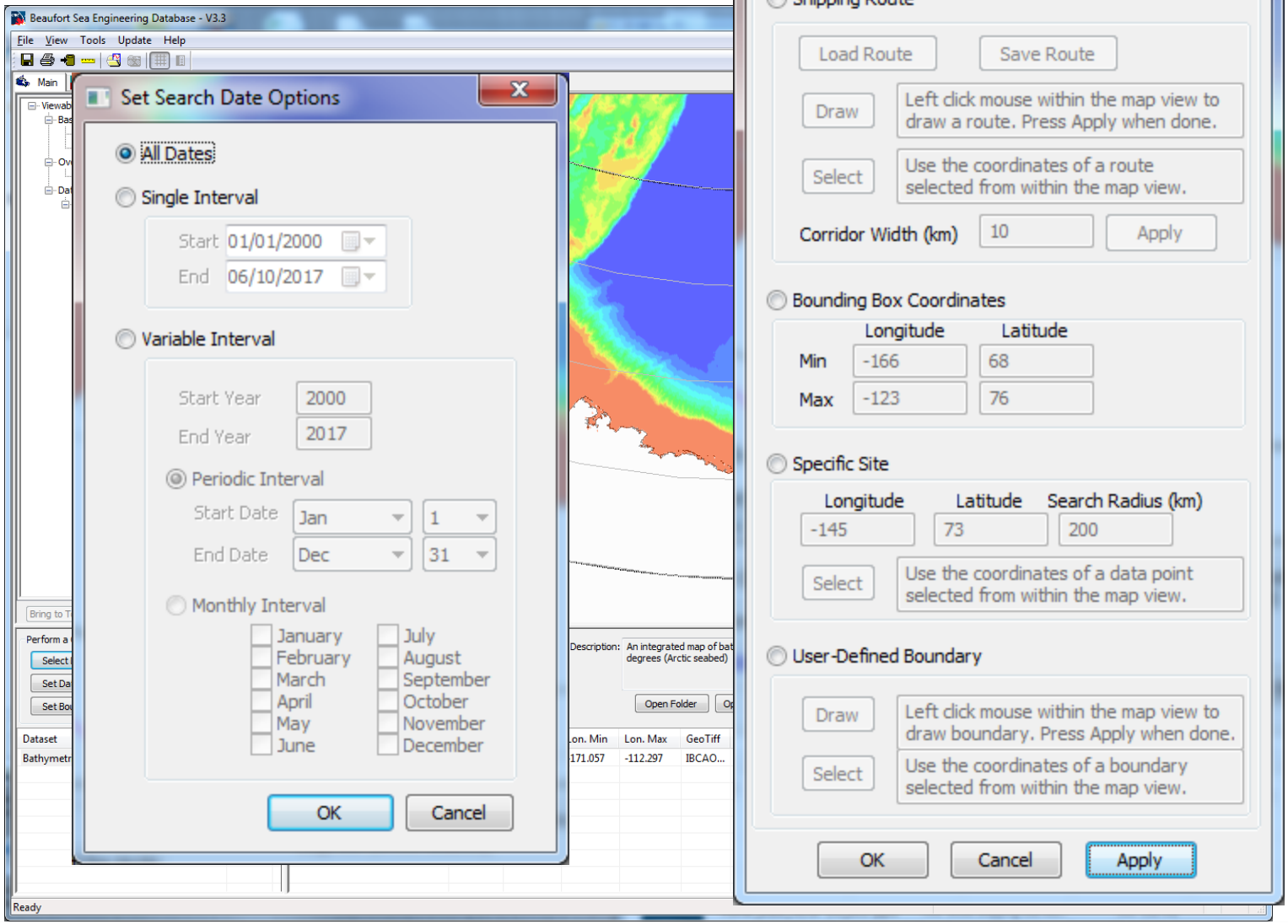
BSED: Querying Data



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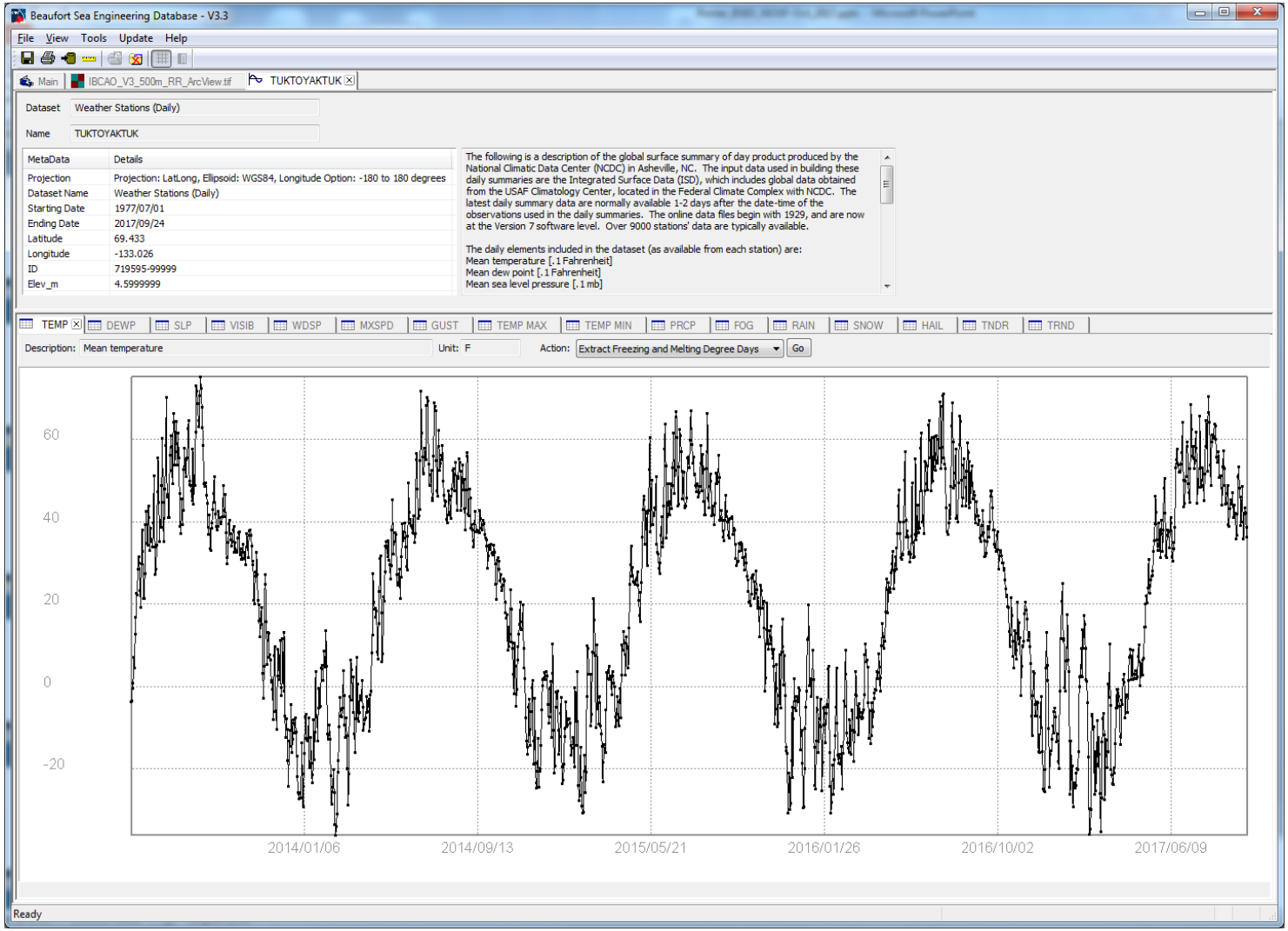
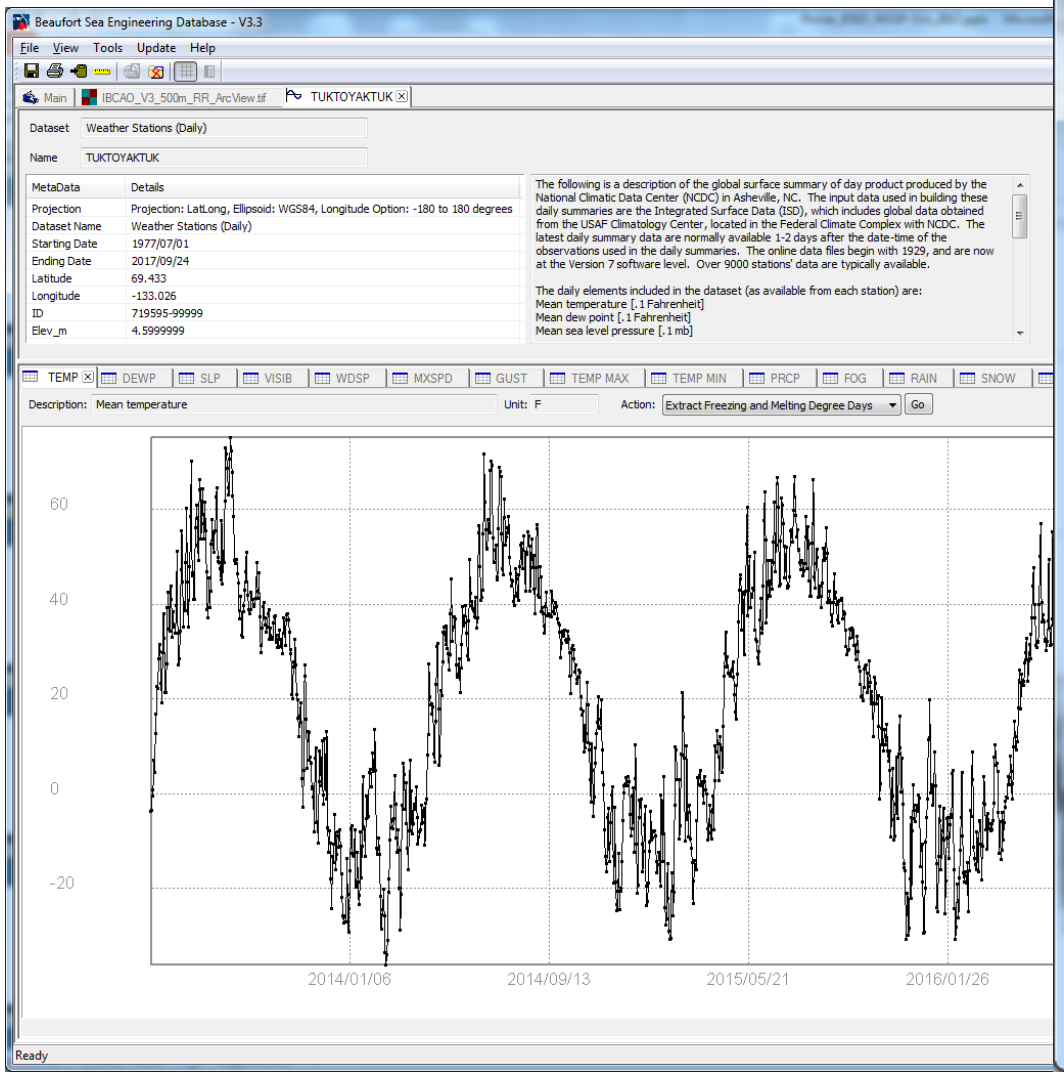
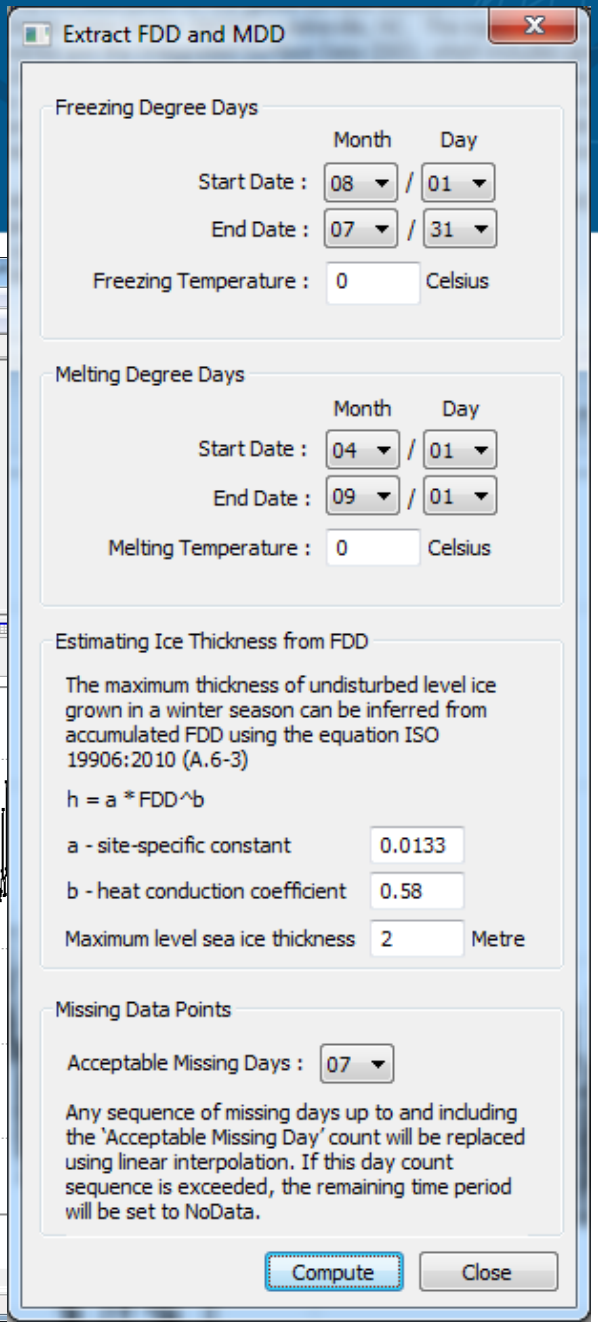
BSED: Weather Station Data

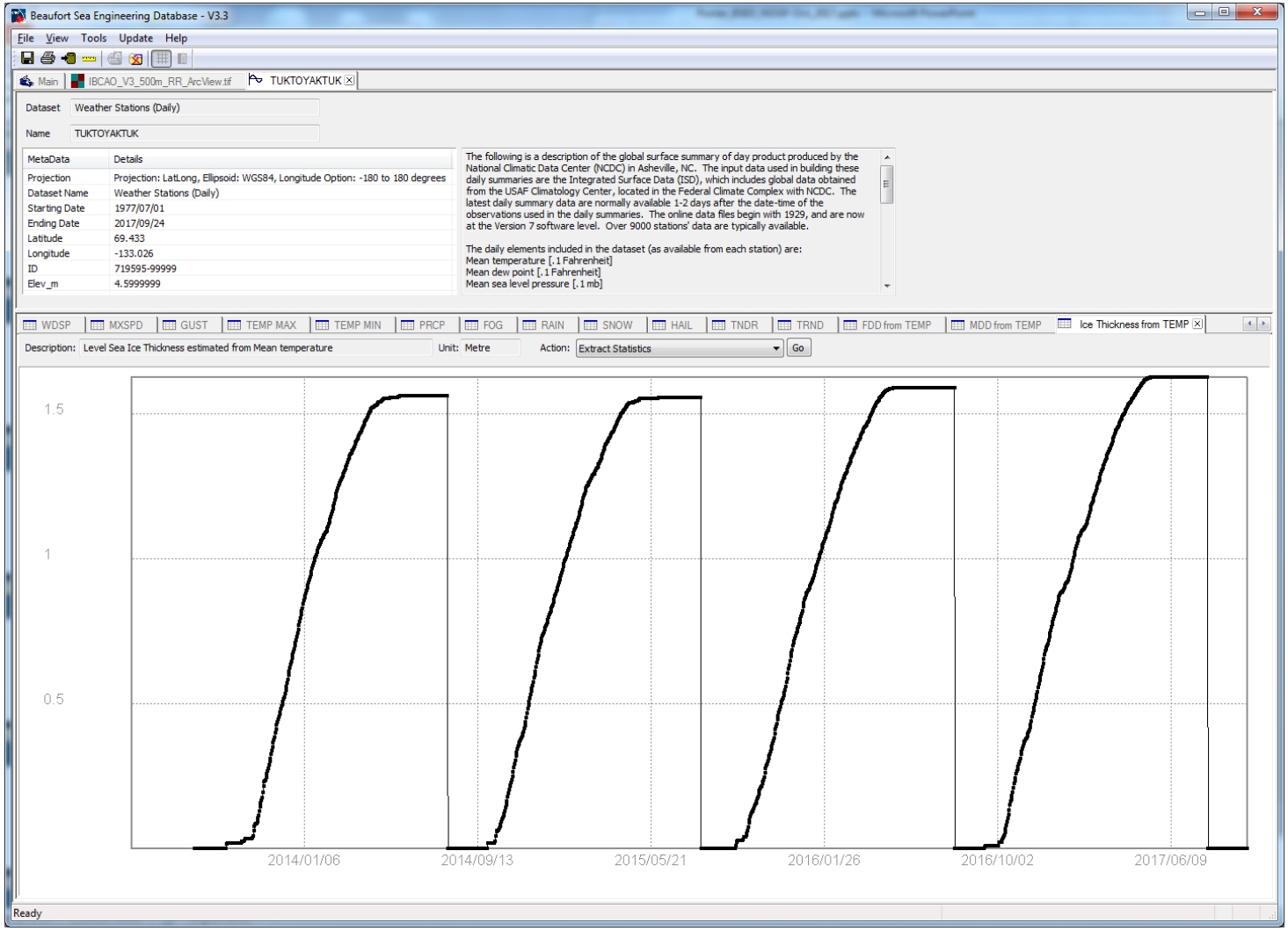


BSED: Tools (FDD)

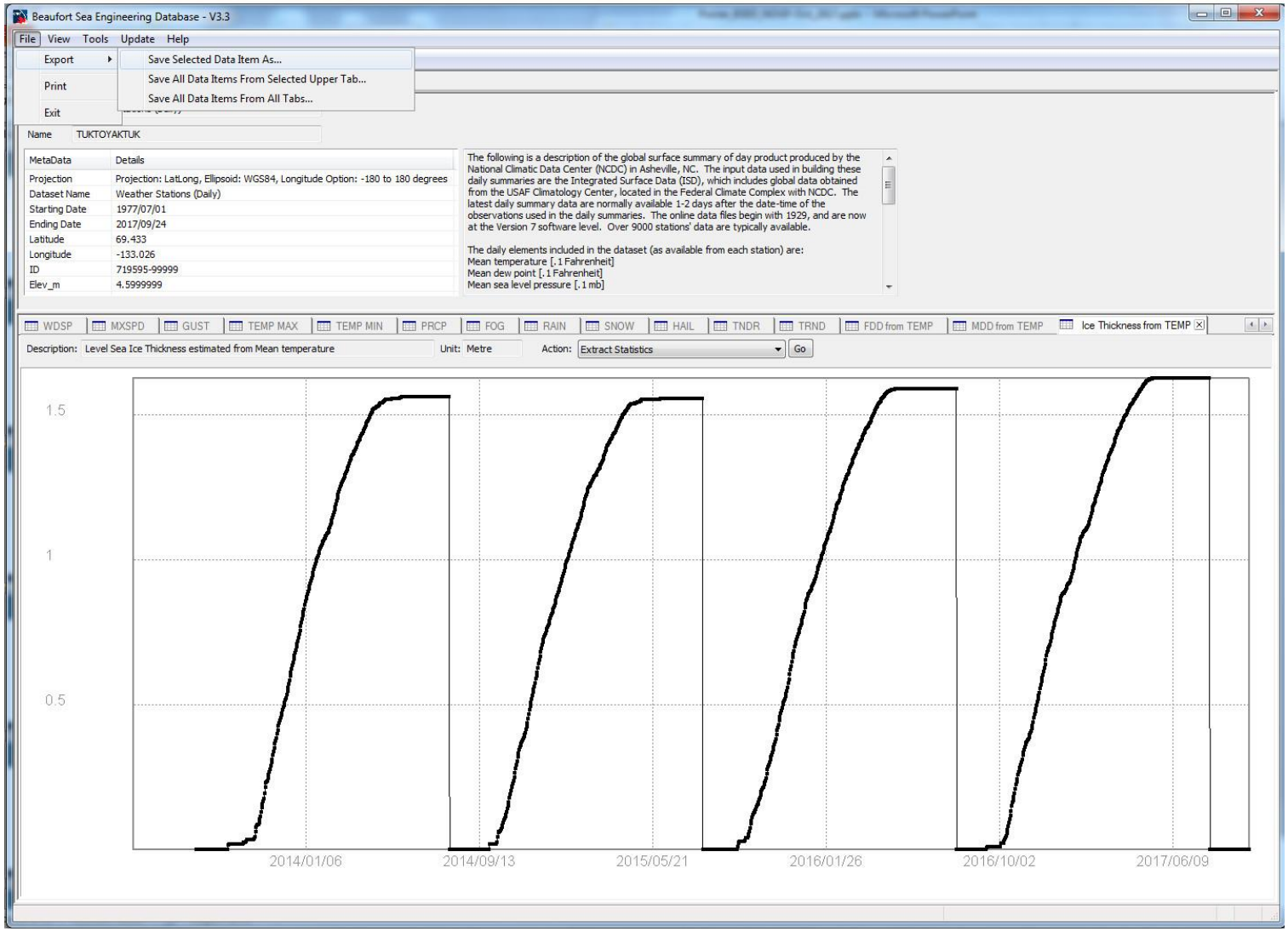




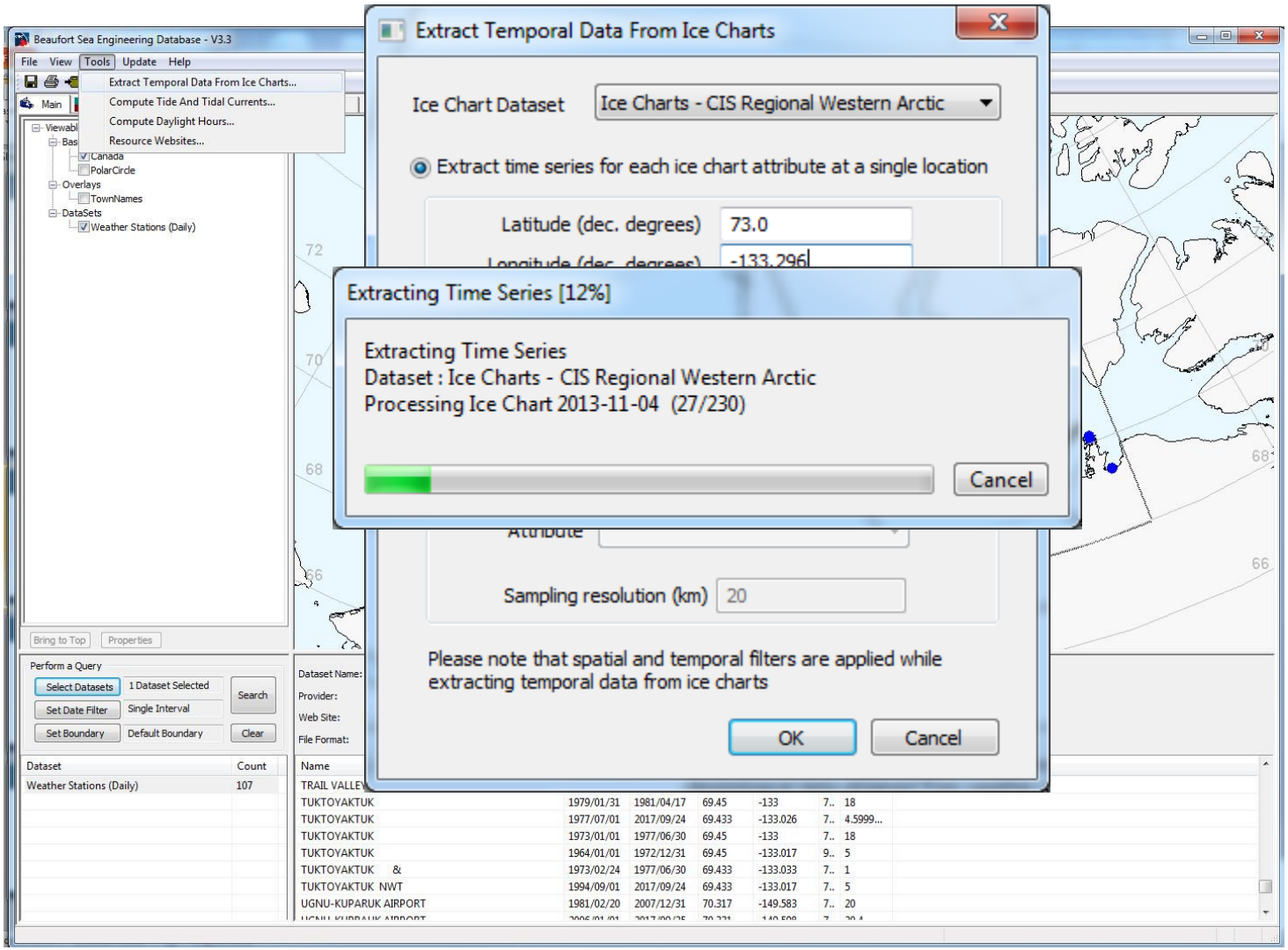
BSED: Analyzing Data



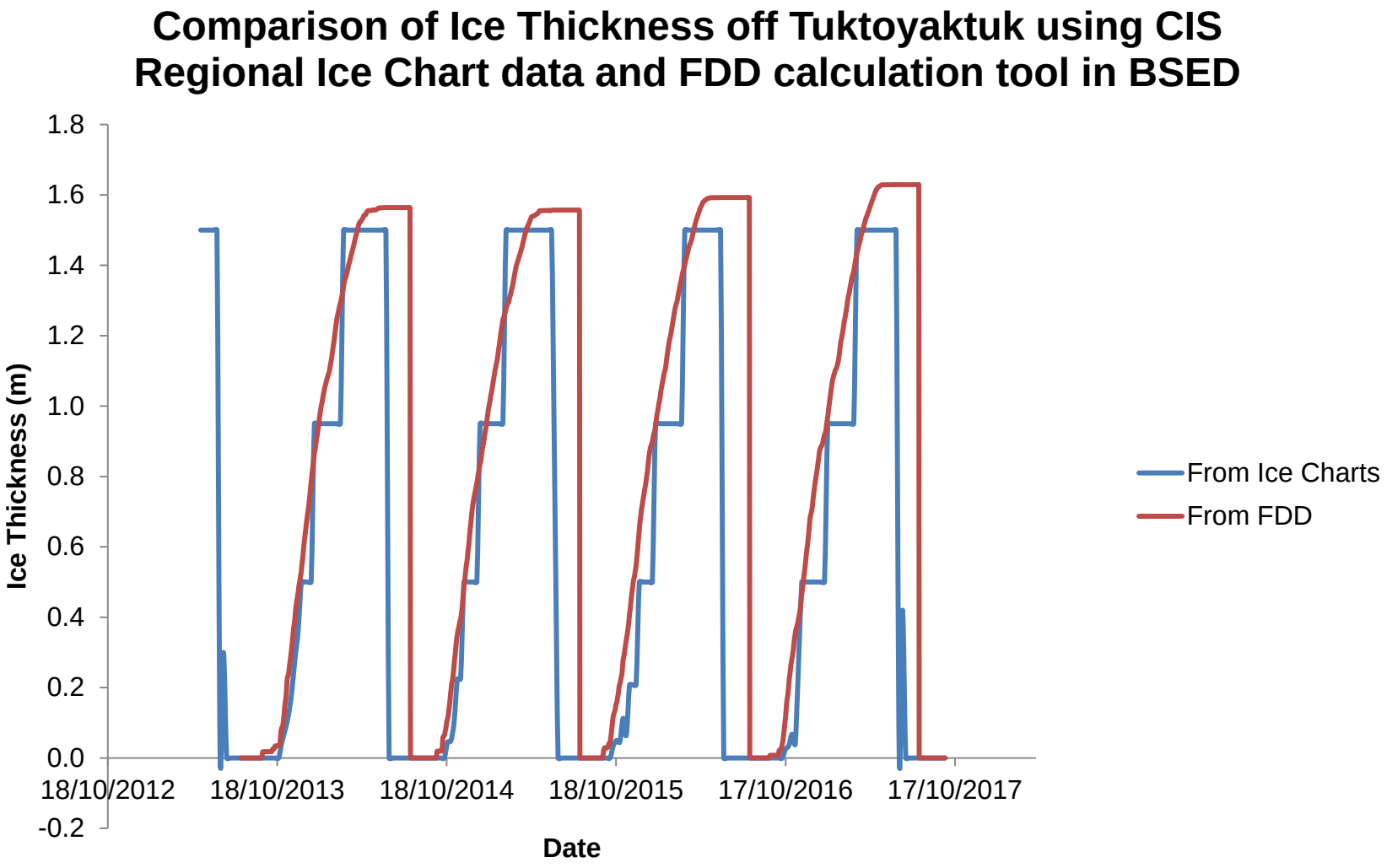
BSED: Extracting Data



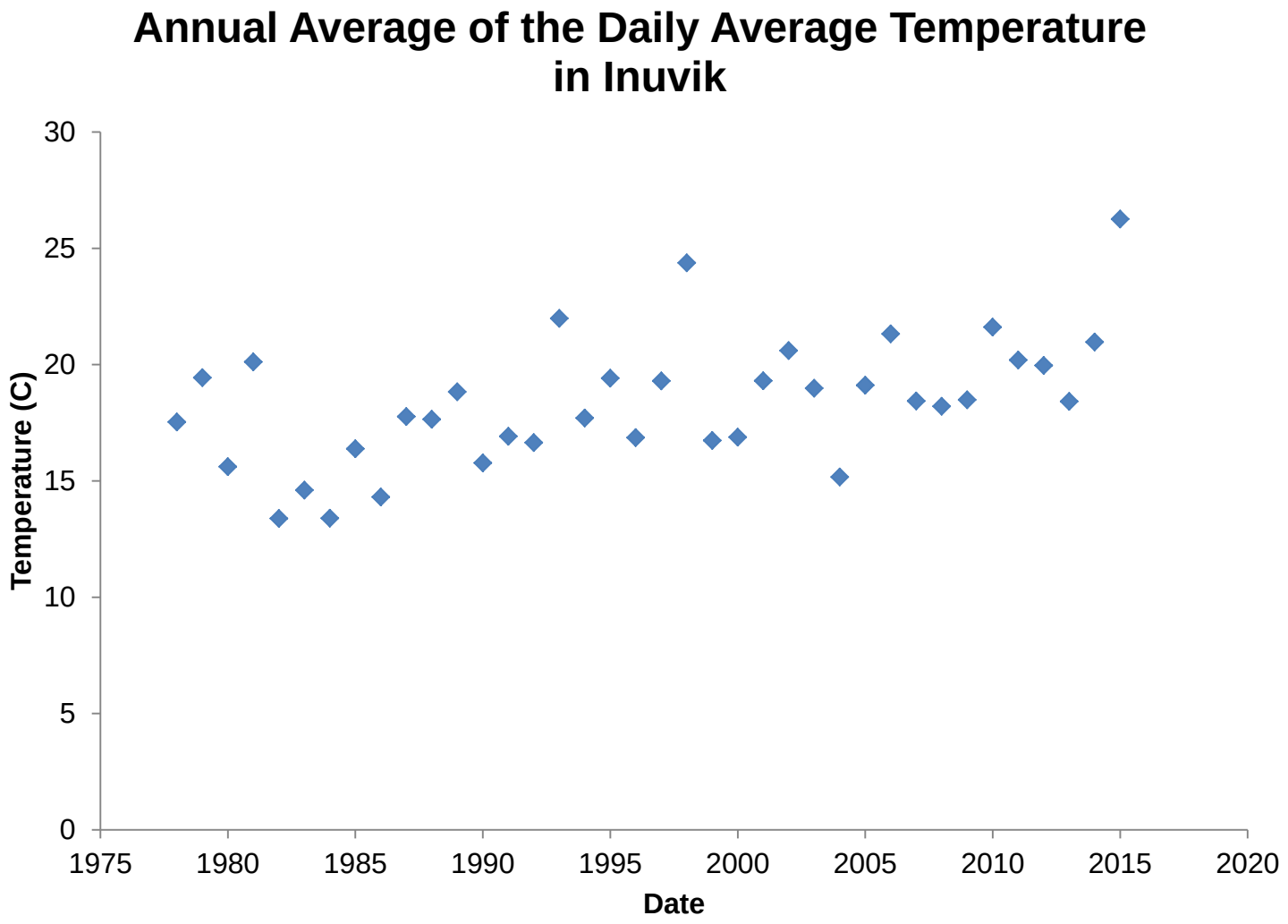
BSED: Extracting temporal data from Ice Charts



BSED: Comparing ice thickness from Ice Charts to FDD



BSED: Verifying for Climate Change Impacts



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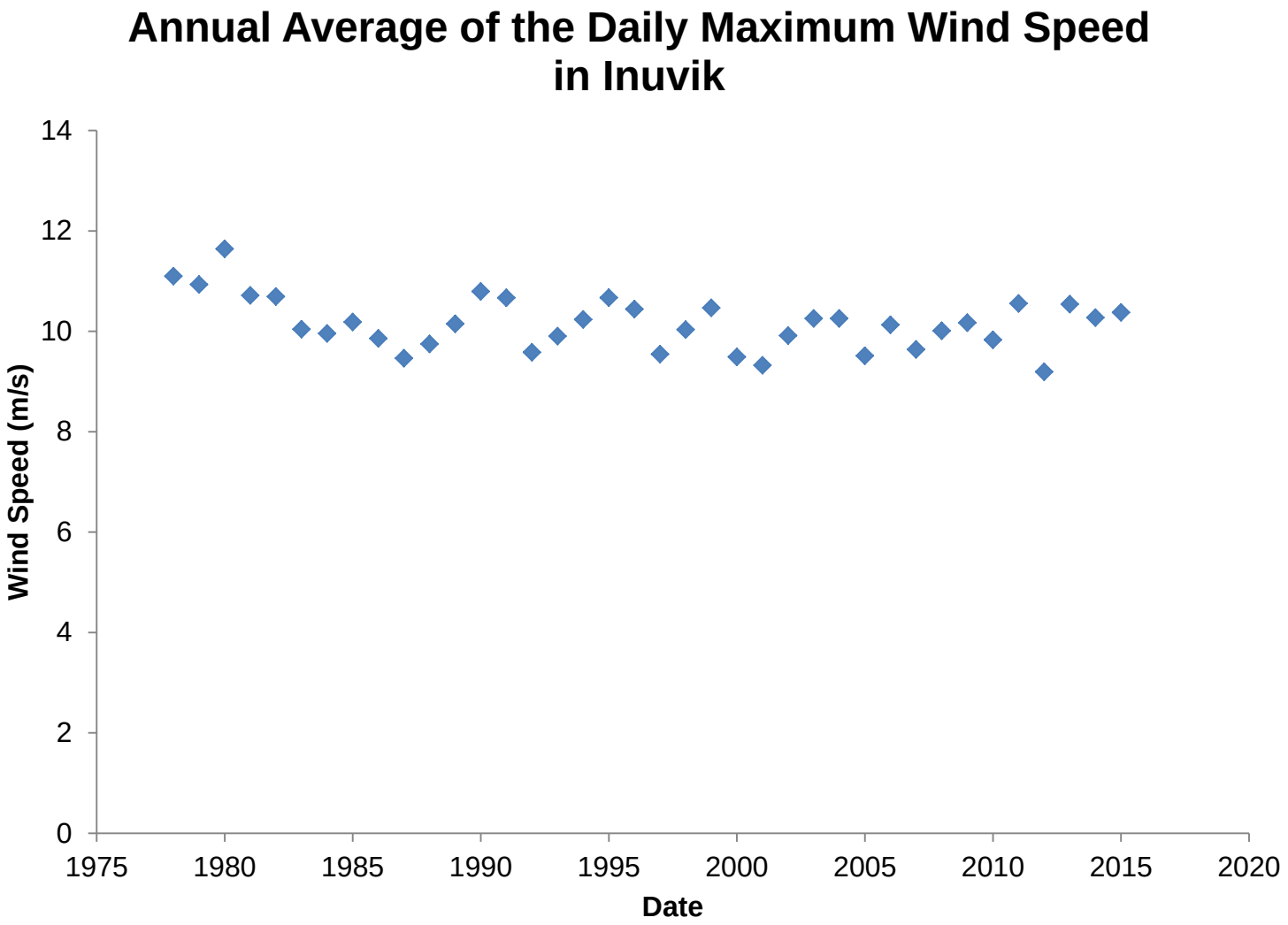

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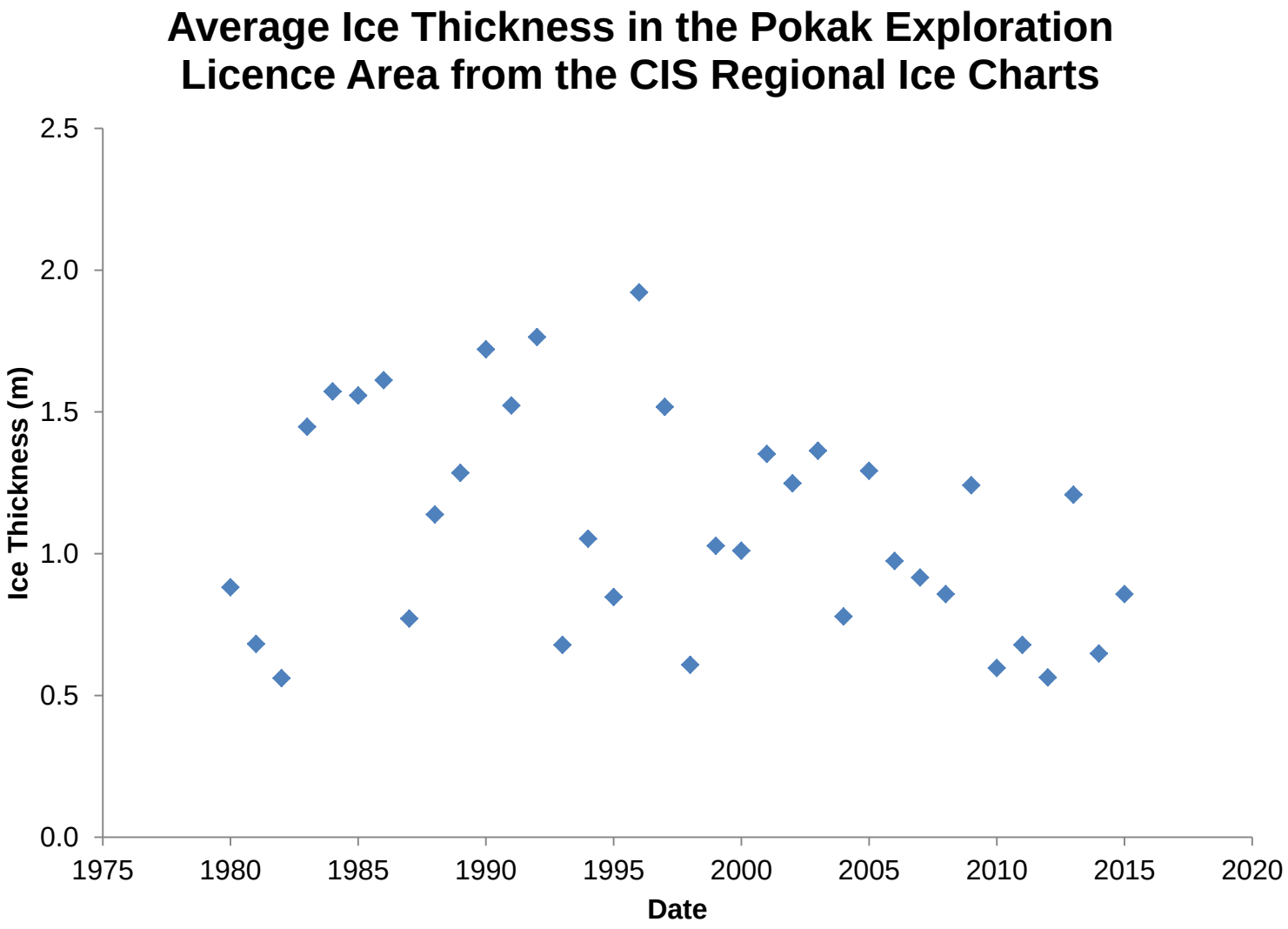

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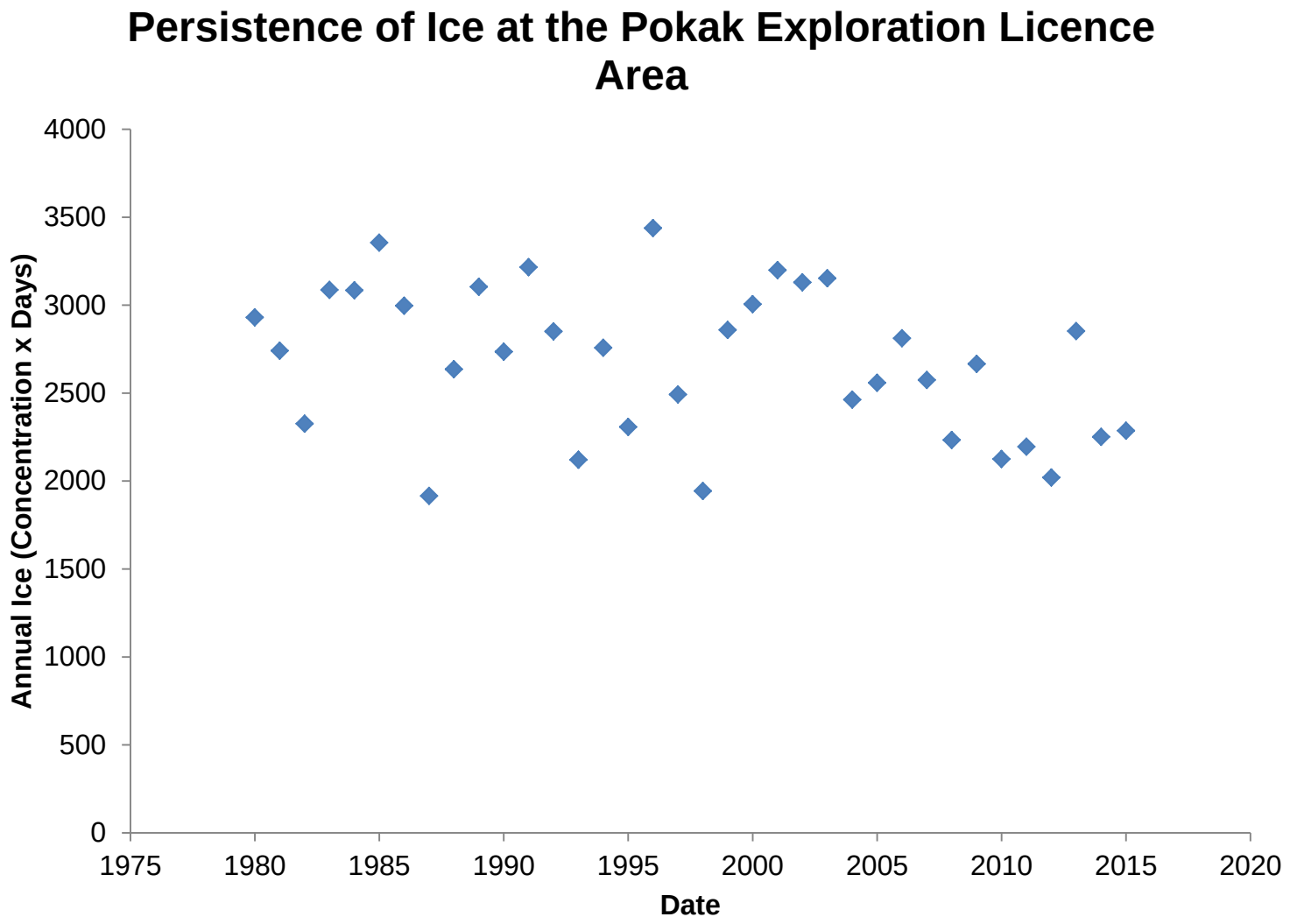

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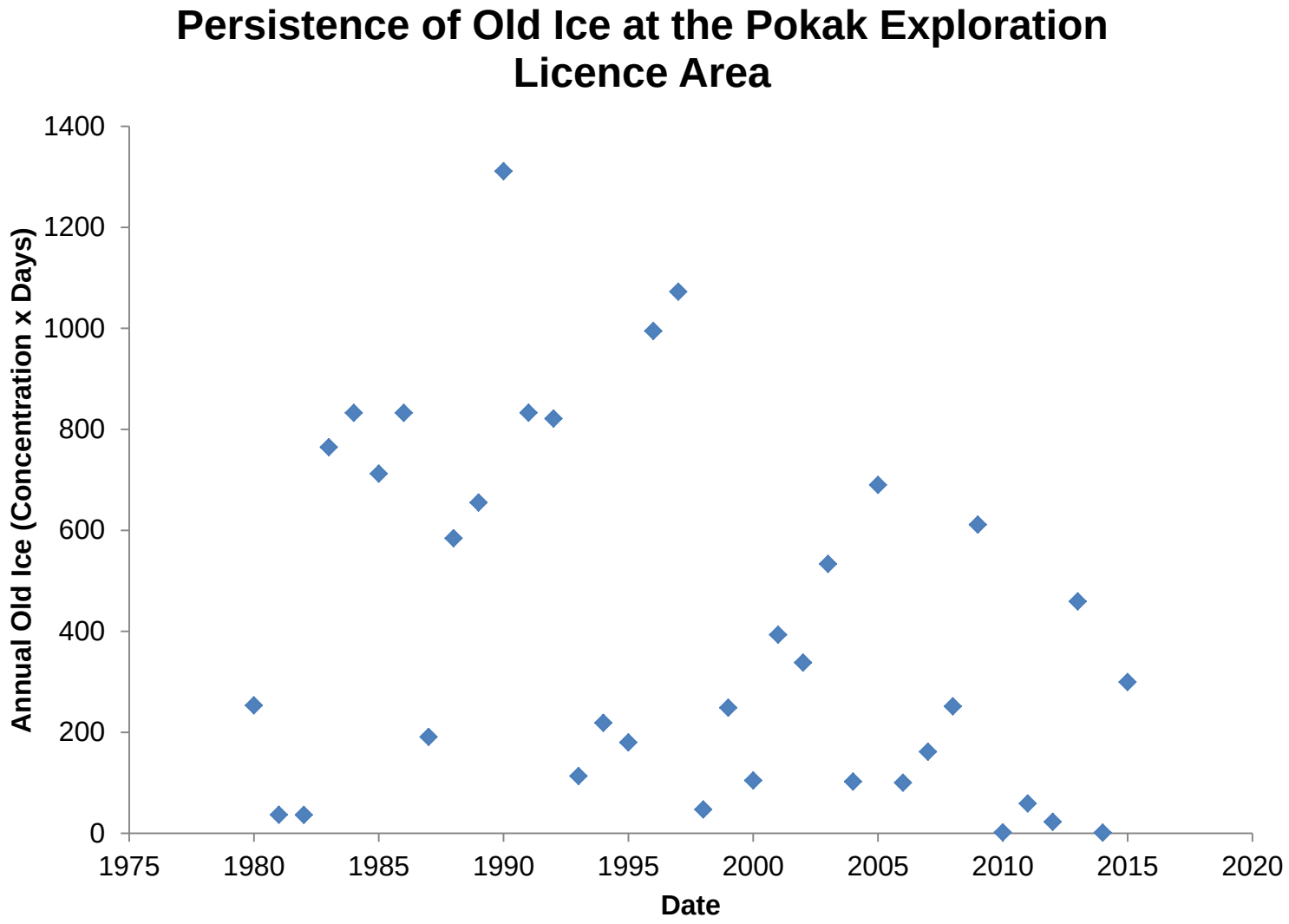

BSED Contact

Thank you

Louis Poirier
(613-993-6834)
Louis.Poirier@nrc-cnrc.gc.ca