

living planet symposium | BONN 23-27 May 2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE



AI4Arctic_CCN enhancing the basis for AI based sea-ice mapping at high resolution

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1. Danish Meteorological Institute (DMI)

2. DTU Space - Technical University of Denmark

3. Nansen Environmental Remote Sensing Center (NERSC)

4. Norwegian Computing Center (NR)

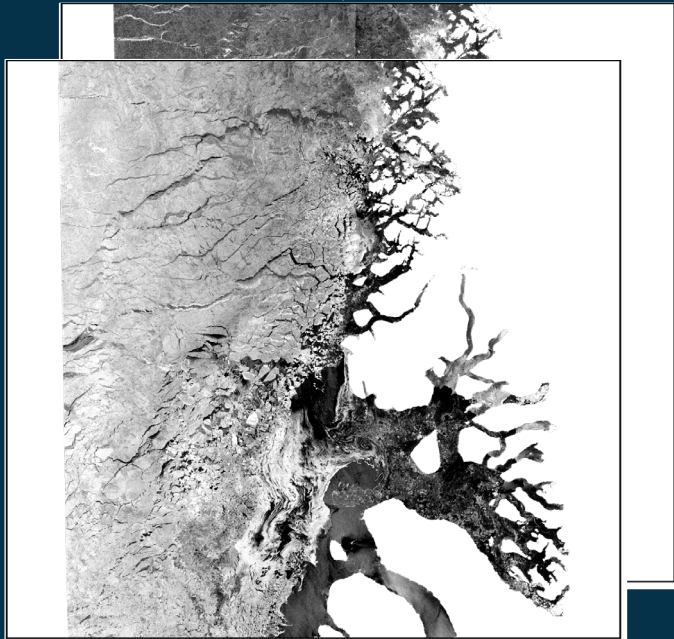
5. Polar View ApS (PV)

Automatic Sea Ice Charting

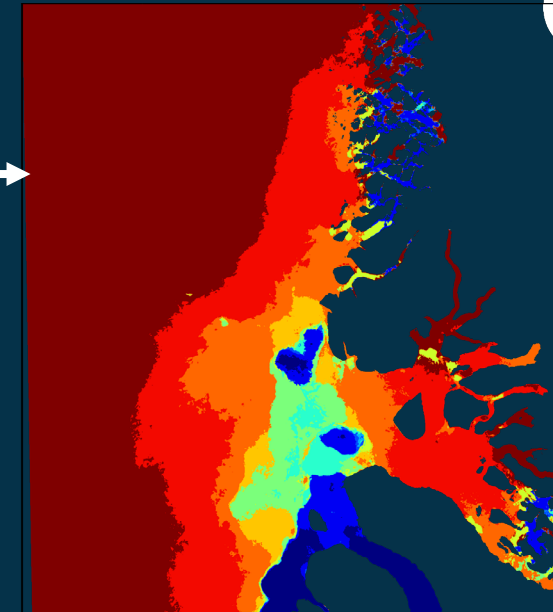
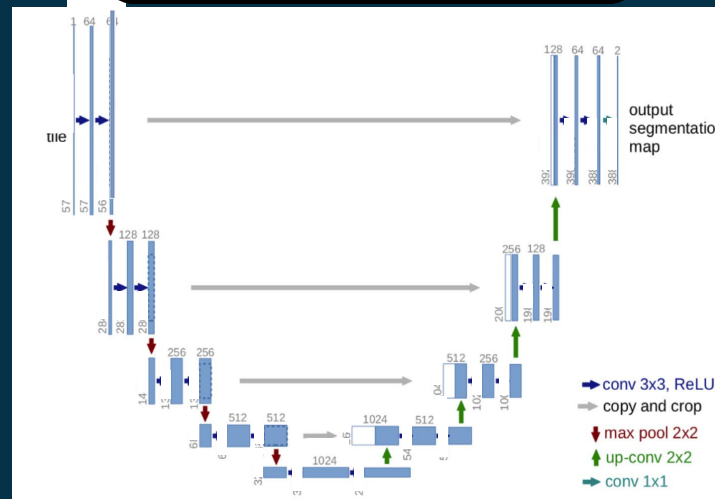
Automatic sea ice chart



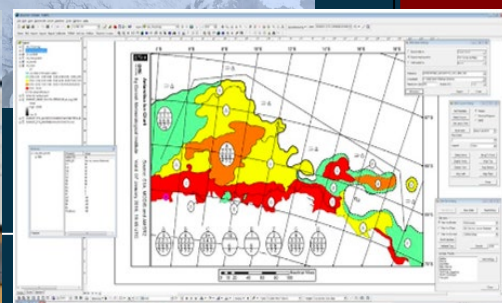
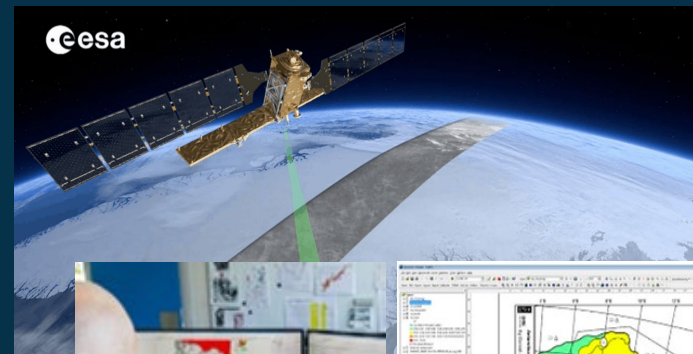
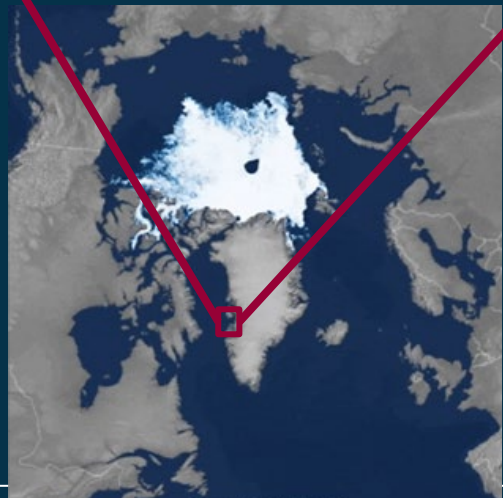
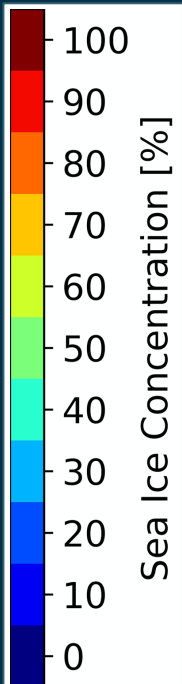
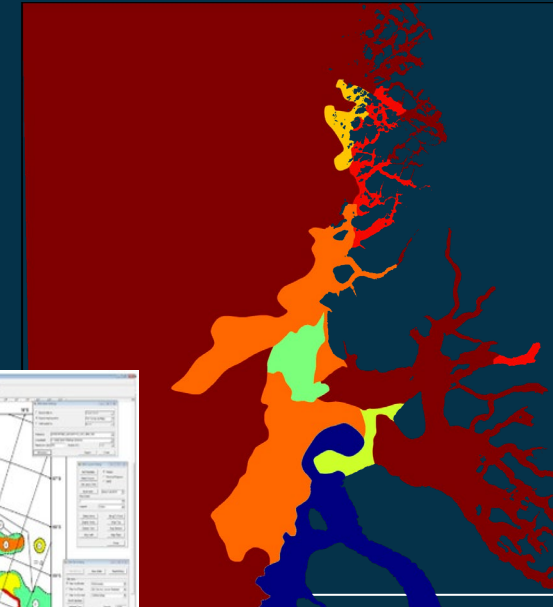
SAR HH, HV



U-Net Convolutional Neural Network



Handcrafted sea ice concentration chart



The AI4Arctic - ASIDv2 Dataset

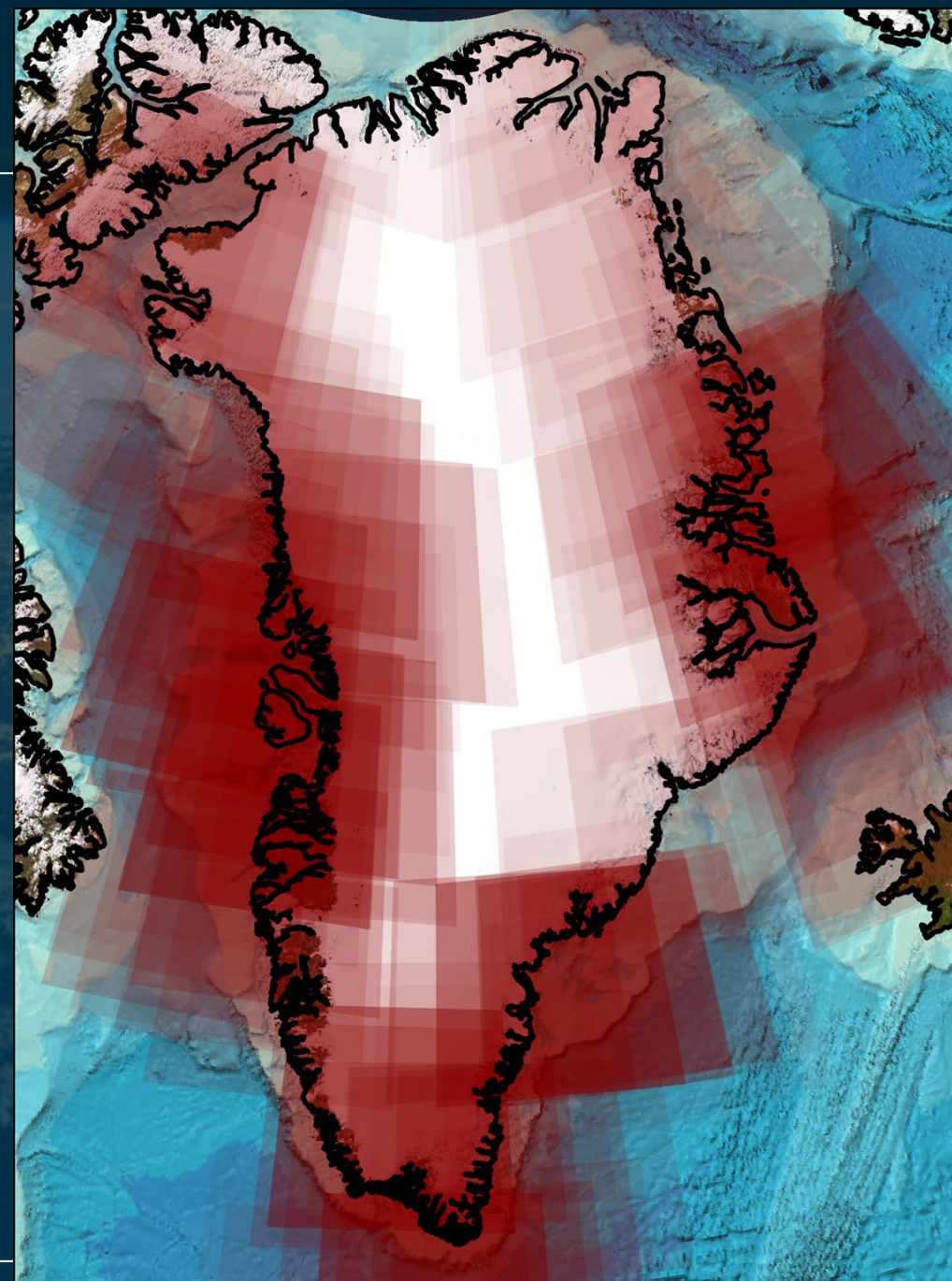
461 scenes, from March 2018- May 2019

Each scene contains:

- Sentinel-1 EW Level-1 GRDM SAR image, HH + HV, Misc. variables e.g. incidence angle, 2 noise correction processing chains (ESA + NERSC)
- AMSR2, Passive Microwave Radiometer (PMR) brightness temperatures, 7 frequencies (6.9GHz - 89 GHz)
- Operational sea ice charts

[https://data.dtu.dk/articles/dataset/AI4Arctic ASIP Sea Ice Dataset - version 2/13011134/2](https://data.dtu.dk/articles/dataset/AI4Arctic_ASIP_Sea_Ice_Dataset_-_version_2/13011134/2)

<https://www.aireo.net/>



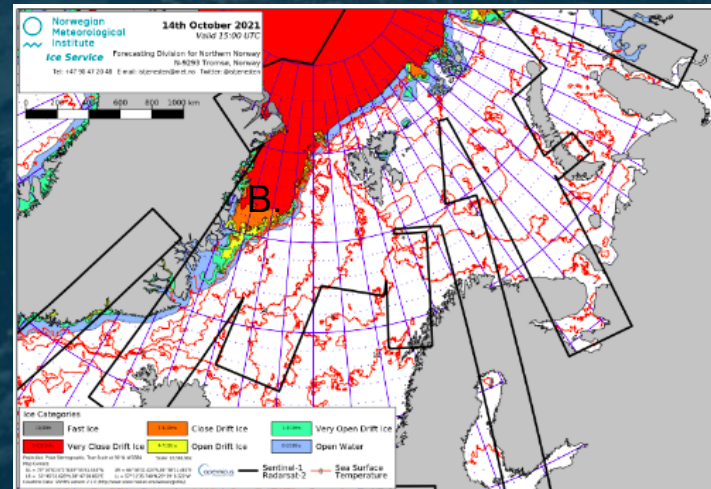
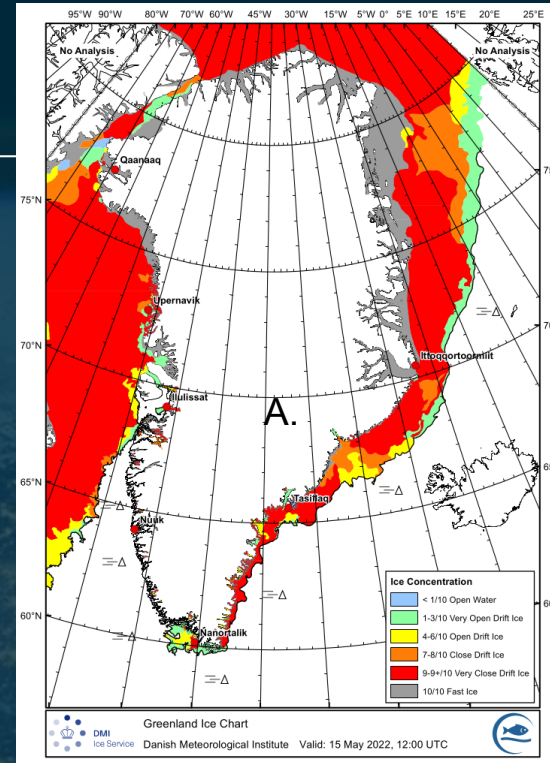
AI4Arctic_CCN

Aims to:

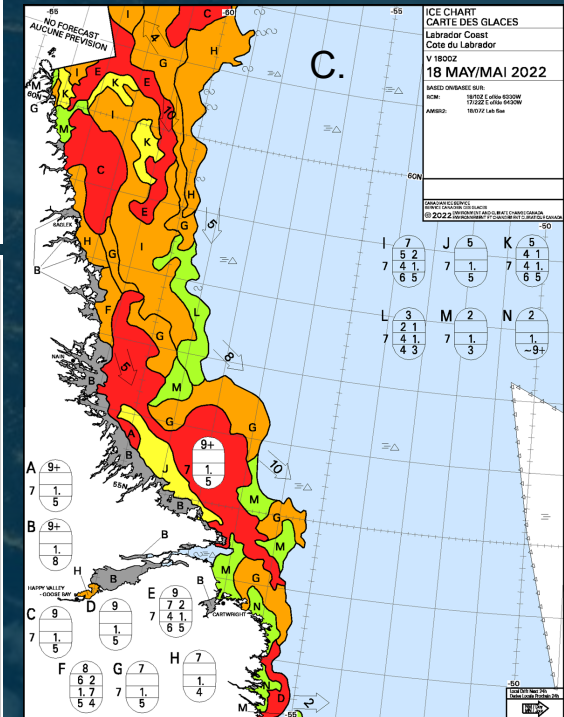
1. Build a new “state of the art” training dataset for automated AI based sea-ice mapping with deep learning techniques.
2. Facilitate a competition in AI based sea-ice mapping and provide dedicated training data for the competition.

Expansion of the ASIv3 dataset

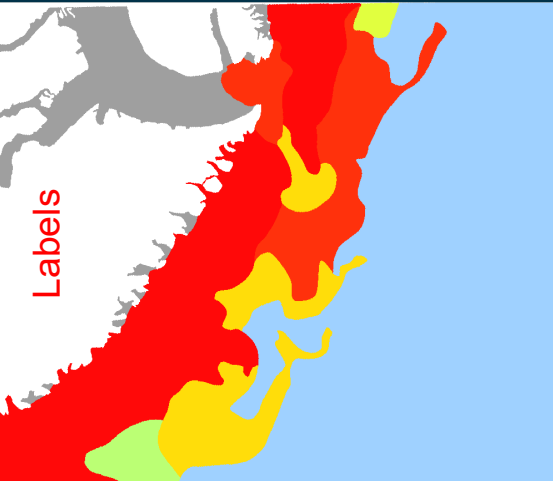
- Longer time period
- Include charts from other ice services
- Include new variables
 - Environmental data



- Examples of ice charts from:
- A. Danish Meteorological Institute (DMI)
 - B. MET Norway
 - C. Canadian ice Service (CIS)



Dataset time and space expansion



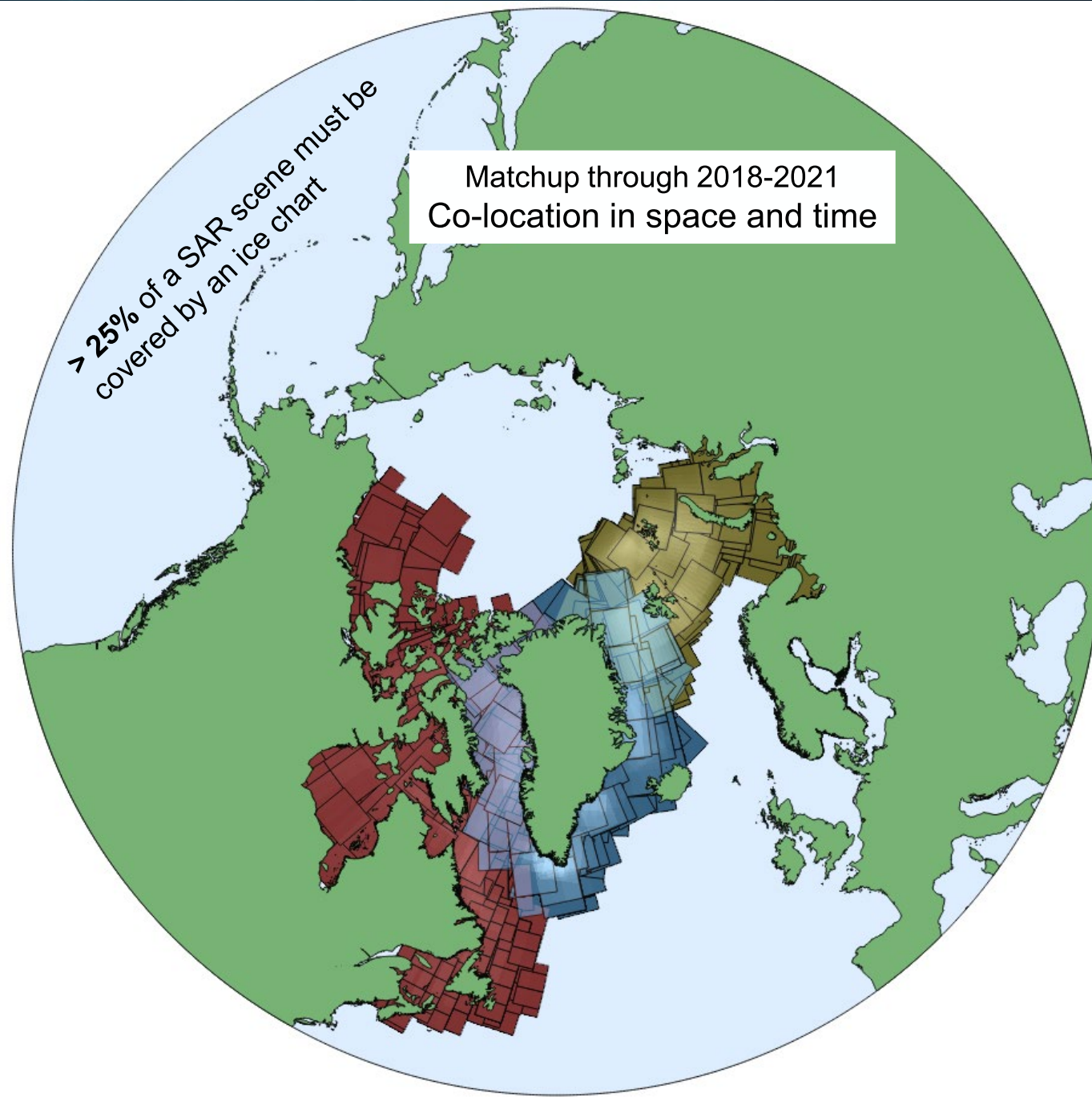
- CIS – 2599 matchups (SAR scenes/corresp. ice charts)
- DMI – 3387 matchups (SAR scenes/corresp. ice charts)
- MetNo – 2251 matchups (SAR scenes/corresp. ice charts)

Total matchups: **8237**

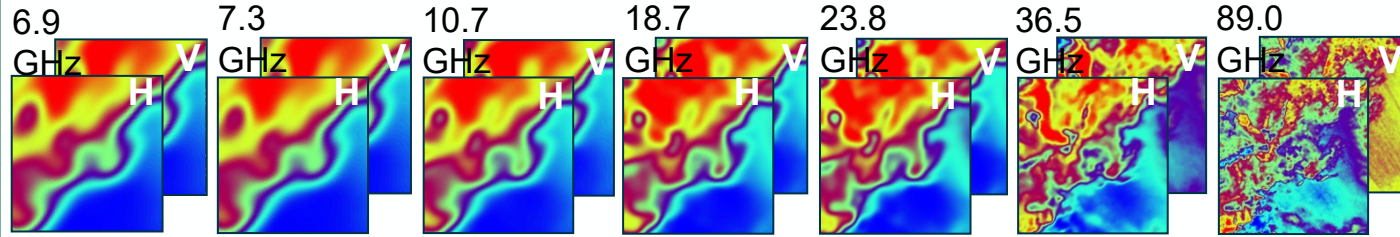
18 times larger than the previous dataset!

SAR scene up to 10,000 x 10,000 pixels

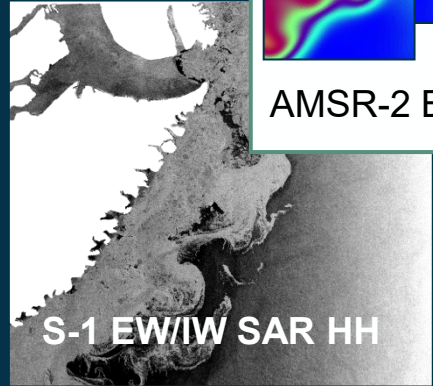
Size: 6-7 TB?



Dataset variables



AMSR-2 Brightness temperatures aligned geometrically with Sentinel-1 SAR



S-1 EW/IW SAR HH



S-1 EW/IW SAR HV

+ EW and IW

+ Auxiliary SAR information
(e.g. incidence angle)



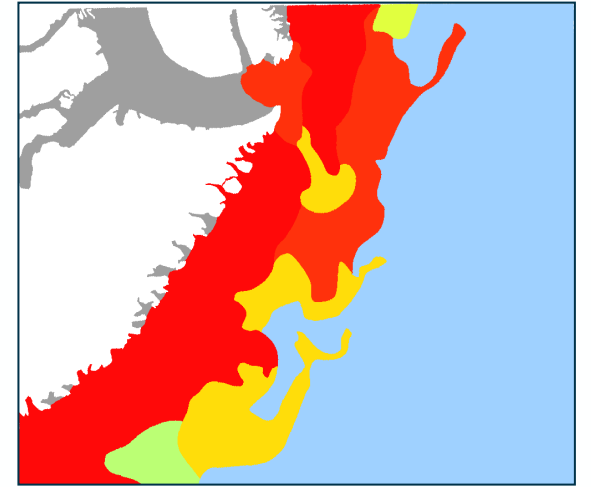
European Centre for Medium-Range Weather Forecasts

- Reanalysis v5 (ERA-5) Wind
- 2 m Surface temperatures



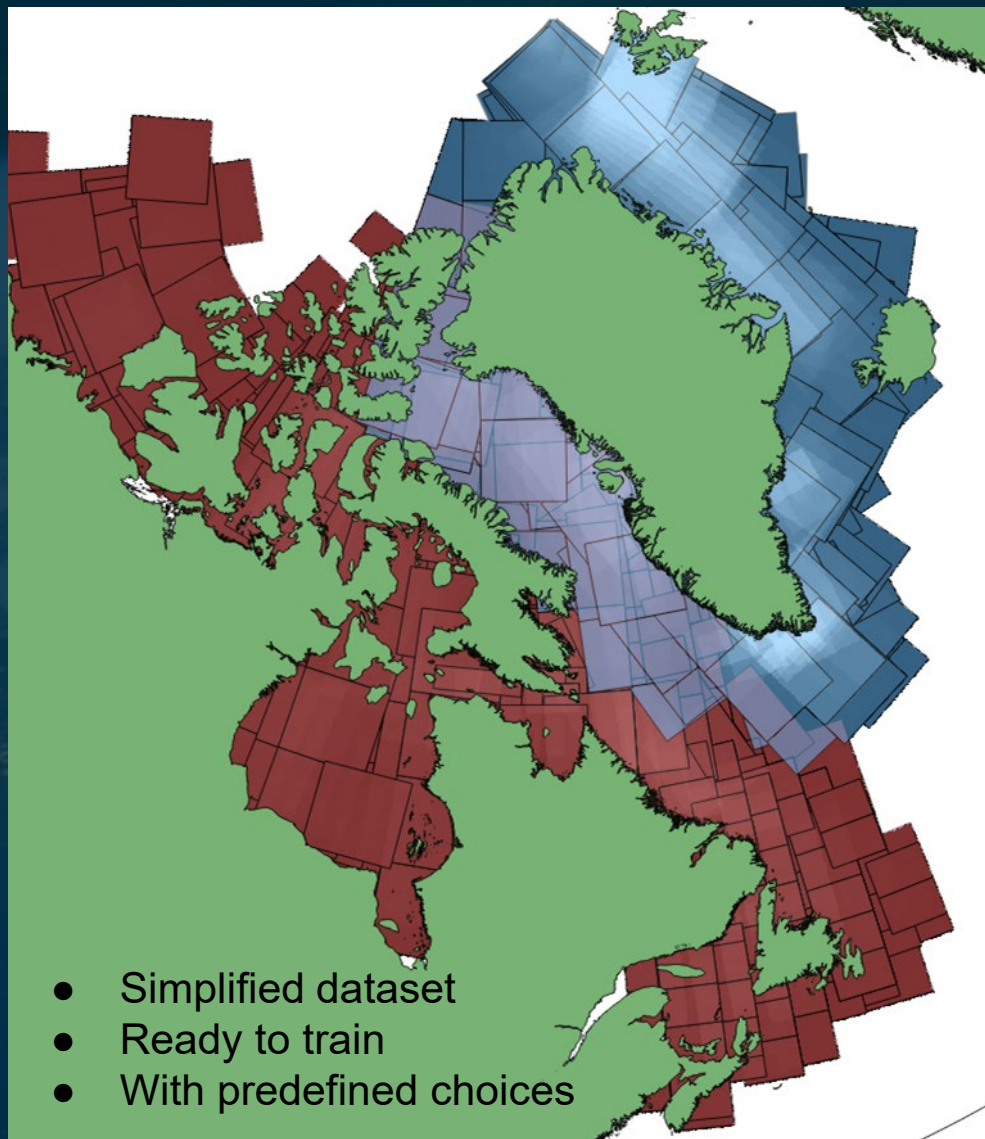
Distance from coast

Labels

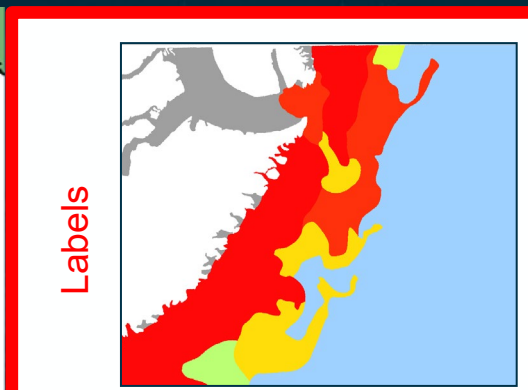


Input





- Simplified dataset
- Ready to train
- With predefined choices



SIGRID3 coding for:
 - Sea ice concentration
 - Stage of development
 - Floe size

Common test dataset for model comparisons

Stay Tuned!

AI4Arctic_CCN Competition!

To be launched in Fall 2022

Will be announced through ESA's "eo4society programme"

<https://eo4society.esa.int/events>



Acknowledgements:

AI4Arctic_CCN acknowledges the European Commission and ESA for the use of Copernicus Sentinel-1 data, the Japan Aerospace Exploration Agency for the use of the AMSR2 data and the Greenland Ice Service at DMI, the Canadian (CIS), and Norwegian Ice Services for the use of their ice charts in the sea ice dataset.

Summary and conclusion

- New dataset!
- Combining multiple professionally labeled data from key operational service providers
- Data from multiple satellites
- Geographical information
- Environmental data
- Covering the majority of the Arctic with >8000 scenes spanning 3 years
- Open source + tools to use the data
- Competition to engage and expand the community

