



Satellite Sea Ice Data

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NOAA Satellite Data Course

Remote course in lieu of Anchorage NPS Course

April 6-8, 2020

Versioning

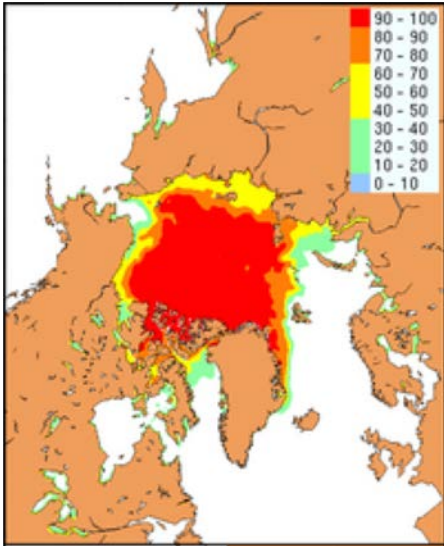
-Robinson, 2018, WCN

-Sevadjian, 2020, 2019, PW

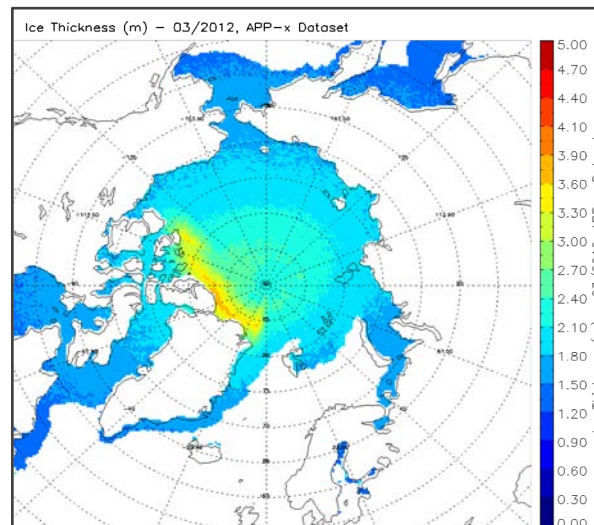


Many sea ice properties can be monitored by satellites

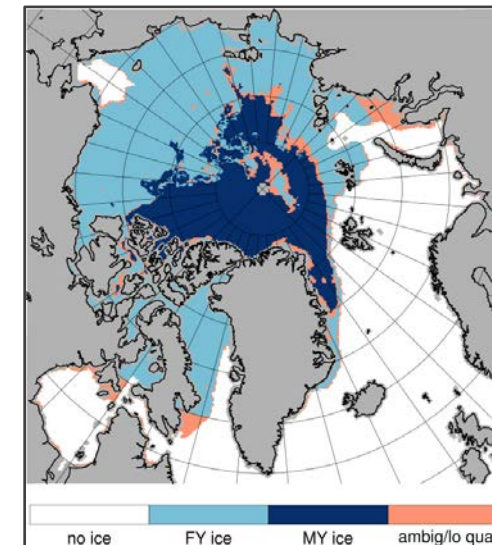
Sea Ice Concentration



Sea Ice Thickness



Ice Type/Age

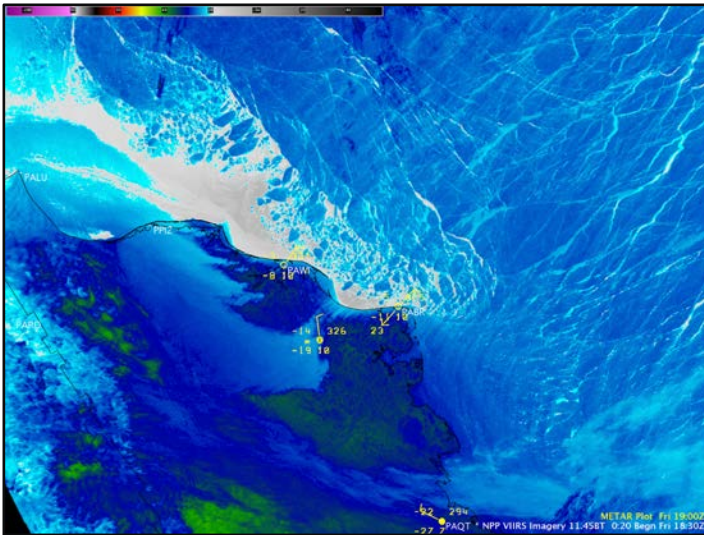


Ice Edge



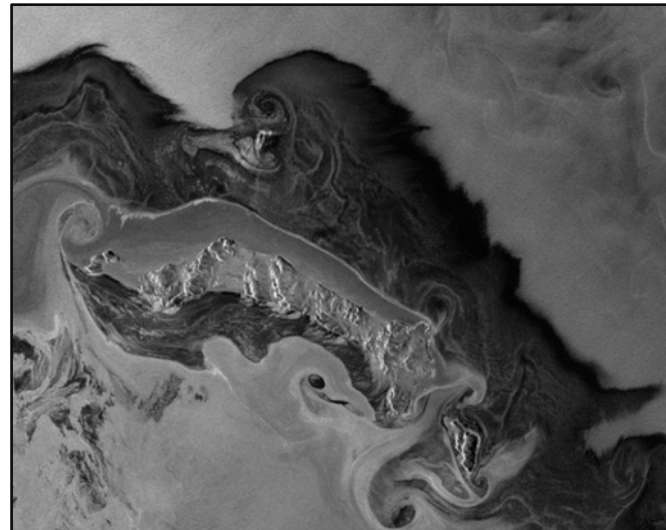
Many different satellite sensors can measure sea ice

Infrared



VIIRS Infrared Image

Microwave (Passive and Active)



Active Microwave SAR Image

Visible



MODIS Visible Image

Sea Ice Products



Ice Concentration Products

- AMSR2 is the newest, highest resolution level 3 data. There are a few sources, the EUMETSAT product is quality and reliable.
- AMSR2 is incorporated into MASAM2 which for Arctic users is a great option because it adds the value of MASIE reliable ice edge.
- For Long-term science data look towards the NOAA/NSIDC CDR.

NSIDC MASAM2

- COMBO MASIE and AMSR2
- MASIE provides high accuracy in showing ice presence
- AMSR2 provides relatively high resolution sea ice concentration
 - ~4km
 - Arctic
 - 2012 – present
 - Daily
 - <https://nsidc.org/data/g10005>

NOAA/NSIDC Climate Data Record

- ~ 25km resolution
- Daily, Monthly
- 1978 – 2017 <https://nsidc.org/data/g02202>
- 2017 – present <https://nsidc.org/data/g10016>

Ice Edge Products

NIC IMS

- Highly accurate maps depicting the extent of daily snow and ice coverage.
- Multiple satellite sensors, manually created daily by analyst
- Shape file, image, geotiff, kml, grib2

Arctic

Daily

25km: since 1997

4km: since 2004

1km: since 2014

https://www.natice.noaa.gov/Main_Products.htm

NSIDC MASIE

MASIE essentially repackages a subset of the IMS product (the sea ice component) into other data formats/products

- 1km – since 2014
- 4km – since 2006
- Arctic
- Daily
- <https://nsidc.org/data/masie>

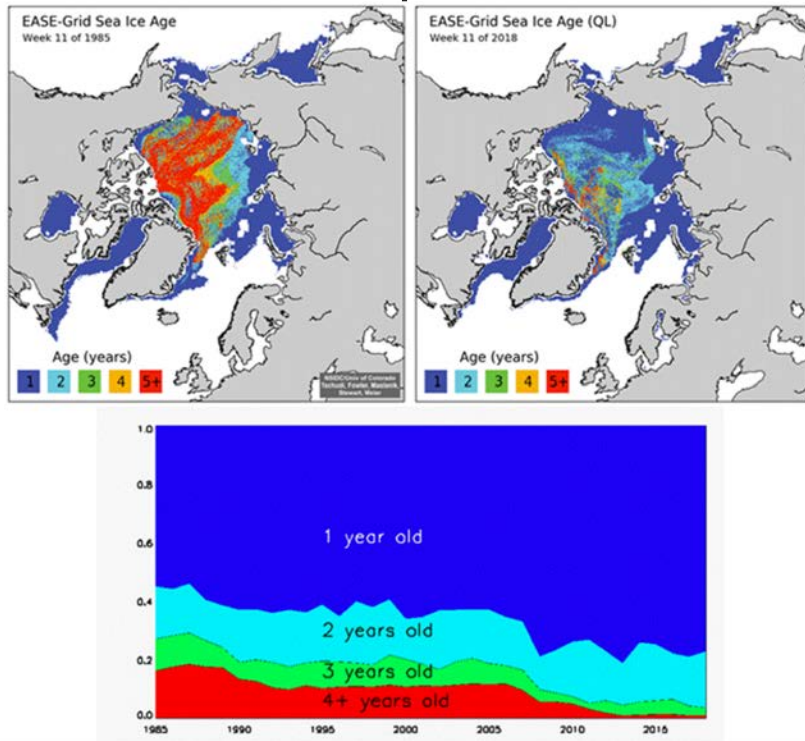


Ice Type (Age) Product

Categories of ice:

- No ice, first year ice , multi-year ice

Used in Arctic Report Card



EASE-Grid Sea Ice Age, Version 3

- <https://nsidc.org/data/nsidc-0611>
- 1984 to Present
- Arctic Coverage (North of 48.4°)
- 12.5km resolution
- Weekly

OSI-SAF EUMETSAT Product

- http://osisaf.met.no/p/ice/edge_type_long_description.html
- 2005 to present
- Arctic
- 10-km resolution
- Daily

Ice Type (Age) Products – How they are made

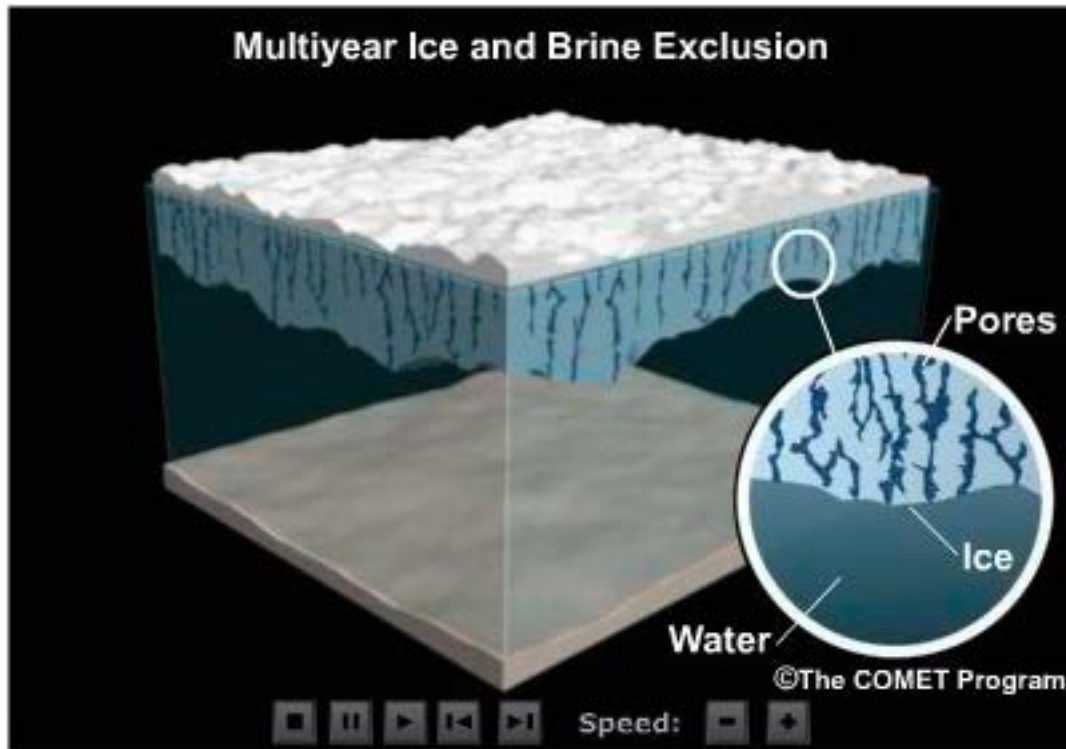


Image courtesy the COMET program.

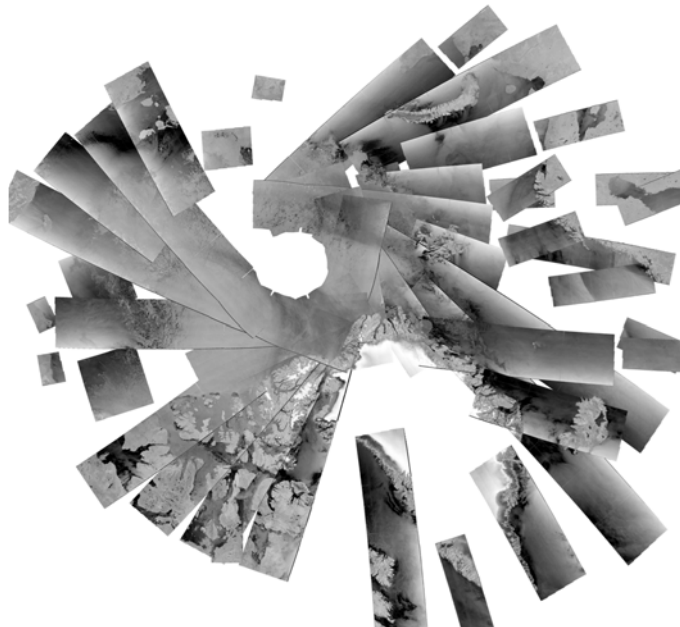
- Passive and active microwave sensors
- Optical properties of ice structure change with age
- As seawater freezes it forms a crystal structure
- Brine is rejected during freezing forming brine channels within the ice
- Brine channels drain, leaving air pockets

SAR Imagery Products

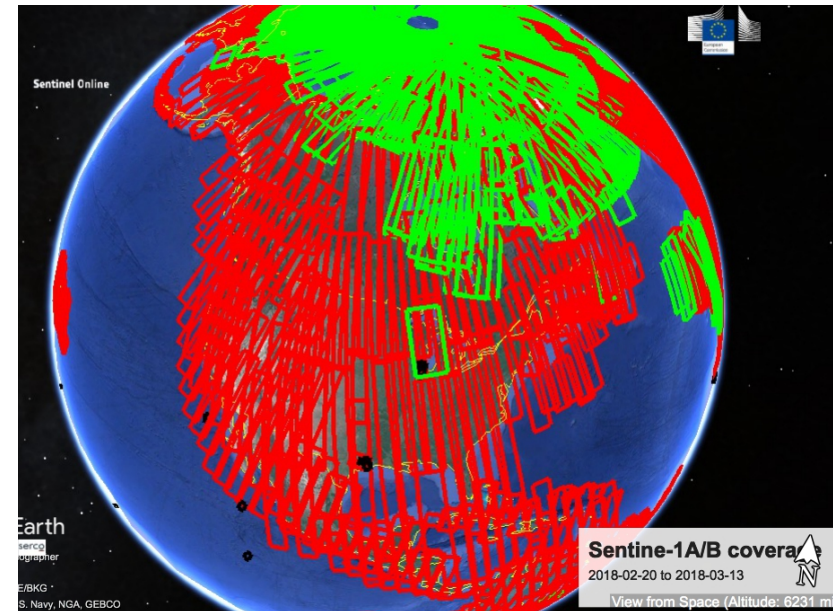
- High-resolution images
- Small footprint but frequent satellite passes in high latitudes
- Super high resolution data. Can be used for detailed information. Level 2 data. Inconsistent coverage so not good for time-series work.

ARCTIC COVERAGE

24 hours



3 weeks



SAR Imagery Products

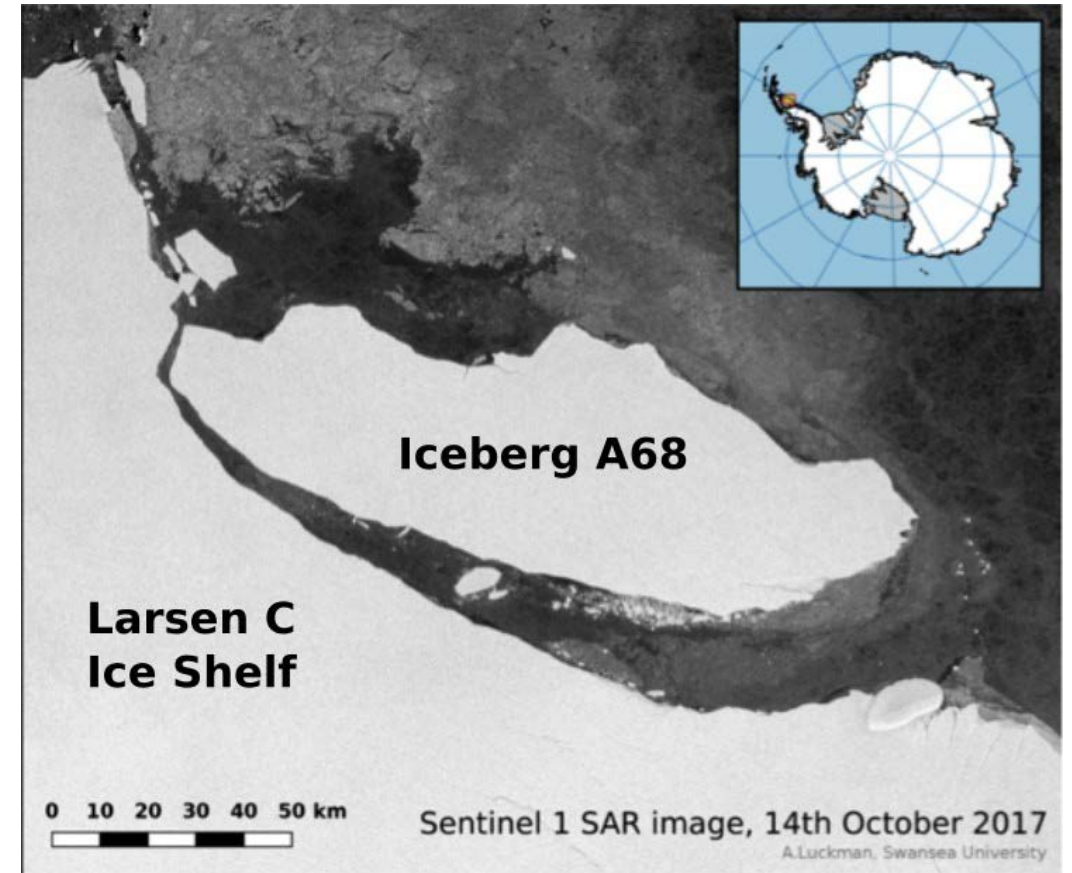
- Sentinel 1A/B, Sentinel 2, RadarSat
- Easily find and download NRT images with PolarView

<https://www.polarview.aq/arctic>

- CoastWatch SAR data landing page:

<https://coastwatch.noaa.gov/cw/satellite-data-products/synthetic-aperture-radar-surface-roughness/sar-imagery-nrcs.html>

More products are coming online through CoastWatch. Contact Jenn for more info. CoastWatch lead is Sean Helfrich.



Break up of the Larson Ice Shelf. A68 sets sail from Larsen C. Sentinel 1 SAR image [Credit: Adrian Luckman, Swansea University].

Data Coming Soon - ICESAT-2 launched Sep 2018

- <https://nsidc.org/data/icesat-2>
- Level 2 data available now
- Level 3 (gridded data) in development
- high-resolution laser altimetry data products
- sea ice thickness, freeboard, land ice height, land and canopy elevation, sea surface height

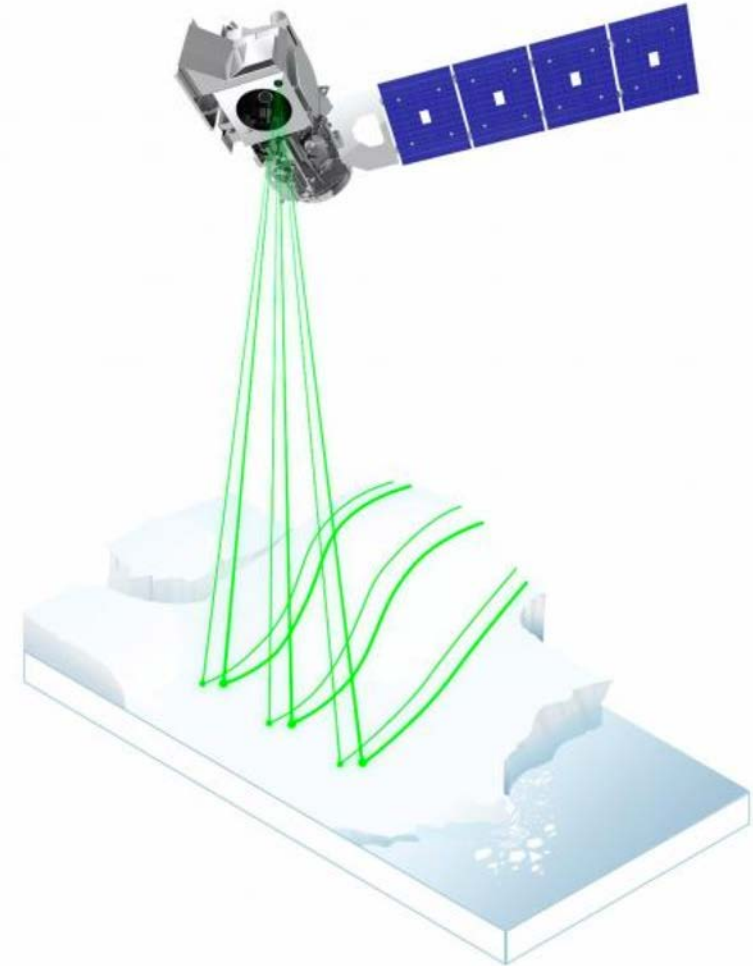


Image courtesy NASA.

POLARWATCH TUTORIALS

Two tutorials are available as part of the NOAA Satellite Data Course Book:

- Extracting polar projected sea ice data from ERDDAP
- Plotting lat-lon data from ERDDAP in Alaska Albers projection

View the tutorials online at:

<https://coastwatch.pfeg.noaa.gov/projects/r/>

