

Introduction to NOAA CoastWatch and the PolarWatch Sea Ice Course

Cara Wilson

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PI of PolarWatch and West Coast node of CoastWatch

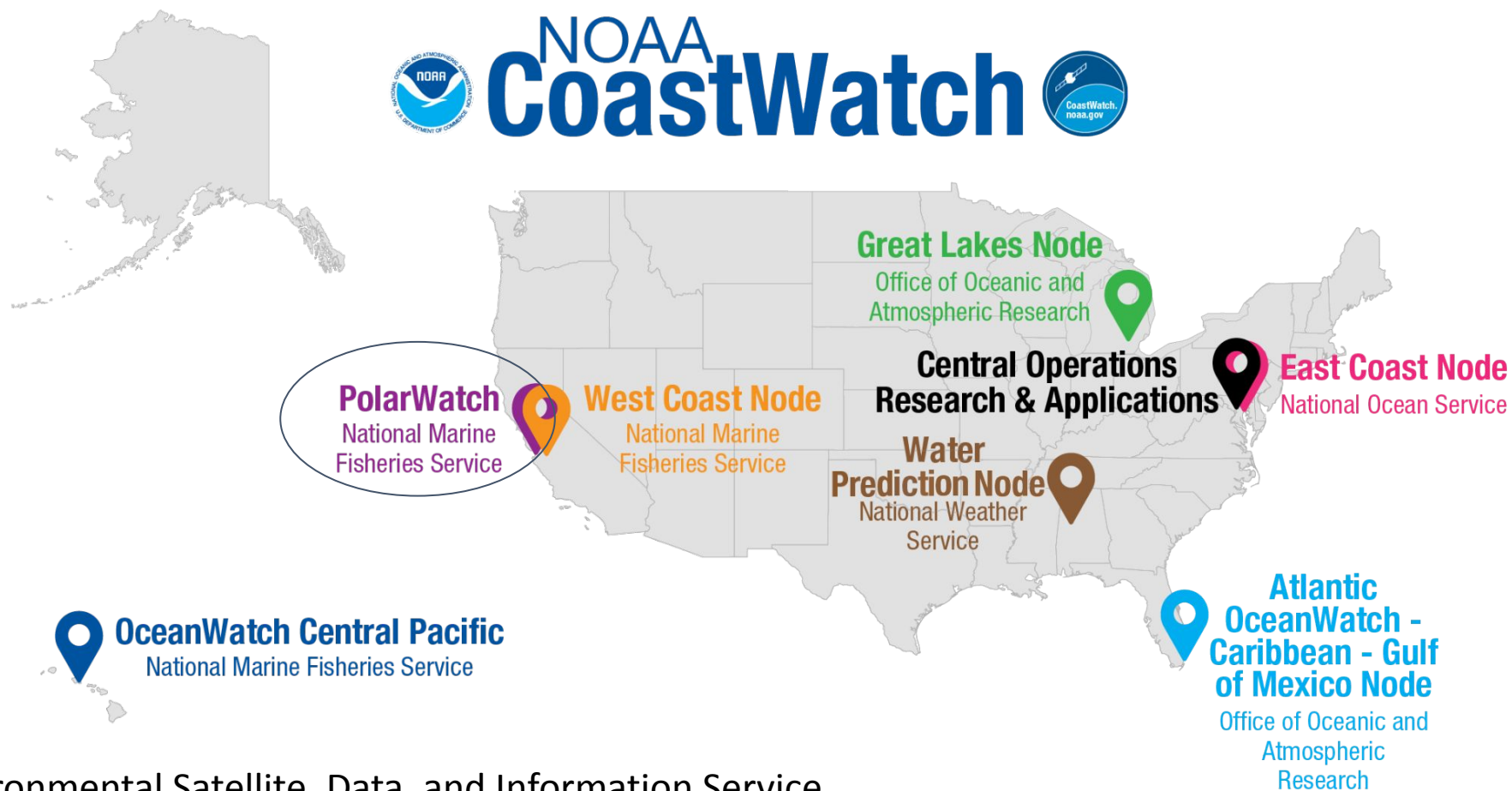
Sea Ice Course - Oct 21, 2024

coastwatch.info@noaa.gov



NOAA CoastWatch is a national program funded by NOAA/NESDIS¹

MISSION: PROVIDE ACCESS TO AND PROMOTE THE USE OF SATELLITE DATA PRODUCTS
for oceanic, freshwater, & polar applications



¹National Environmental Satellite, Data, and Information Service



PolarWatch (PW) – NOAA Fisheries

Personnel

Cara Wilson – Manager

Dale Robinson – Deputy Manager

Sunny Bak Hospital – Coordinator

Location

Housed at SWFSC, CA

Focused on high latitude regions



Node Highlights

Providing easier access to polar satellite data

Previewing data online with polar maps

Serving sea ice datasets

Serving polar projected datasets

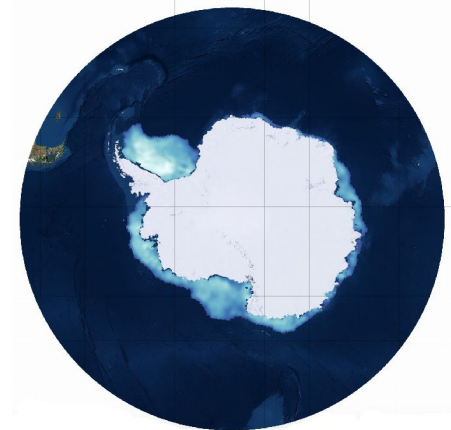
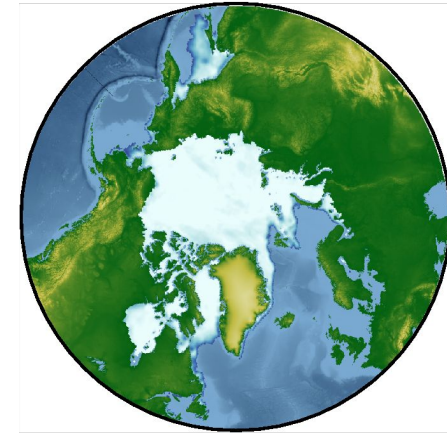
Collaborators

National Ice Center (NIC)

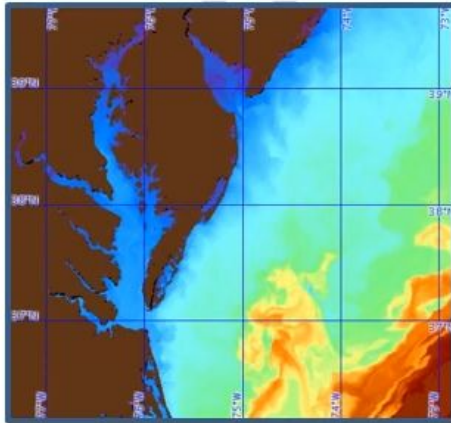
National Snow and Ice Data Center (NSIDC)

STAR Science Teams (Sea Ice, SAR, LSA)

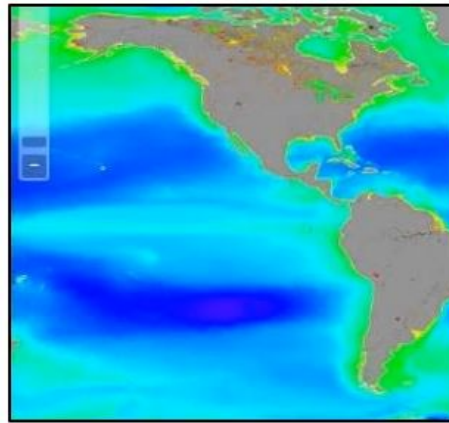
<https://polarwatch.noaa.gov/>



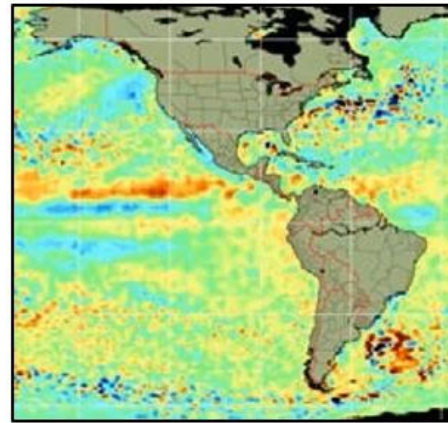
CoastWatch distributes ocean satellite data



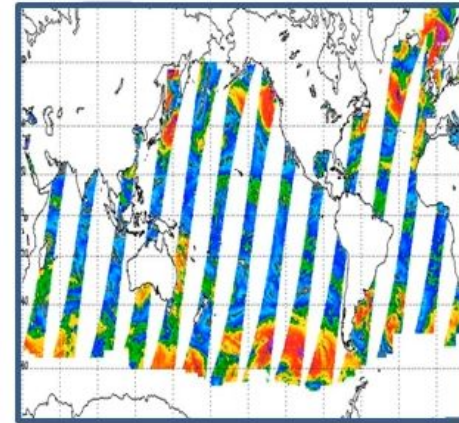
Temperature



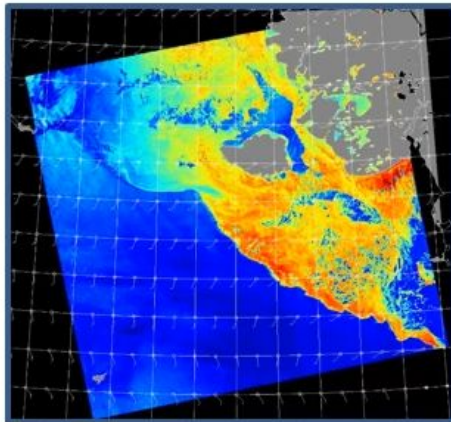
Ocean Color



Altimetry



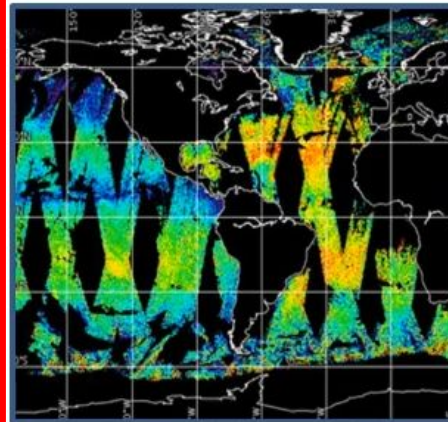
Ocean Vector Winds



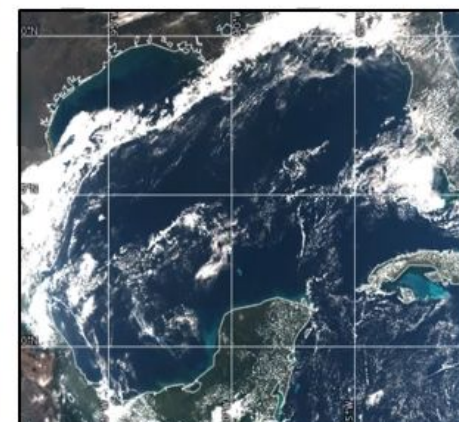
Synthetic
Aperture
Radar



Sea Ice



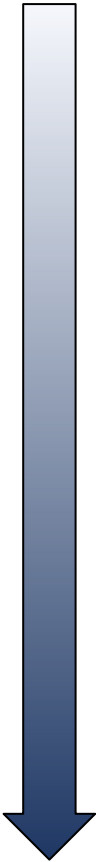
Salinity



Imagery

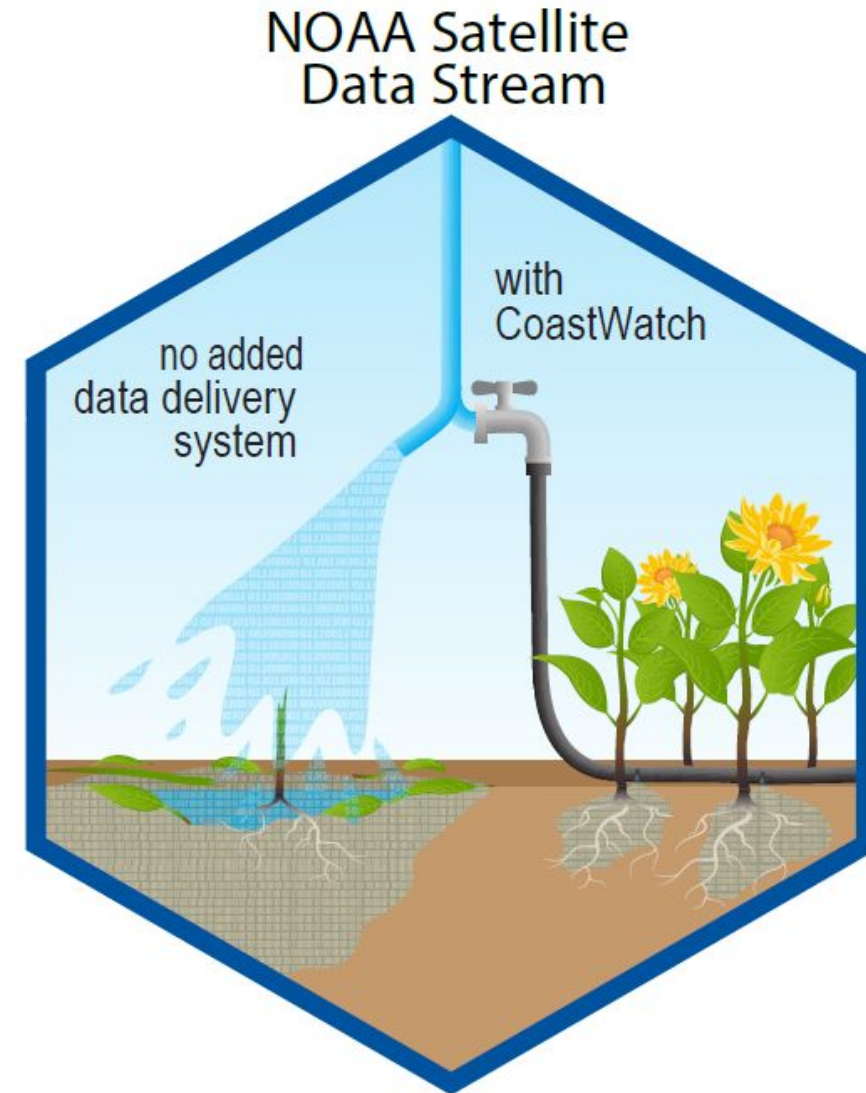
CoastWatch offers several levels of service to help users with satellite data

INCREASING
ASSISTANCE TO USER



- Provide access to datasets with data servers
- Develop tools and tutorials to help users interact with the server and use the data
- Provide training and hands-on assistance
- Find or create products and tools to address users needs
- Work directly with users on projects

COASTWATCH IS A VALUE ADDED PROVIDER



NOAA CoastWatch Resources in a Nutshell



- Easy access to satellite datasets using ERDDAP
- Online (short, ~20 minutes) videos explaining the basics of all the satellite products (SST, ocean color, sea surface height, etc.)
- Code notebooks in R and Python on GitHub to demonstrate basic data extraction (from ERDDAP) and plotting examples
- Periodic courses offered on understanding and accessing satellite data
- Helpdesk: Coastwatch.info@noaa.gov

Recorded Lectures are Available on the CoastWatch Learning Portal

Presently housed on the University of Maryland learning management system :

<https://umd.instructure.com/courses/1336575/pages/all-lectures>

All lectures are available as audio-recorded PowerPoint files, videos or transcripts.

Processes after the EMR signal as it passes through the atmosphere

NOAA CoastWatch Satellite Course

Satellite 101

Ocean color data products

- Ocean color concentration (chlorophyll a, phytoplankton biomass, etc.)
- Diffuse attenuation coefficient of 440 nm (Kd440)
- Diffuse attenuation coefficient of 670 nm (Kd670)
- Ocean color temperature (remote sensing of sea surface temperature)
- Various regional products (e.g., Kd, Kd440, Kd670, etc.)

NOAA CoastWatch Satellite Course

Ocean Color

NOAA CoastWatch Satellite Course

Sea Surface Temperature

Ocean features can be tracked with wind data

NOAA CoastWatch Satellite Course

Sea Surface Height, Winds, Salinity

Ocean color data products

- Oceanographic concentration (e.g., light sensor, remote sensing, etc.)
- Diffuse attenuation coefficient of 440 nm (Kd440)
- Diffuse attenuation coefficient of 670 nm (Kd670)
- Various regional products (e.g., Kd, Kd440, Kd670, etc.)

NOAA CoastWatch Satellite Course

Water Quality

Datasets: Sea Ice Properties

- Sea Ice Concentration
- Sea Ice Thickness
- Ice Type/Age
- Ice Edge

NOAA CoastWatch Satellite Course

Sea Ice

HAB detection using satellite

NOAA CoastWatch Satellite Course

HABs

Polarization

NOAA CoastWatch Satellite Course

Synthetic Aperture Radar (SAR)

NetCDF file format: Most satellite data are distributed in NetCDF

NOAA CoastWatch Satellite Course

Tools & Strategy

Balance the Needs of Your Project

NOAA CoastWatch Satellite Course

Selecting a Dataset

Tutorials are Available on the CoastWatch Learning Portal

Presently housed on the University of
Maryland learning management system :

<https://umd.instructure.com/courses/1336575/pages/all-lectures>

The image shows a screenshot of the CoastWatch Learning Portal. At the top is a blue navigation bar with the following links: Home, Training Classes, Lectures, Tutorials, Example Applications, User Forums, Help, and CoastWatch. Below the navigation bar is the text "Step-by-step instructions, exercises, User Guides, and videos." Below this text is a grid of nine tutorial tiles. Each tile contains a small screenshot of the tutorial's interface and a title. The tiles are: ArcGIS (showing a heatmap), CoastWatch Data Portal (showing a map of the coast), CoastWatch Utilities (showing a map with a color scale), ERDDAP (showing a data table), Matlab (showing a code editor), Panoply (showing a data table), Python (showing a code editor with a large red 'X' over it), and R (showing a code editor with a large red 'X' over it).

Home Training Classes Lectures Tutorials Example Applications User Forums Help CoastWatch

Step-by-step instructions, exercises, User Guides, and videos.

ArcGIS

CoastWatch Data Portal

CoastWatch Utilities

ERDDAP

Matlab

Panoply

Python

R

most up-to-date
versions for
Python and R
are on GitHub

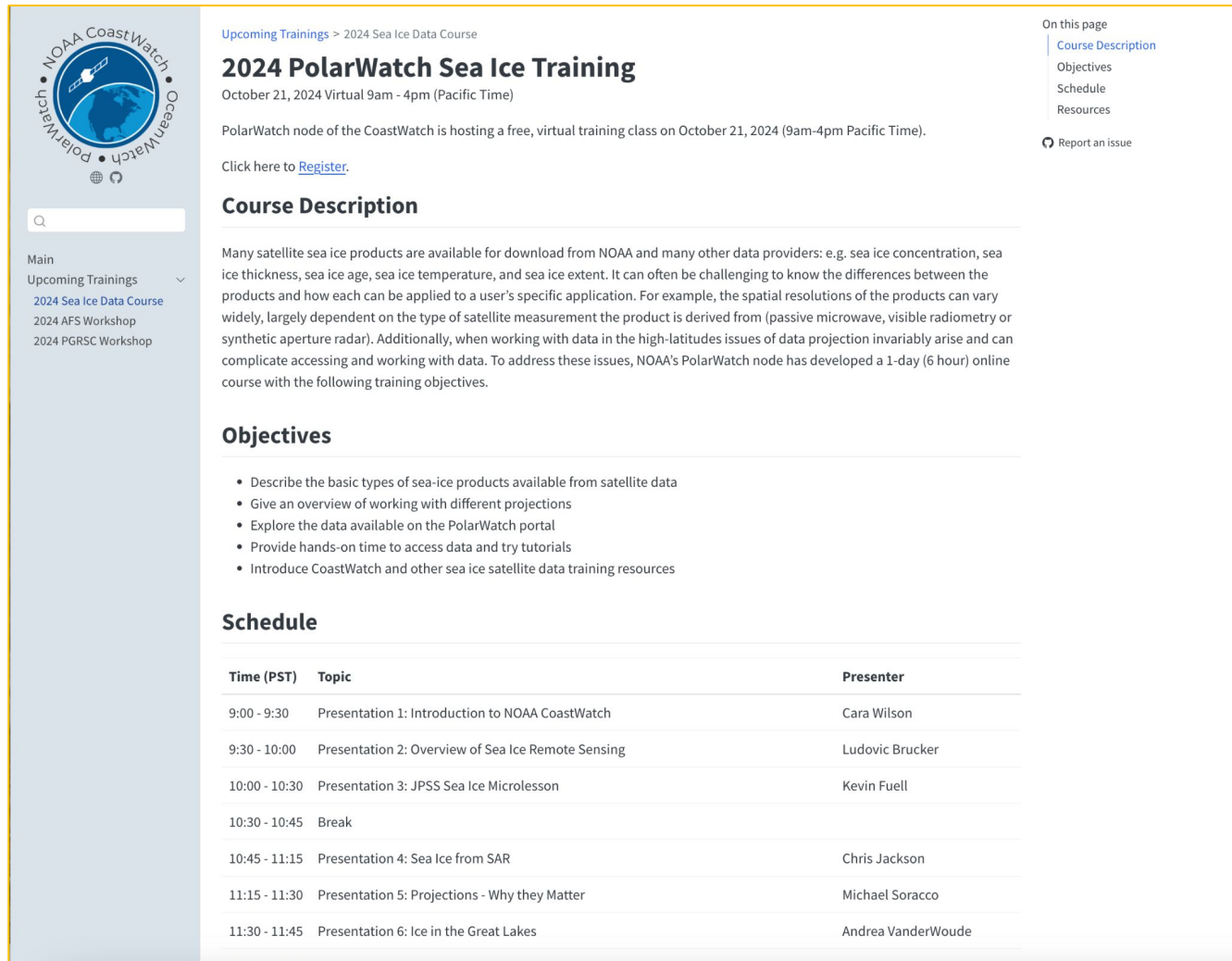


Distribution of CoastWatch Courses is Transitioning to GitHub

Upcoming Trainings:

Oct 25, 2024 - Animal Telemetry
online, 10 am-5 pm PST

Nov 26, 2024 - PGRSC
in person, 1-6 pm Fiji Time



The screenshot shows the NOAA CoastWatch website interface. On the left is a navigation sidebar with a search bar and a menu containing 'Main', 'Upcoming Trainings', '2024 Sea Ice Data Course', '2024 AFS Workshop', and '2024 PGRSC Workshop'. The main content area is titled 'Upcoming Trainings > 2024 Sea Ice Data Course' and features the heading '2024 PolarWatch Sea Ice Training' with the date and time 'October 21, 2024 Virtual 9am - 4pm (Pacific Time)'. A paragraph states that the PolarWatch node is hosting a free virtual training class on October 21, 2024 (9am-4pm Pacific Time), with a link to 'Register'. Below this is a 'Course Description' section explaining that many satellite sea ice products are available for download from NOAA and other providers, and that the course addresses challenges in working with high-latitude data. An 'Objectives' section lists five bullet points: describing sea-ice products, working with projections, exploring data on the PolarWatch portal, hands-on data access, and introducing training resources. A 'Schedule' section contains a table with columns for 'Time (PST)', 'Topic', and 'Presenter'. On the right side of the page, there is a 'On this page' table of contents with links for 'Course Description', 'Objectives', 'Schedule', 'Resources', and a 'Report an issue' button.

Time (PST)	Topic	Presenter
9:00 - 9:30	Presentation 1: Introduction to NOAA CoastWatch	Cara Wilson
9:30 - 10:00	Presentation 2: Overview of Sea Ice Remote Sensing	Ludovic Brucker
10:00 - 10:30	Presentation 3: JPSS Sea Ice Microlesson	Kevin Fuell
10:30 - 10:45	Break	
10:45 - 11:15	Presentation 4: Sea Ice from SAR	Chris Jackson
11:15 - 11:30	Presentation 5: Projections - Why they Matter	Michael Soracco
11:30 - 11:45	Presentation 6: Ice in the Great Lakes	Andrea VanderWoude

<https://coastwatch-training.github.io/CoastWatch-Workshops/>



Distribution of CoastWatch Tutorials is Transitioning to GitHub

The R and python code on GitHub are the most up-to-date versions.

Polar Projection Specific Examples

- [transform-to-another-map-projection](#) Access satellite data with polar stereographic coordinates and transform it into a different coordinate system using EPSG code. R and python versions.
- [map-data-with-different-projections](#) Download and examine a polar stereographic projected dataset, plot the data on a projected map. Add animal track data with geographical coordinates onto the projected map. R and python versions.
- [calculate-seaice-extent](#) View sea ice concentration (SIC) data on a map with the polar stereographic projection. Calculate and compare sea ice area/extent from multi-year SIC datasets. R and python versions.
- [matchup-polar-satellite-data-to-buoy-data](#) Extract sea ice thickness (remote sensing) data in a polar stereographic projection using the buoy's location and dates.
- [matchup-polar-data-to-animal-track-locations](#) Extract sea ice concentration data in polar projection along a set of points defined by longitude, latitude, and time coordinates like that produced by an animal telemetry tag, a ship track, or a glider track.
- [subset-polar-data-with-shapefile](#) Download remote sensing data in polar stereographic projection from ERDDAP and subset it within the boundaries of Lake Iliamna in Alaska, where the lake shape data is presented in a different projection.

<https://github.com/coastwatch-training/CoastWatch-Tutorials>



Why a Course Dedicated to just Sea Ice?

- Data come from many providers: NOAA, NASA, NSIDC, NIC etc.
- Different sensor types are used - Visible, SAR, microwave, IR etc.
- Parameters unique to high latitude regions are measured.
 - sea ice concentration, sea ice temperature, thickness, extent etc.
- High latitude data are typically provided in different map projections.
- Over 100 people registered for this course; clearly people are interested in learning more about satellite sea ice data



Some Acronyms...

- NOAA** National Oceanic and Atmospheric Administration
responsible for operational satellites
- NASA** National Aeronautics and Space Administration
responsible for research satellites
- NIC** US National Ice Center
a multi-agency organization composed of contributions from the U.S. Navy, NOAA and the U.S. Coast Guard (USCG) to generate operational (real time) ice products
- NSIDC** National Snow and Ice Data Center
a science center for cryospheric data and research
- JPSS** Joint Polar Satellite System
collaboration between NOAA and NASA to launch a series of polar-orbiting operational environmental satellites
- NESDIS** National Environmental Satellite, Data, and Information Service
a NOAA line office



Questions?

Coastwatch.info@noaa.gov

Learning Portal has links to recorded lectures and tutorials

Subscribe to our newsletter for announcements for satellite classes:

subscribe

coastwatch.noaa.gov

The screenshot shows the NOAA CoastWatch website interface. At the top, there is a navigation bar with the NOAA logo and the text 'NOAA COASTWATCH'. Below this is a search bar and a 'Submit' button. The main content area features a 'Welcome to NOAA CoastWatch' message and a grid of service tiles. A green circle highlights the 'Learning Portal' tile, and a green arrow points from the text 'Learning Portal has links to recorded lectures and tutorials' to it. Another green circle highlights a 'Subscribe' button in the 'Recent News' section, with a green arrow pointing from the text 'Subscribe to our newsletter for announcements for satellite classes: subscribe' to it. The 'Explore Data By Application' section at the bottom includes categories like 'Climate & Weather', 'Ecosystem Monitoring', 'Fisheries & Aquaculture', 'Ocean & Coastal Dynamics', 'Transportation & Safety', and 'Water Quality'. The right sidebar contains 'Help Desk Support' with contact information, 'Recent News' with a list of updates, and 'Training Courses' with details on upcoming workshops and satellite courses.



We will be using Slido to interact with participants:

Go to www.slido.com

#seaice



2024 PolarWatch Sea Ice Training

October 21, 2024 Virtual 9am - 4pm (Pacific Time)

Resources

- [Coastwatch Tutorials \(on GitHub\)](#)
- [Coastwatch Lecture series](#)
- [JPSS Sea Ice Microlesson](#)

Schedule

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11:15 - 11:30	Presentation 5: Projections - Why they Matter	Michael Soracco
11:30 - 11:45	Presentation 6: Ice in the Great Lakes	Andrea VanderWoude
11:45 - 12:45	Lunch break	
12:45 - 13:00	Presentation 7: Projections in Action	Peter Hollemans
13:00 - 13:30	Presentation 8: ERDDAP Demo	Cara Wilson
13:30 - 13:45	Presentation 9: PolarWatch Portal Demo	Sunny Hospital
13:45 - 14:00	Presentation 10: CoastWatch Viewer Demo	Michael Soracco
14:00 - 14:15	Break	
14:15 - 14:30	Presentation 11: Overview of Tutorials	Cara Wilson
14:30 - 16:00	Hand's on time, with instructor's guidance available	

