CoastWatch Tutorials on GitHub

NOAA CoastWatch Satellite Course

Last Update: Oct 20, 2024

Software Tutorials on GitHub

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

Python-setup	updated py setup readme	last week
Tutorial1-basics	made edits from V's review	yesterday
Tutorial2-timeseries-compare-sens...	final edits	18 hours ago
calculate-seaice-extent	updated calculate-seaice-extent-R	yesterday
convert-180+180-to-0-360-longitu...	fixed lat typo problem	last week
create-virtual-buoy-with-satellite-d...	Virtual-buoy-Python	3 hours ago
define-marine-habitat	Vs edits on python modules	53 minutes ago
extract-satellite-data-within-bound...	incorporated V's edit in extract-within-boundary-R	6 hours ago
map-data-with-different-projections	resolved the conflicts in 3 files	last week
matchup-satellite-buoy-data	#77 corrected warning	4 days ago
matchup-satellite-data-to-track-lo...	Vs edits on python modules	53 minutes ago
transform-to-another-map-projecti...	Vs edits on python modules	53 minutes ago

- Each tutorial module is designed to illustrate the process of accessing and manipulating satellite data from the CoastWatch ERDDAP data servers.
- Code is usually available for both R and python
- R folders contain both .md (for internet viewing) and .rmd (for downloading) files

Partial List of Tutorials on GitHub

Tutorial1-basics Learn to access satellite data from CoastWatch ERDDAP data server and to work with NetCDF files. Visualize sea surface temperature on a map and plot time series data.

Tutorial2-timeseries-compare-sensors Learn common ways to download data from ERDDAP servers to access time-series chlorophyll data from four different satellite datasets and summarize and visualize the data for comparison.

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.

convert-180+180-to-0-360-longitude Work with datasets with -180° to +180° longitude values in a region that crosses the antimeridian. Convert the coordinates from (-180, +180) to (0, 360) and visualize data on a map.

create-virtual-buoy-with-satellite-data Create a “virtual” buoy using satellite data to fill the gaps in in-situ data collected by a physical buoy. Extract data from a location close to an existing buoy. Clean dataset by removing outliers, and aggregate (resample) to achieve a reduced temporal resolution. Plot time series data.

extract-satellite-data-within-boundary Extract sea surface temperature satellite data for an non-rectangular geographical region from an ERDDAP server using a shapefile, make maps, and plot a timeseries of the seasonal cycle of SST within the boundary.

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.

matchup-satellite-buoy-data Temporally and geospatially subset satellite data to match with buoy data (tabular), run statistical analysis and produce a map of the satellite data with overlaying buoy data.

matchup-satellite-data-to-track-locations Extract satellite data 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.

transform-to-another-map-projection Access satellite data with polar stereographic coordinates and transform it into a different coordinate system using EPSG code.

PolarWatch Specific Tutorials on GitHub

- 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.
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- matchup-polar-satellite-data-to-buoy-data Extract satellite sea ice temperature data in a polar stereographic projection that is col-located with acbuoy's location and dates. R and python versions.
- 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.R and python versions.
- 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. R and python versions.
- jpss-seaice-concentration Process L2 or L3 sea ice data and visualize it on a map with a polar stereographic projection. This tutorial is created by SPoRT and is designed to be run in Google Colab with pre-downloaded data files. Python only.

Convert-180+180-to-0-360-longitude

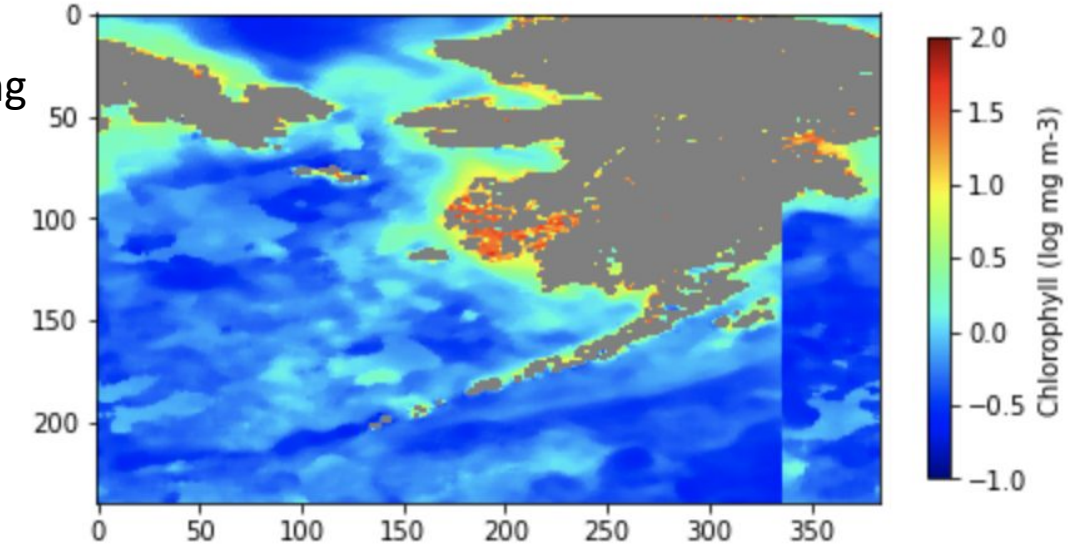
Python only

Work with datasets with -180° to +180° longitude values in a region that crosses the antimeridian. Convert the coordinates from (-180, +180) to (0, 360) and visualize data on a map

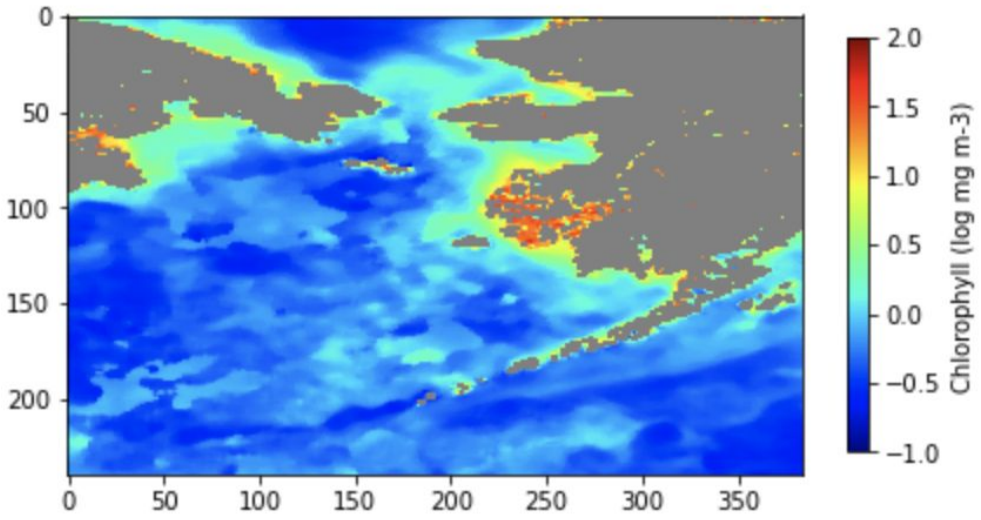
Tutorial demonstrates:

- Downloading data that crosses the antimeridian from a dataset with -180 to +180 longitude values
- Converting the data to a 0-360 longitude values
- Reordering the longitude axis so that the longitude values are in ascending order

Correcting this Map ->



To this Map ->

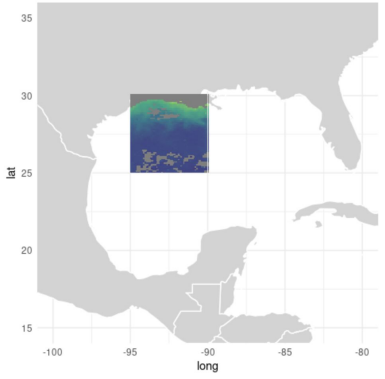


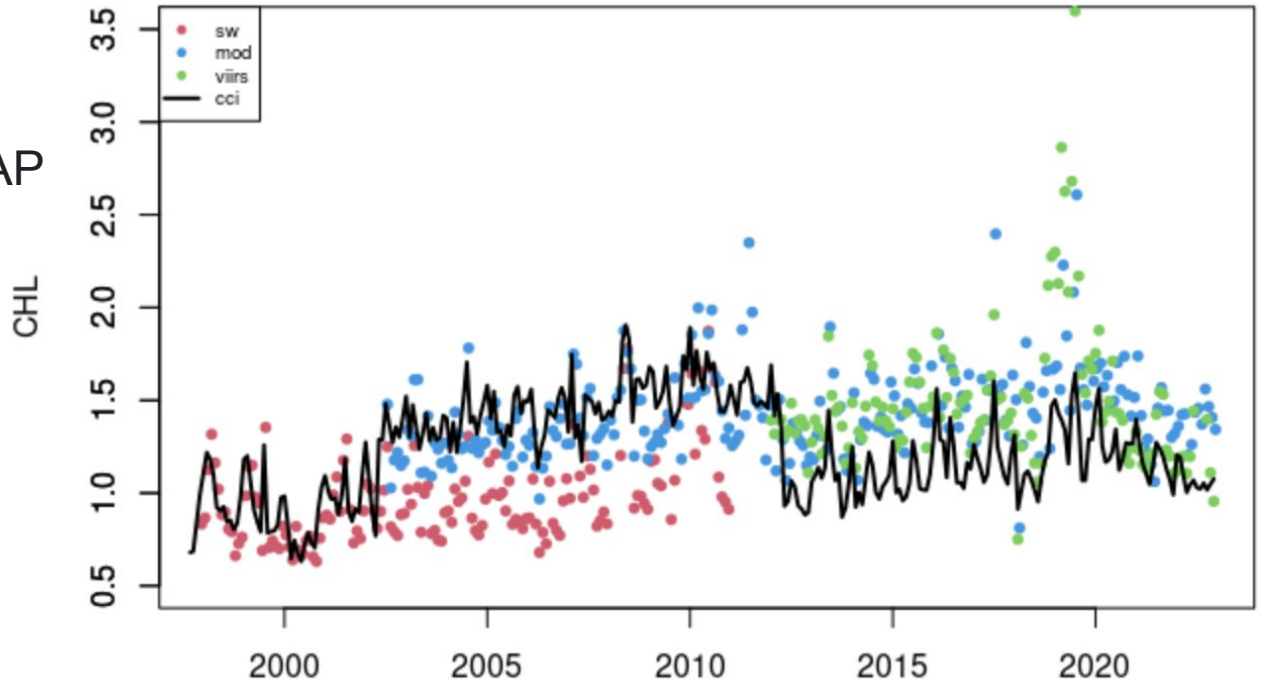
Tutorial2-timeseries-compare-sensors

Learn common ways to download data from ERDDAP servers to access time-series chlorophyll data from four different satellite datasets and summarize and visualize the data for comparison.

Tutorial demonstrates:

- Using **rerddap** to extract data from a rectangular area of the ocean over time
- Retrieve information about a dataset from ERDDAP
- Comparing results from different sensors
- Averaging data spatially
- Producing timeseries plots
- Drawing maps with satellite data



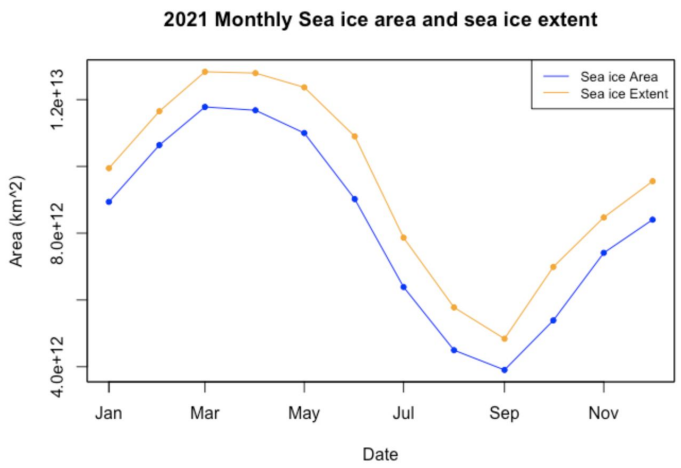


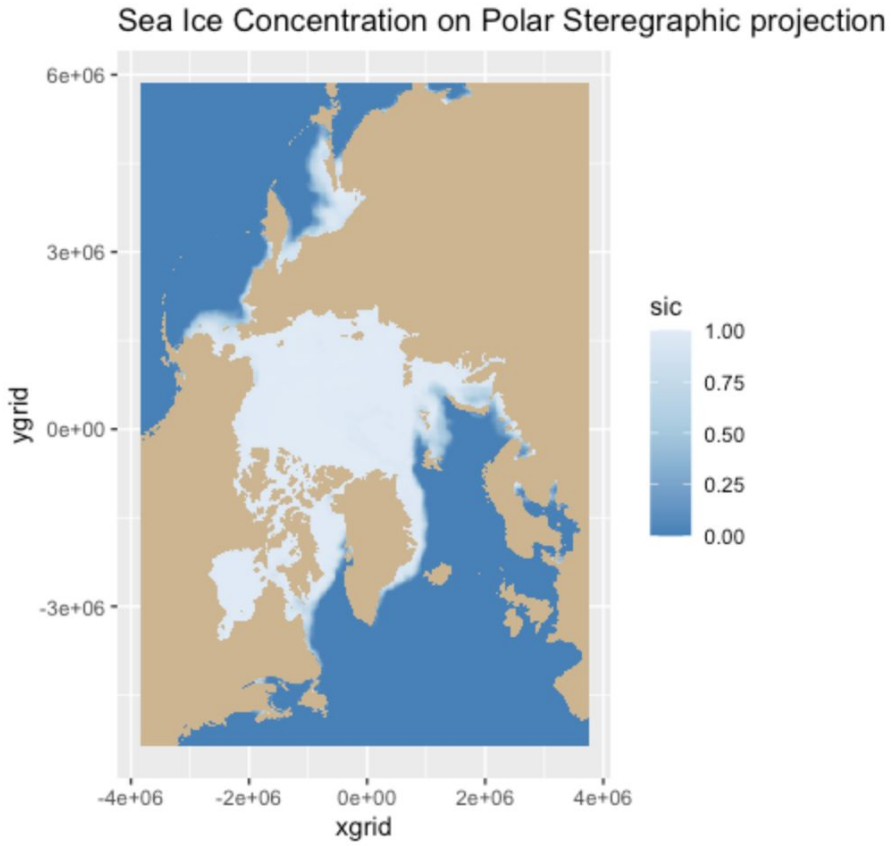
calculate-seaice-extent

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.

Tutorial demonstrates:

- Downloading and saving a netcdf file from the PolarWatch ERDDAP
- Accessing satellite data and metadata in polar stereographic projection
- Downloading and adding grid cell area data to a map
- Computing sea ice area and extent using sea ice concentration data
- Plotting a time series of sea ice area and extent



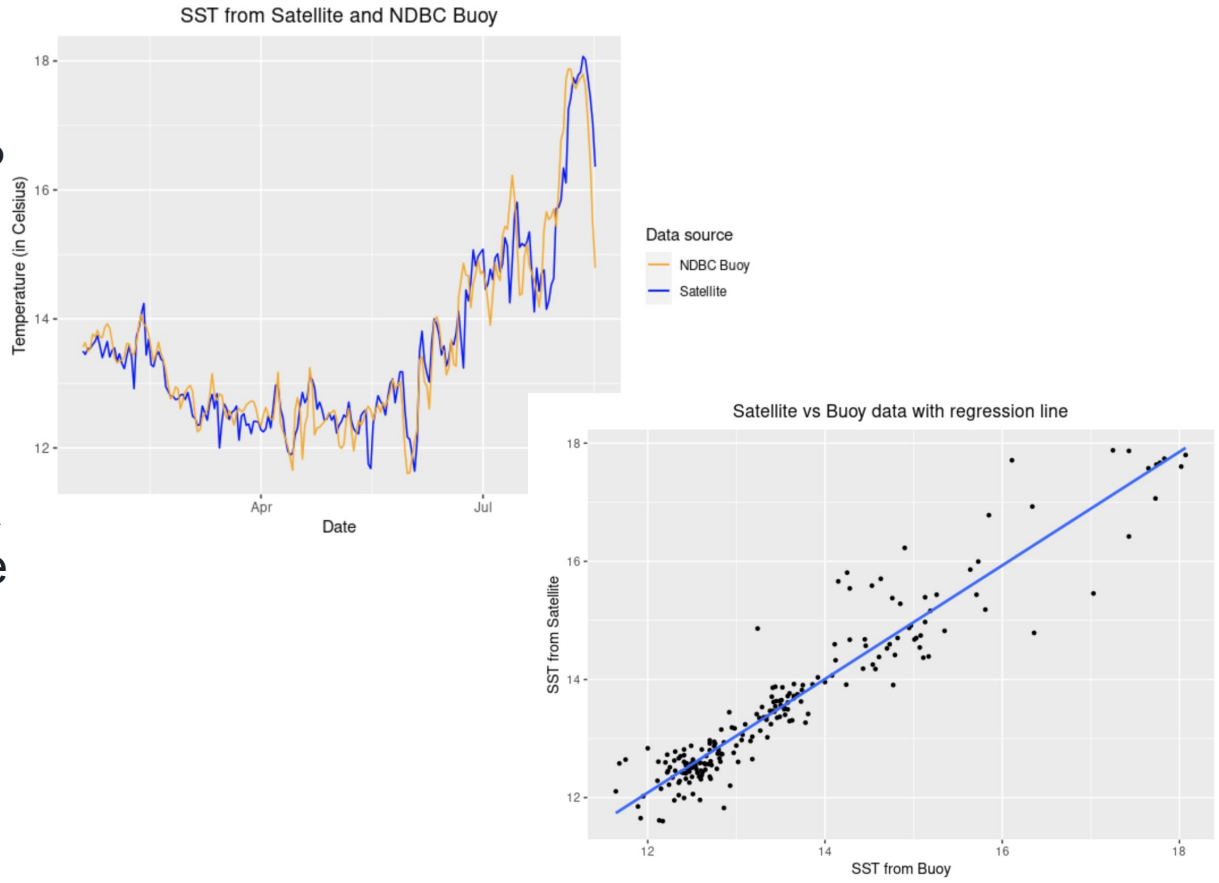


create-virtual-buoy-with-satellite-data

Create a “virtual” buoy using satellite data to fill the gaps in in-situ data collected by a physical buoy. Extract data from a location close to an existing buoy. Clean dataset by removing outliers, and aggregate (resample) to achieve a reduced temporal resolutio¯

Tutorial demonstrates:

- Downloading the satellite and buoy data from ERDDAP
- Visualizing the datasets
- Reshaping the satellite data into a buoy data format
- Resampling buoy data (aggregation) to match satellite data temporal resolution
- Validating the satellite data with the actual buoy data
- Performing a linear regression of satellite vs. buoy data
- Creating a scatter plot of satellite vs. buoy data with the regression line

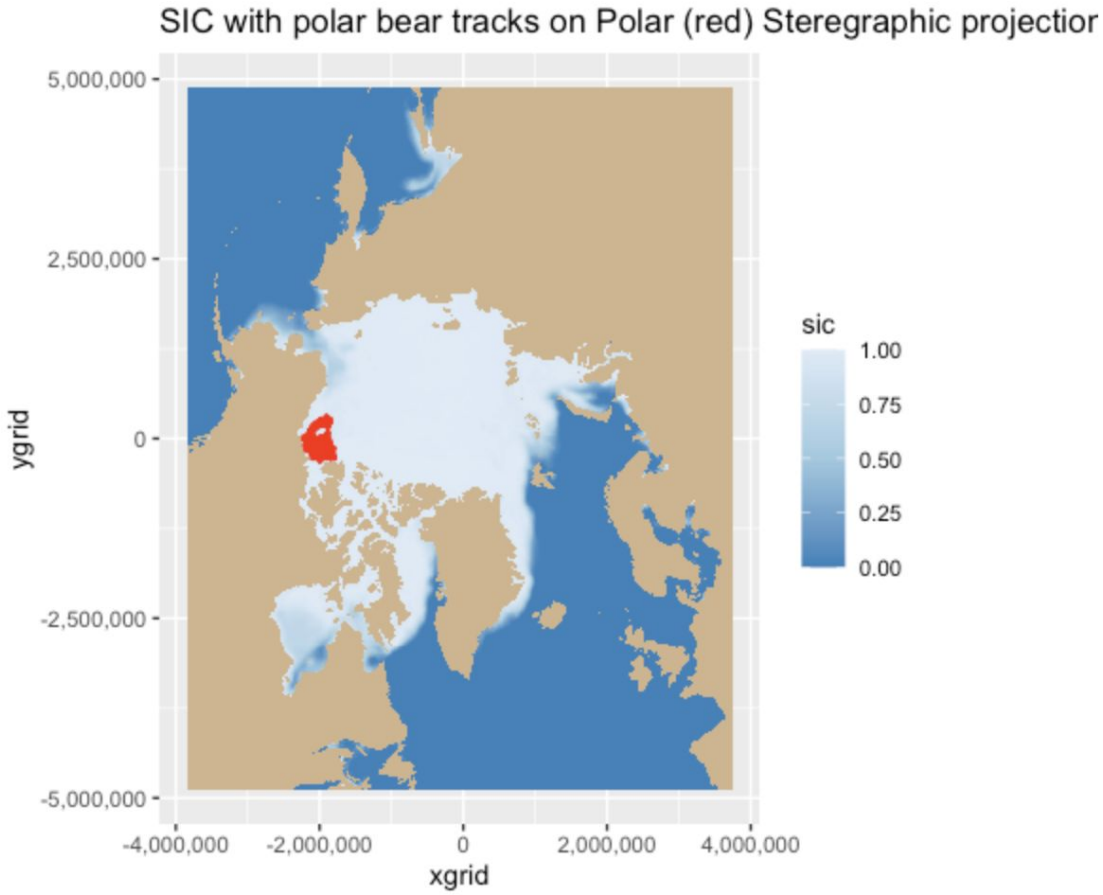


map-data-with-different-projections

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.

Tutorial demonstrates:

- Accessing satellite data from ERDDAP
- Making a projected map
- Adding projected data
- Adding geographical data

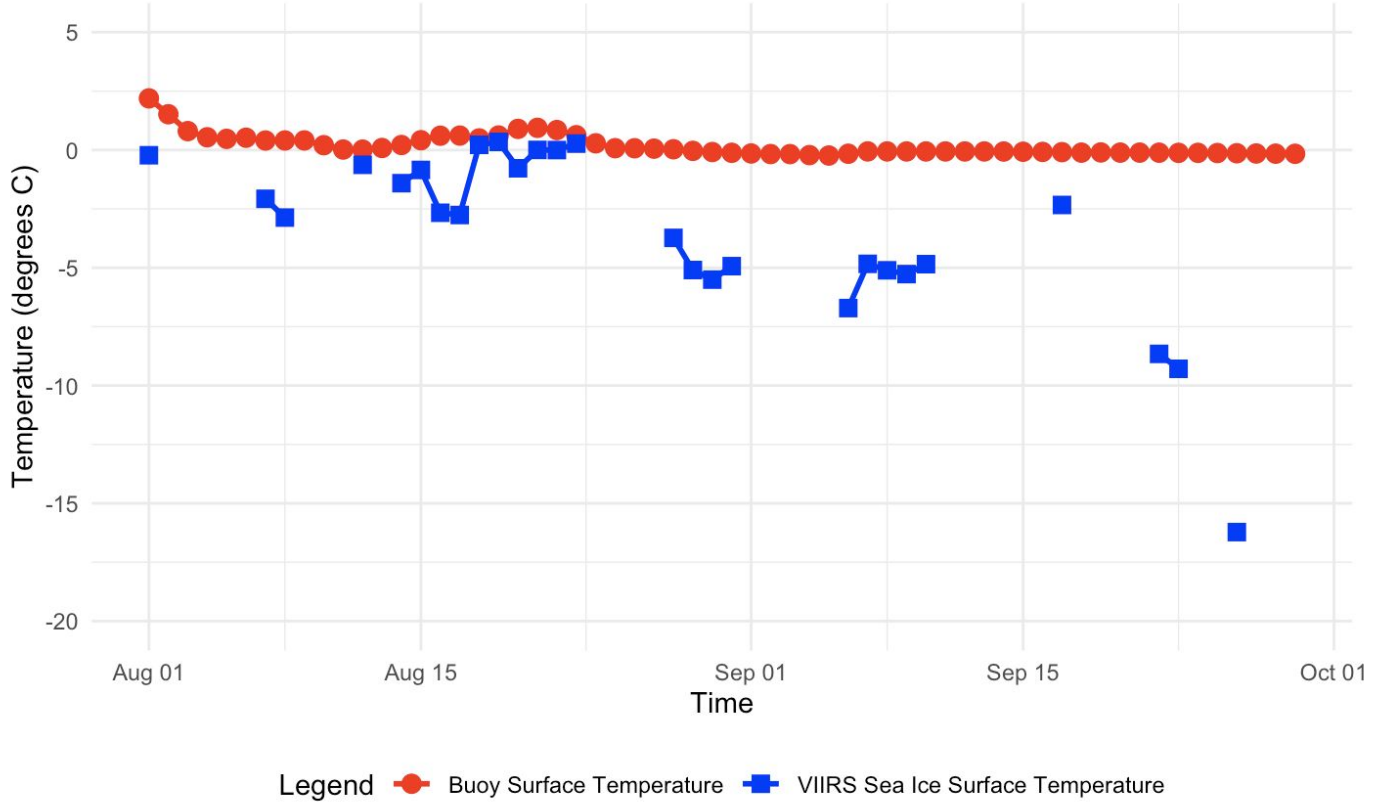


matchup-polar-satellite-data-to-buoy-data

Extract sea ice temperature (satellite) data in a polar stereographic projection using the buoy's location and dates.

Tutorial demonstrates:

- Accessing satellite data from ERDDAP
- Accessing tabular data from ERDDAP
- Changing the projection of a dataset
- Plotting timeseries data

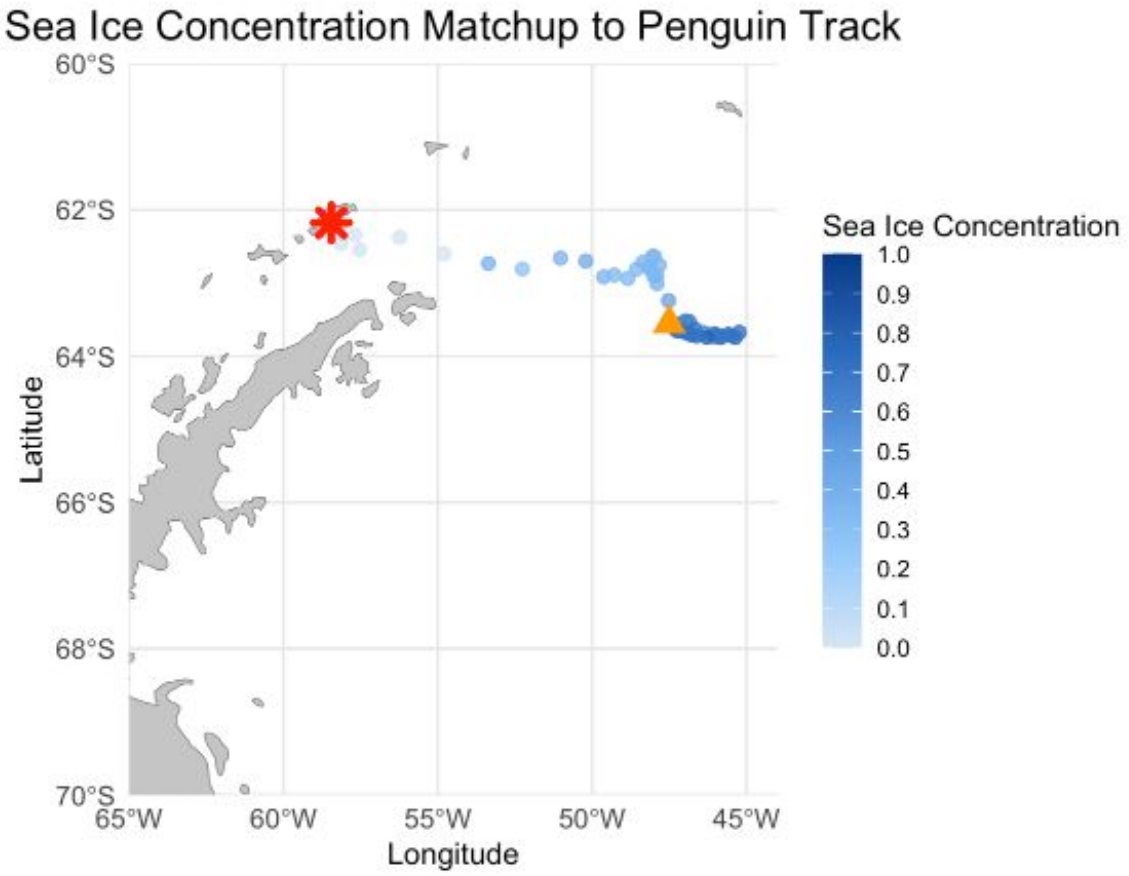


matchup-polar-data-to-track-data

Match up telemetry data (a set of moving x, y, t points) to projected data by converting the p

Tutorial demonstrates:

- Accessing satellite data from PolarWatch ERDDAP
- Changing the projection of a dataset
- Using rerddapXtraco witha projected dataset

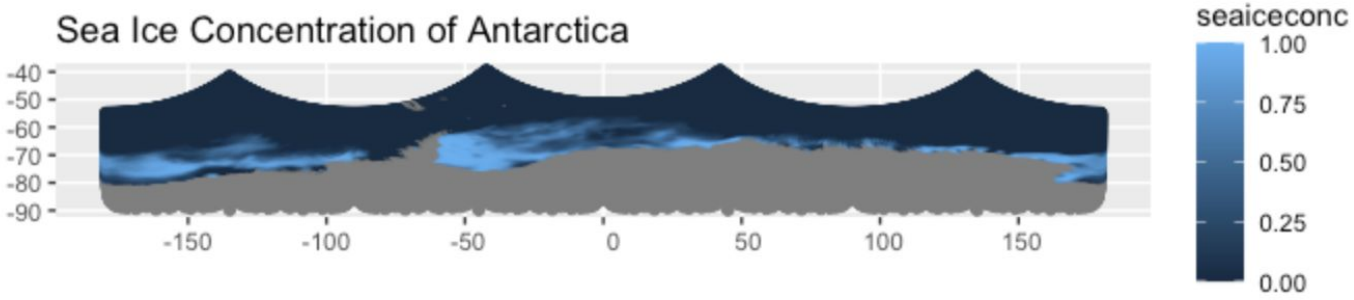


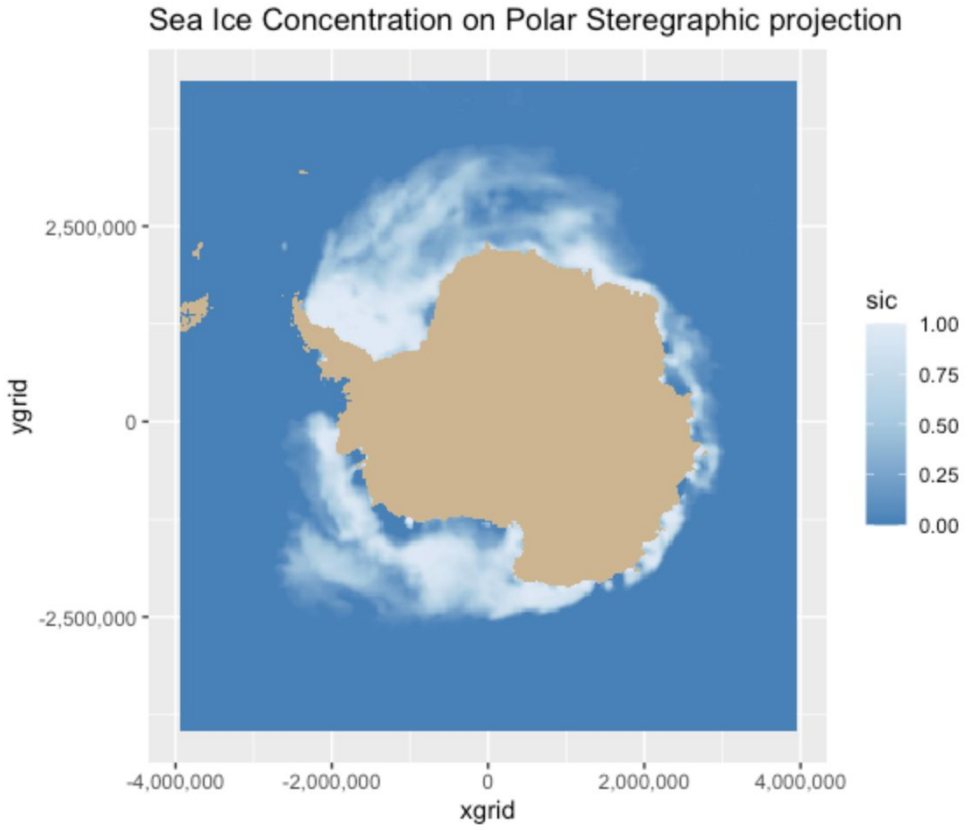
Transform-to-another-map-projection

Access satellite data with polar stereographic coordinates and transform it into a different coordinate system using EPSG code.

Tutorial demonstrates:

- Downloading a netcdf file from PolarWatch ERDDAP
- Accessing satellite data and metadata in polar stereographic projection
- Converting netcdf data into a dataframe
- Transforming coordinates using EPSG codes
- Mapping data using the transformed coordinates





rerddapXtracto package

- R package written by Roy Mendelssohn (SWFSC/ERD)
- Uses the rerddap and plotdap packages
- erddap, plotdap and rerddapXtracto are all available on cran
- rerddapXtracto contains several functions:
  rxtracto: extracts a variable along xyt points (i.e. a tagged animal)
  rxtractogon: extracts a variable within a user-supplied polygon
  rxtracto_3D: extracts a 3-dimensional (latitude, longitude and time) cube of a variable
  plotTrack: plots the results from rxtracto (including creating animations)
  plotBox: plots the output from rxtracto_3D
- Will work on any dataset on any ERDDAP (option to change the default ERDDAP)
- https://github.com/coastwatch-training/CoastWatch-Tutorials/blob/main/R-help/troubleshooting-rerddapXtraco.md

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