NOAA CoastWatch & PacIOOS: Training Course to Access and Use Data for Ocean and Coastal Applications, Nov 26, 1-6pm, Suva, Fiji

CoastWatch Tutorials on GitHub

Pacific GIS and Remote Sensing Council

coastwatch.info@noaa.gov

Tutorials on GitHub

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

Python-setup	updated py setup readme	last year
R-help	adding RHelp directory (#47)	5 months ago
Tutorial1-basics	added echo=FALSE to Tutorials 1 and 2 (R)	last year
Tutorial2-timeseries-compare-sensors	Minor edits (#51)	2 months ago
calculate-seaice-extent	Minor edits (#51)	2 months ago
convert-180+180-to-0-360-longitude	fixed lat typo problem	last year
create-virtual-buoy-with-satellite-data	Virtual-buoy-Python	last year
define-marine-habitat	Vs edits on python modules	last year
extract-satellite-data-within-boundary	Minor edits (#51)	2 months ago
great-lakes-examples	Sundev2 (#66)	2 weeks ago
map-data-with-different-projections	Minor edits (#51)	2 months ago
mask-shallow-ocean-color/R	Minor edits (#51)	2 months ago
matchup-polar-data-to-animal-track-locatio...	Sundev2 (#66)	2 weeks ago
matchup-polar-satellite-data-to-buoy-data/...	Sundev2 (#66)	2 weeks ago
matchup-satellite-buoy-data/R	Minor edits (#51)	2 months ago
matchup-satellite-data-to-track-locations	Delete duplicated python code, modified markdonw file (...	last month

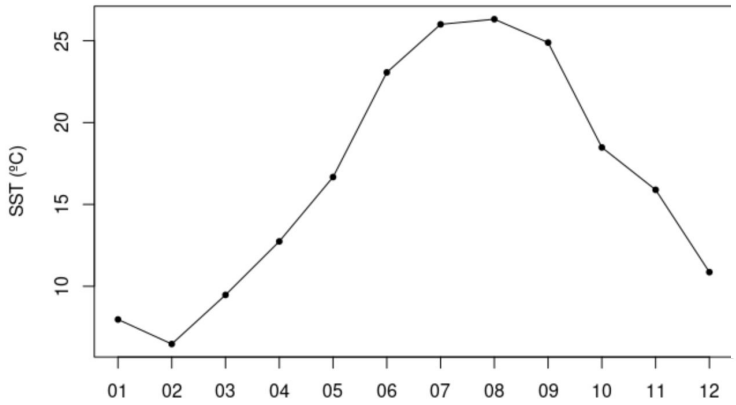
- Each tutorial module is designed to illustrate the process of accessing and manipulating satellite data from the CoastWatch ERDDAP data servers.
- Code is usually available for both R and python
- R folders contain both .md (for internet viewing) and .rmd (for downloading) files

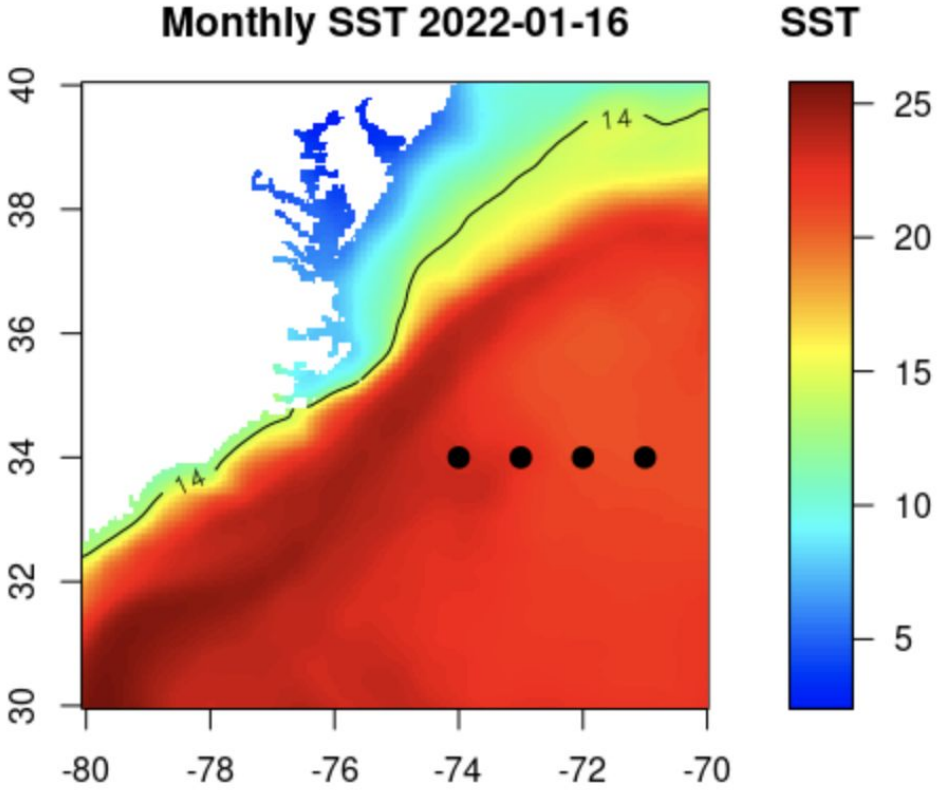
Tutorial1-basics

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.

Tutorial demonstrates:

- Locating a satellite product in ERDDAP
- Manually changing the constraints
- Copying the URL defining the data request
- Downloading the resulting NetCDF file
- Opening and examining the NetCDF file
- Making basic maps and time series plots



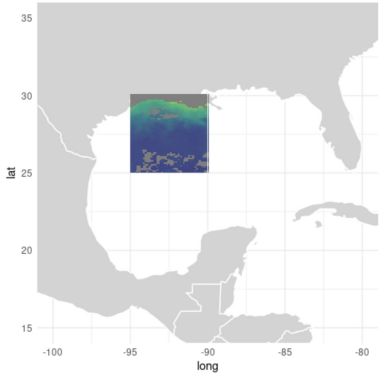


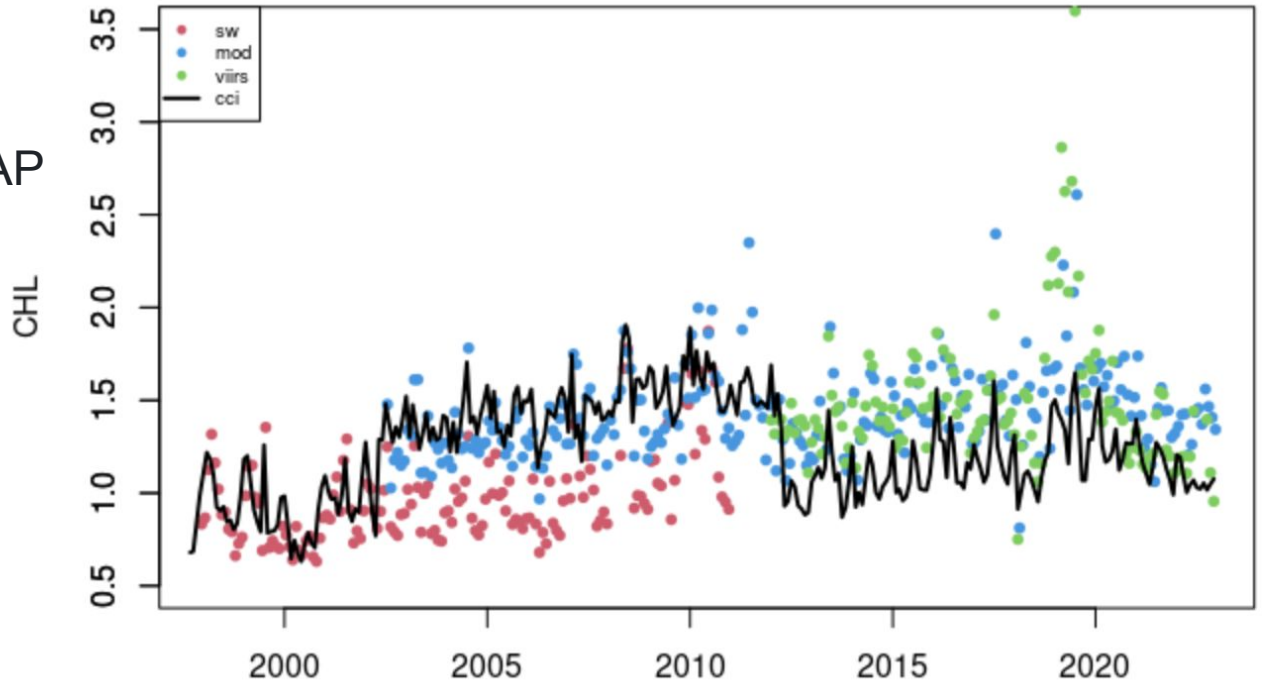
Tutorial2-timeseries-compare-sensors

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





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

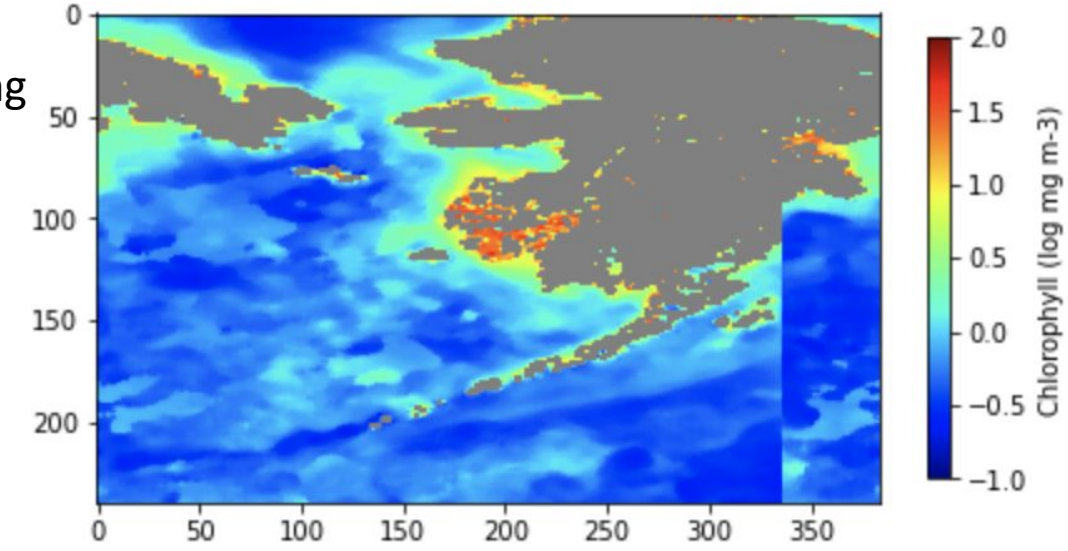
Python only

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

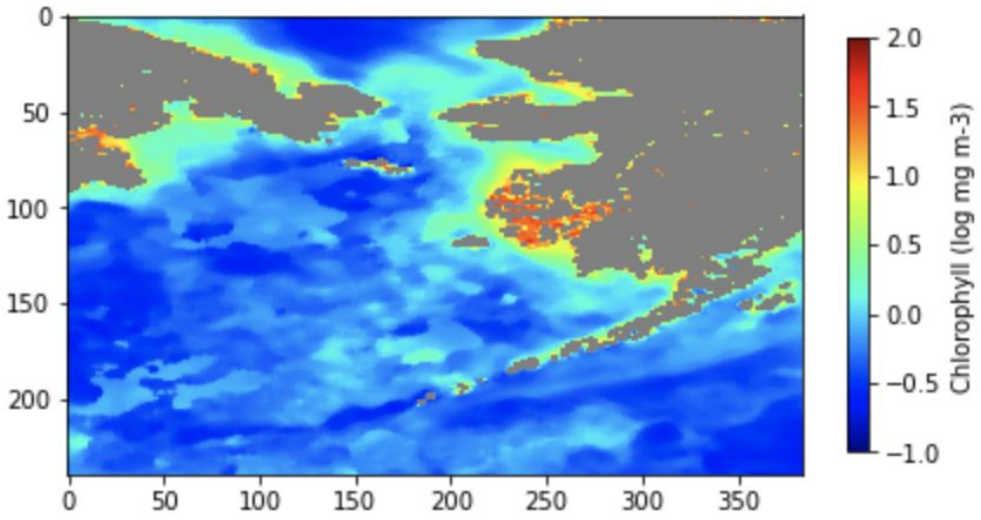
Tutorial demonstrates:

- 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 ->

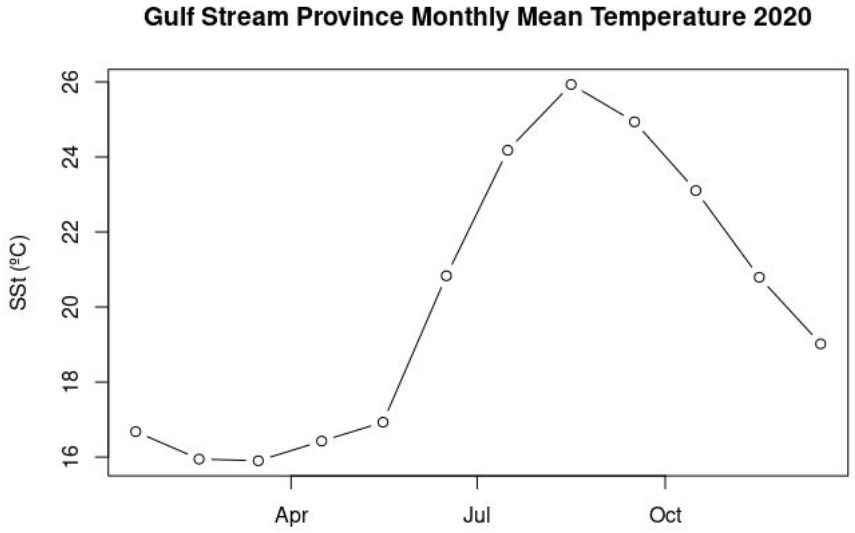


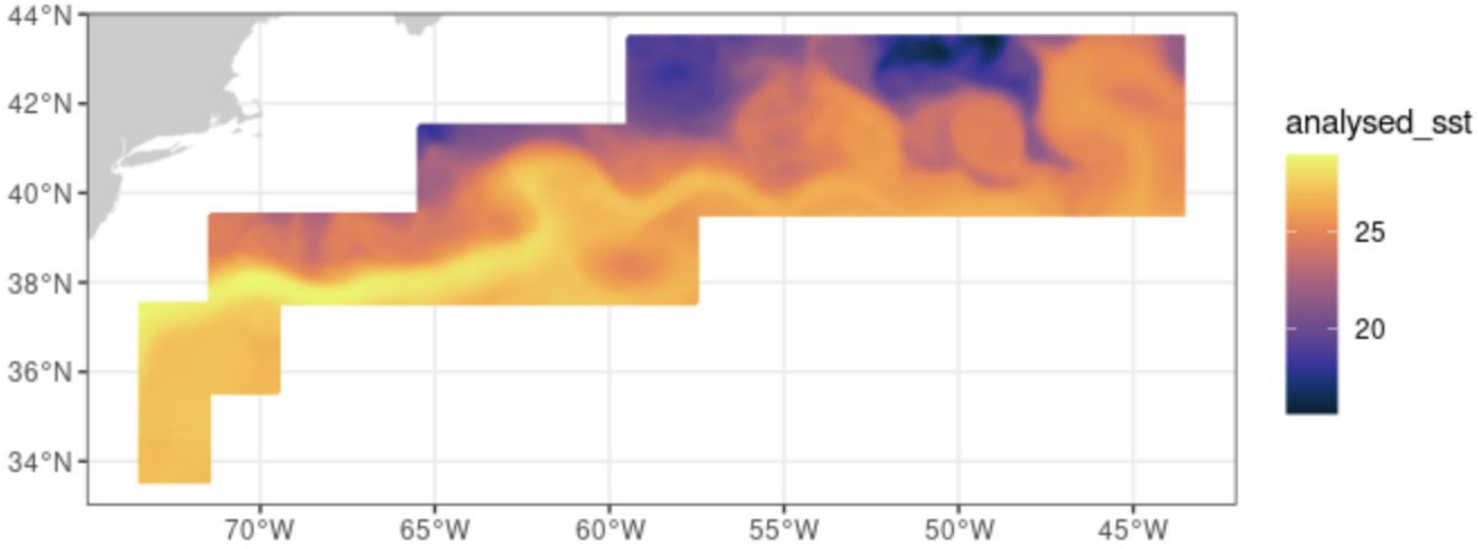
extract-satellite-data-within-boundary

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

Tutorial demonstrates:

- Using **rerddapXtracto** package to extract data from a polygon
- Downloading data from ERDDAP
- Visualizing data on a map



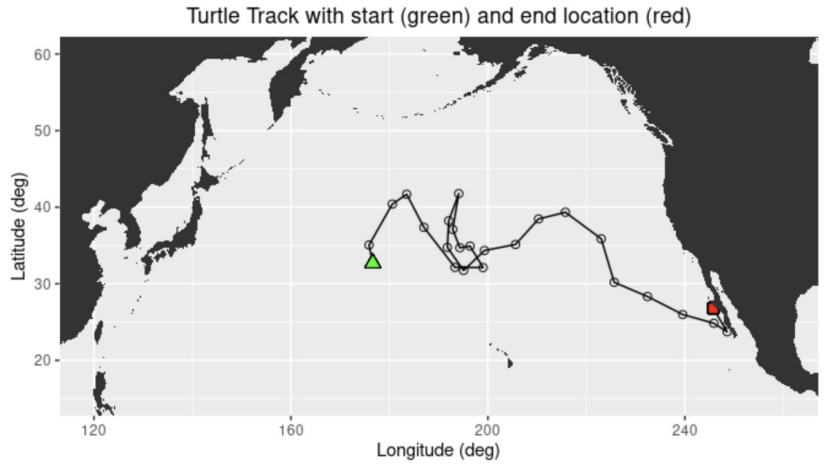


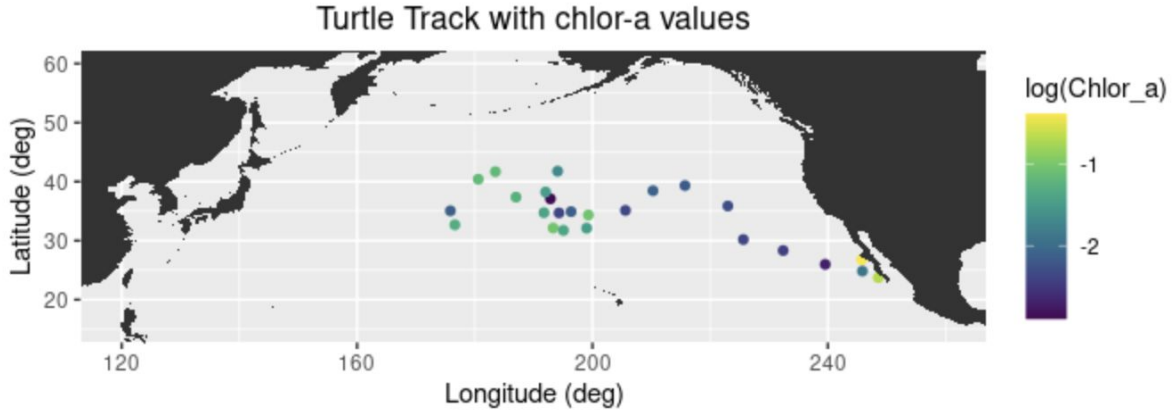
matchup-satellite-data-to-track-locations

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 gl

Tutorial demonstrates:

- Importing track data in csv file to data frame
- Using **rerddapXtracto** package to extract satellite data associated with xyt points
- Plotting the latitude/longitude points onto a map
- Extracting satellite data from an ERDDAP data server along a track
- Plotting the satellite data onto a map





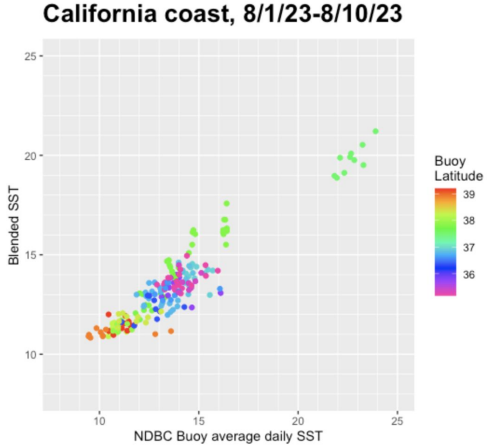
matchup-satellite-buoy-data

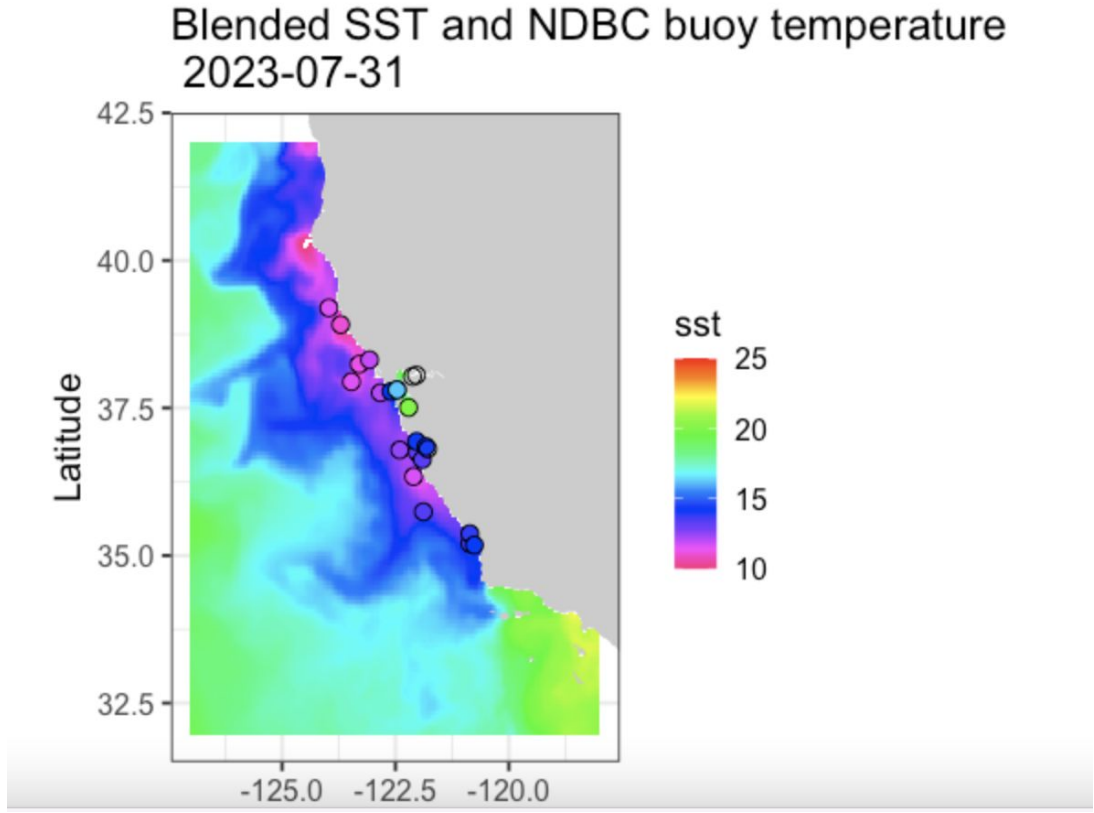
R only

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.

Tutorial demonstrates:

- Downloading tabular data (buoy data) from ERDDA
- Retrieving information about a dataset from ERDDAP
- Matching satellite data with the buoy data
- Running statistical analysis to compare buoy and satellite data
- Producing satellite maps and overlaying buoy data





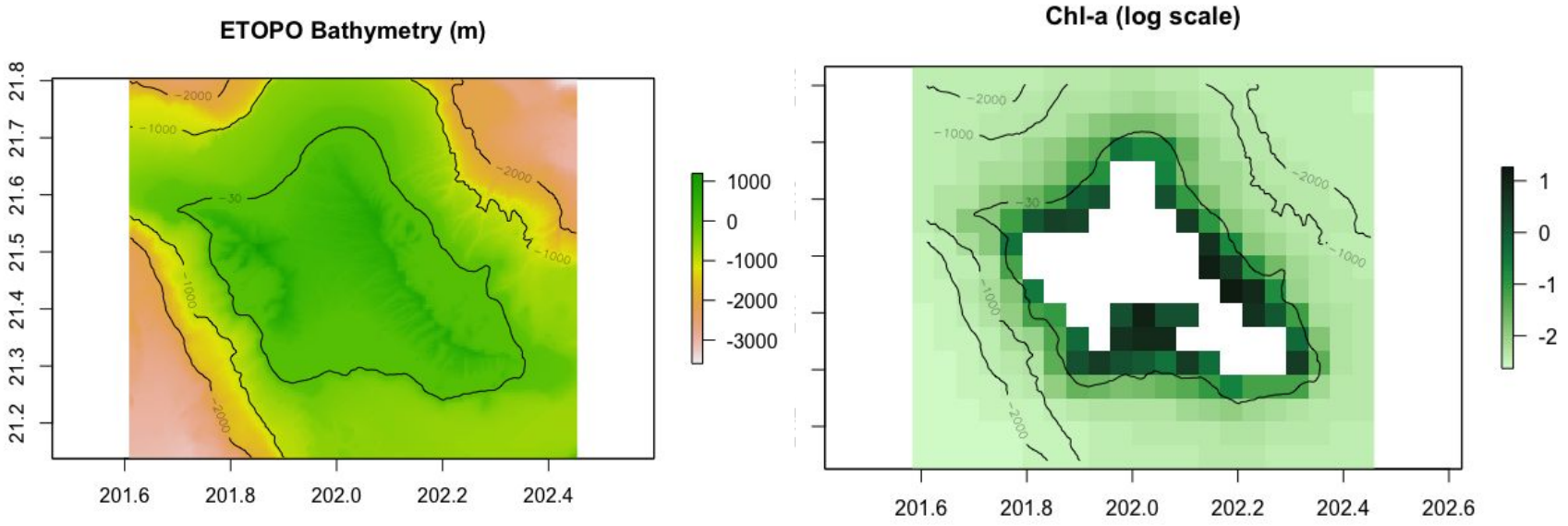
mask-shallow-ocean-color

R only

Ocean color data in optically-shallow waters (<30m) are usually biased because of light reflected off the seafloor contributing to the water-leaving signals received by the satellite sensor. Create a mask to remove ocean color pixels in the coastal shallow water that are contaminated by bottom reflectance.

Tutorial demonstrates:

- Accessing and Downloading satellite data from ERDDAP
- Matching coarse-resolution ocean color data with fine-resolution bathymetry data
- Calculating percentage of shallow water area in each ocean color pixel
- Creating and applying value mask to datasets
- Outputing dataset into netCDF format



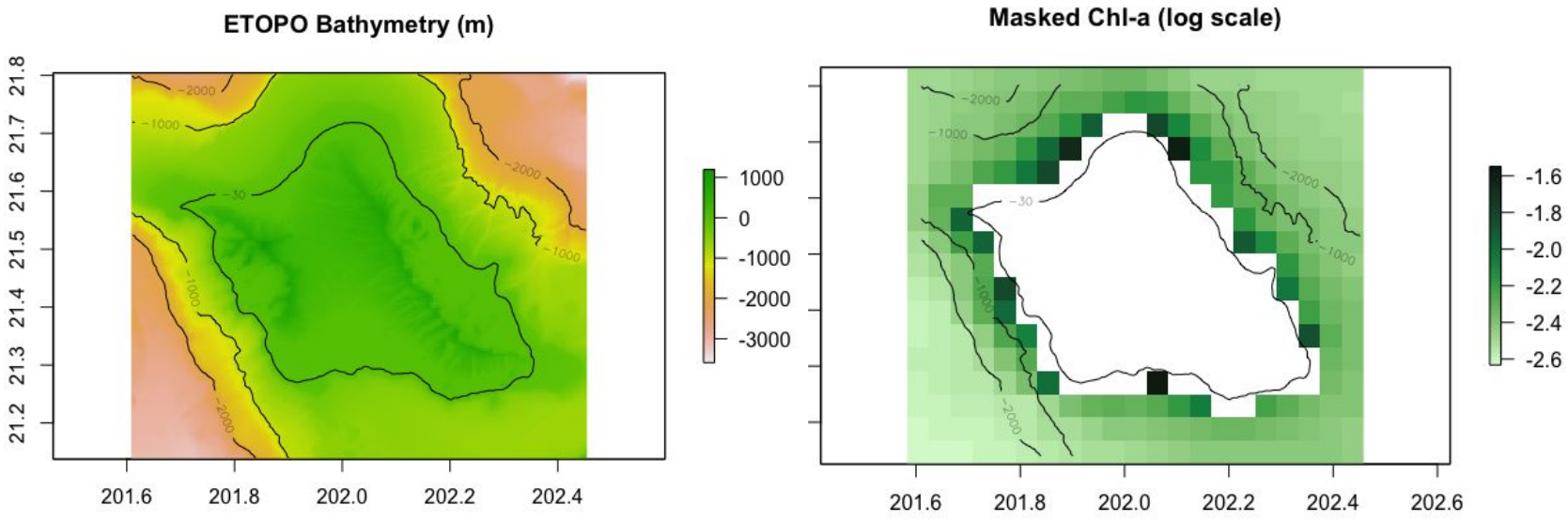
mask-shallow-ocean-color

R only

Ocean color data in optically-shallow waters (<30m) are usually biased because of light reflected off the seafloor contributing to the water-leaving signals received by the satellite sensor. Create a mask to remove ocean color pixels in the coastal shallow water that are contaminated by bottom reflectance.

Tutorial demonstrates:

- Accessing and Downloading satellite data from ERDDAP
- Matching coarse-resolution ocean color data with fine-resolution bathymetry data
- Calculating percentage of shallow water area in each ocean color pixel
- Creating and applying value mask to datasets
- Outputing dataset into netCDF format

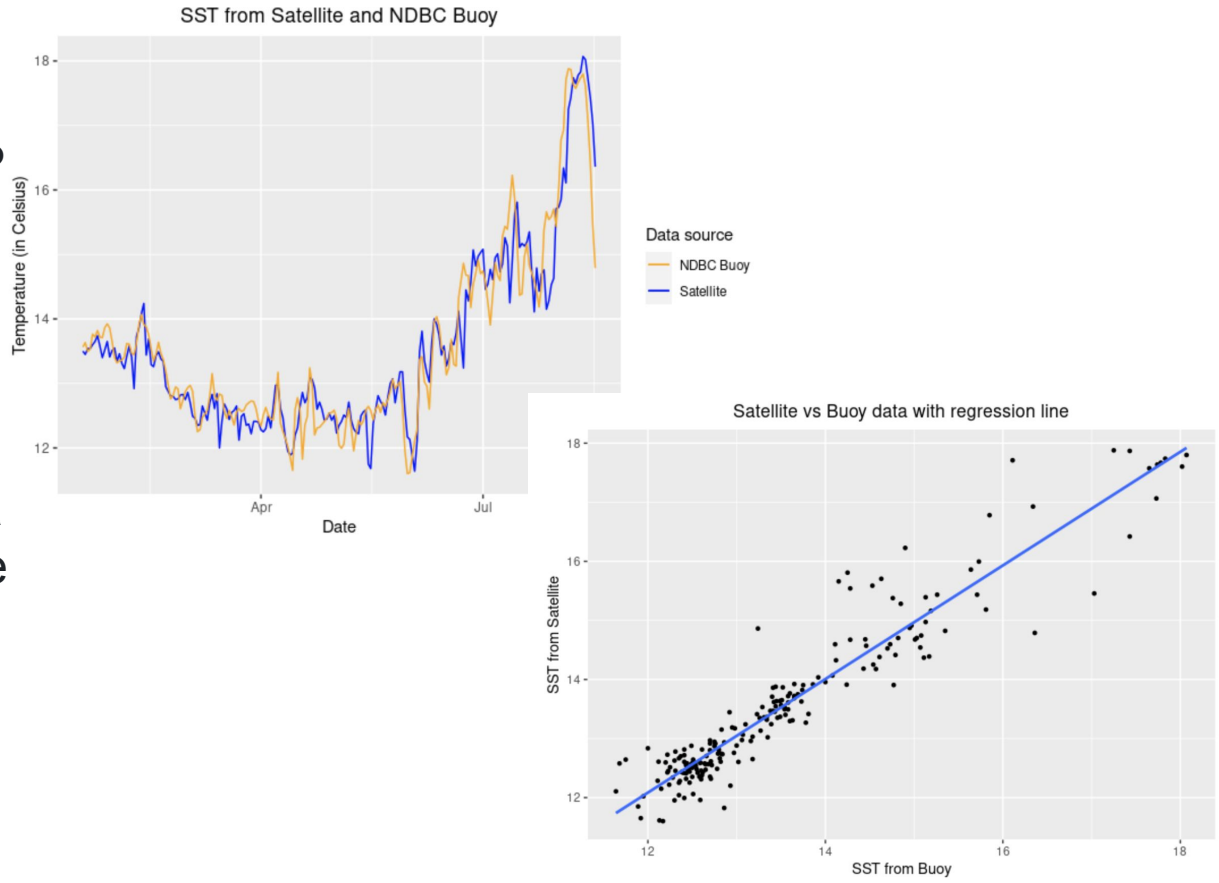


create-virtual-buoy-with-satellite-data

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

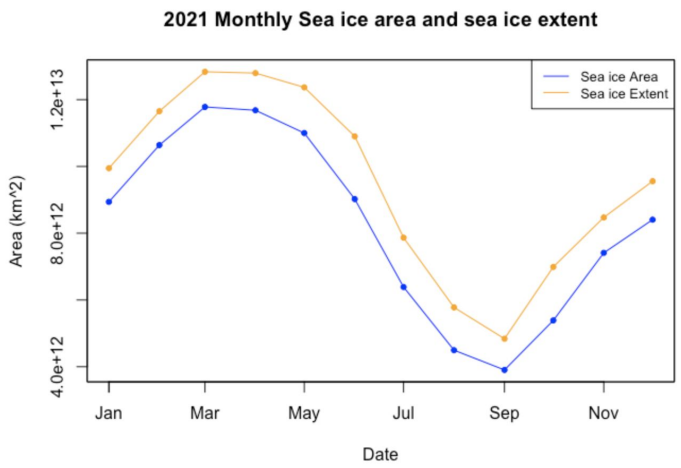


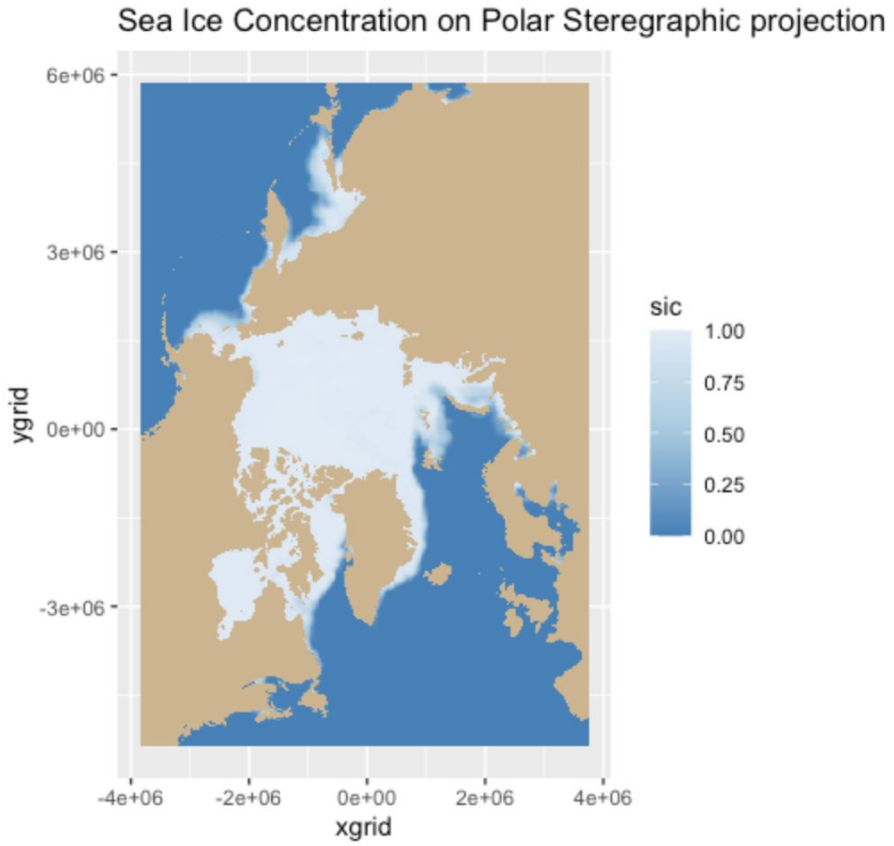
calculate-seaice-extent

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



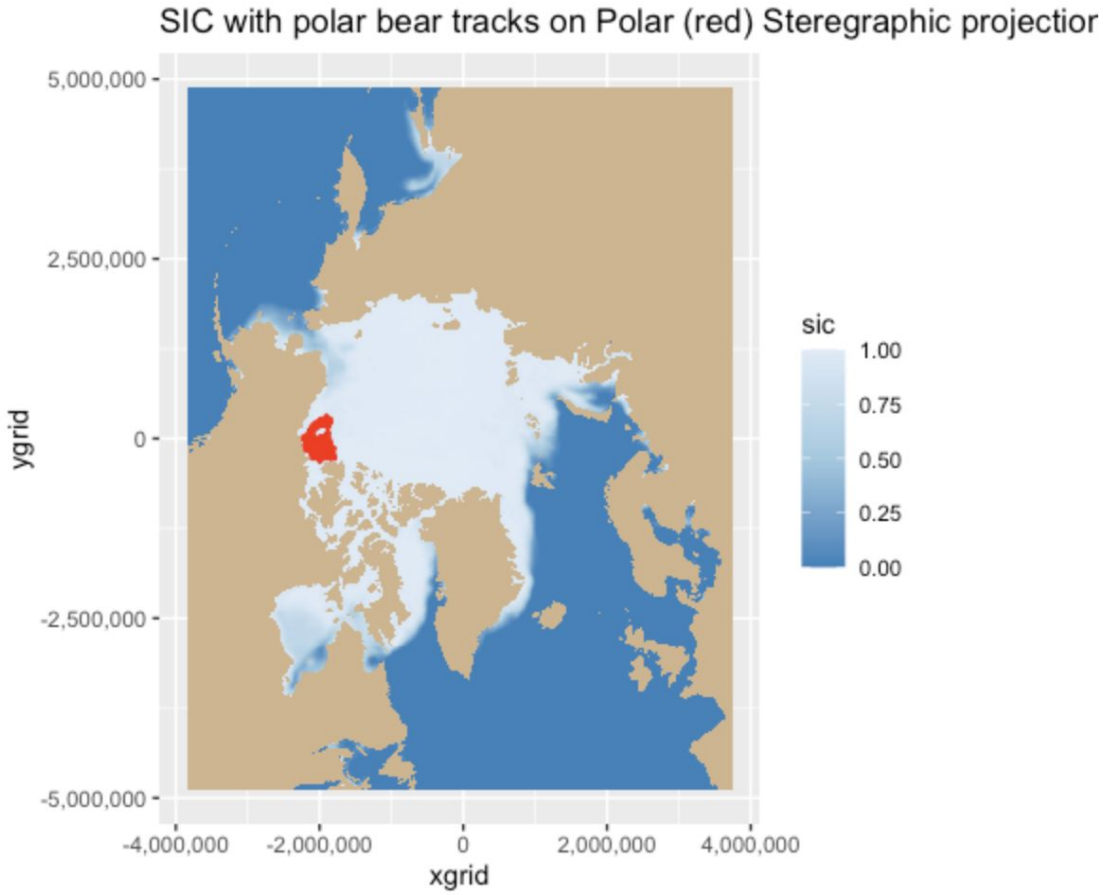


map-data-with-different-projections

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

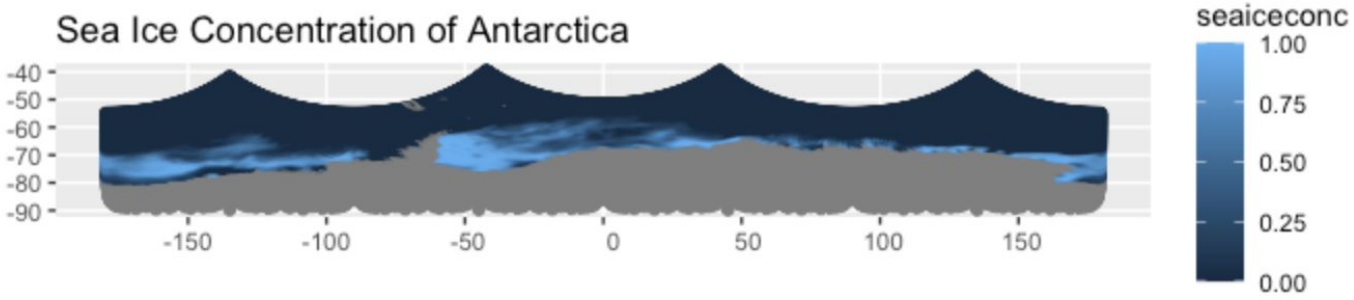


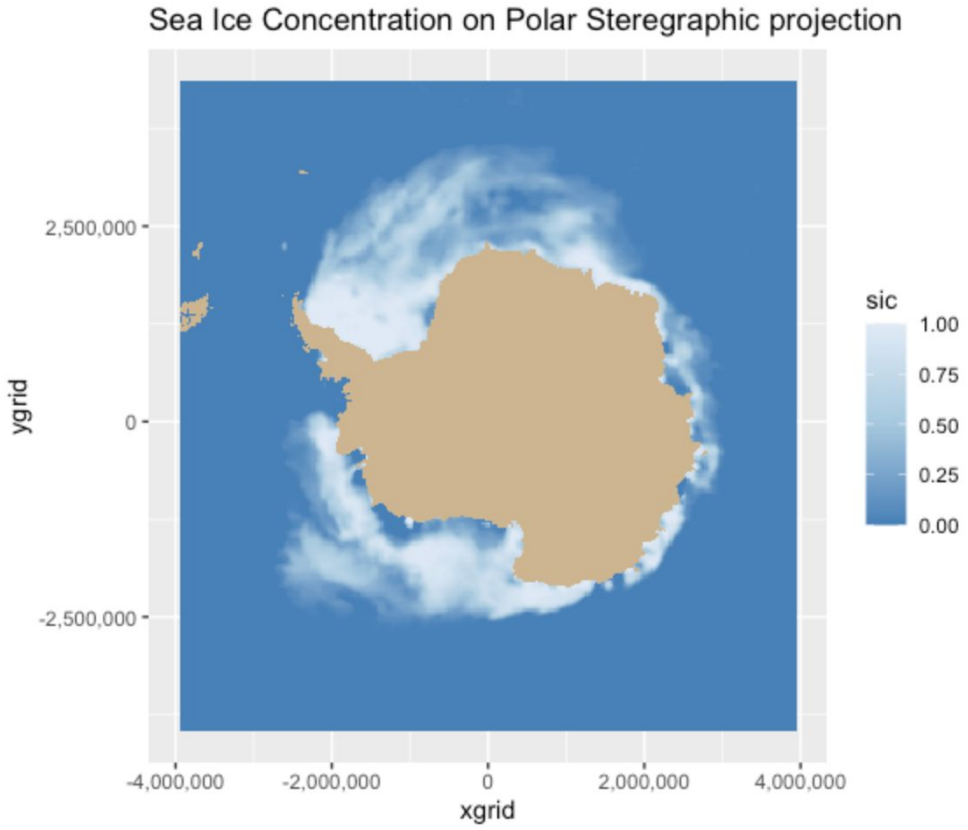
Transform-to-another-map-projection

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), based on code originally developed by Dave Foley for Matlab
- 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 enter a url to change the ERDDAP accessed)