

## Remote sensing data retrieval and analysis lab – day 1.

In this multiple part lab you will learn to use a variety of existing tools as well as data from a variety of satellites you may or may not know about. Some of you already have a lot of experience processing remote sensing data. Please help others who don't.

### *The 'case study'*

Scenario: you are interested in getting water quality data in Harpswell sound to advise Maine's Department of Marine Research regarding siting of leases for oyster aquaculture. For marketable growth rates, oysters need temperatures greater than 20°C for about 3 months a year, chlorophyll concentrations between 0.5-10 mg m<sup>-3</sup>, and turbidities less than 20 NTU. In addition, harmful algal blooms are bad for the industry. Your job is to determine if and where in Harpswell sound oysters will thrive.

Part 1: NASA's Giovanni – generating climatic data.

NASA's Giovanni is a great tool for quick exploration of remote sensing products obtained with satellites and data-assimilating models.

Login: <https://giovanni.gsfc.nasa.gov/>

Tutorials can be found at:

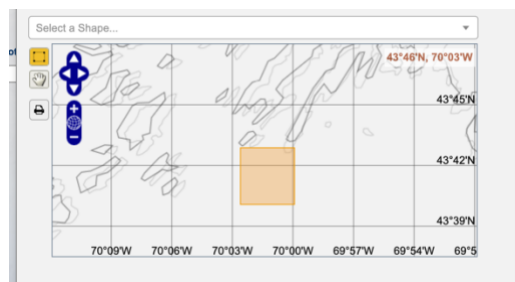
<https://giovanni.gsfc.nasa.gov/giovanni/doc/UsersManualworkingdocument.docx.html> and also on YouTube.

Explore products available on the Ocean Biology and Oceanography page (under the Disciplines tab). By clicking on the link in the bracket for each product you can learn more about the product and its source. Notice those inverted from satellite observation vs. those from a data assimilating model (NOBM).

Use Giovanni to generate a seasonal climatology for the area around Harpswell Sound from 2002 to 2021. Use MODIS Aqua (MODISA) for chlorophyll, PAR, R<sub>rs</sub>(645) – a proxy for suspended particulate matter (SPM; e.g. Nechad et al., 2010), and temperature, over the lifetime of MODISA (2002-2021).

Do this by:

1. Selecting a product of choice.
2. Selecting a box just in the mouth of Harpswell Sound (notice that the highest resolution you can get is 4 km):
3. Select plot: 'Time series seasonal' (try both 'monthly' and 'seasons').



Summarize the salient features of the seasonal variability of the four parameters. How do they compare to each other? Try to explain the differences and similarities.

Part 2: In-situ data.

Whenever you obtain remote sensing data, you want to make sure they fit the environment of interest within a known uncertainty (that may be different from the uncertainty derived from global comparisons). For Harpswell Sound, Collin has been maintaining a measurement buoy (<http://bowdoin.loboviz.com/>).

Plot and download relevant data from <http://bowdoin.loboviz.com/loboviz/>, that is, backscattering and turbidity, fluorescence, CDOM, temperature and downwelling planar irradiance (Ed) from which you compute PAR.

Tomorrow you will learn to process a variety of satellite data (e.g. Landsat 8, Sentinel 2) to obtain parameters within Harpswell Sound.

Questions:

1. How do the properties within the Sound compare to those at its mouth?
2. Discuss whether either of the areas you investigated are likely to be appropriate sites for oyster aquaculture, based on LOBO buoy and remote sensing observations.