GeoHackeo Proposal: CoCo 2022

Time series analysis of nutrient cycling and primary production in two coastal ecosystems

Team Name: GreenSeas

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Abstract: Understanding cycling of nitrates and phosphates in aquatic ecosystems is essential for waterway management in order to avoid harmful coastal algal blooms and other impacts, such as eutrophication. The objective of our project is to visualize the concentrations of different nutrients and primary production rates in two different coastal ecosystems over time and space and analyze temporal trends. Data from Copernicus Marine Service (CMS) will be visualized on an interactive map using *plotly* as well as mathematical interpretations of the data. We expect to see differences between northern and southern hemisphere coastal ecosystems influenced by proximity to anthropogenic nutrient sources.

Dataset: The data we will use are from a site of low latitude (Gulf of Mexico: cmems_mod_glo_bgc_my_0.25_P1M-m_1651069812390.nc) and a site of high latitude (Southwestern Atlantic: cmems_mod_glo_bgc_my_0.25_P1M-m_1651070252977.nc). Both are available on CMS. Both datasets are available in NetCDF format. They provide data such as latitude, longitude, pH, nitrates, phosphates and primary production and others, but we are only interested in the ones mentioned above. The data ranges from 2005 to 2020 (15 years). All the technical information about this product is available in this link.

Methods:

1. Import datasets from Copernicus Marine Service, clean any outliers and organize the data as a spatial time series in order to create two unique datasets using Pandas.
2. Extract the nitrate, phosphate, primary production, and pH data from specific lat/long coordinates in each coastal environment using pandas of our study area.
3. Calculate median values and standard deviation using Pandas and NumPy.
4. Create histograms of the concentrations of the nutrients with respect to time (years) for each of the two locations and visualize the evolution over time and space using matplotlib and seaborn. Do the same for primary production and pH.
5. Create interactive maps for: nitrate, phosphate and primary production at both ecosystems throughout the years for spatial and temporal visualization of different concentrations and rates.
6. Analyze data and find interpretations for the results (main riverine nutrient sources, type of vegetation in each coastal ecosystem, etc.) and summarize in presentation.

Timeline:

Monday: Create GitHub repository / Clean and organize the data sets
Tuesday: Create histogram plots and mathematical analysis of nutrient concentrations and primary production rates.
Wednesday: Plot interactive maps / Preliminary results on spatial and temporal variations / Develop initial presentation draft
Thursday: Final Results and Interpretations (external sources of nutrients and other processes) / Polish the presentation!
Friday: Presentations!

Visual Diagram: