CRMS2Map documentation

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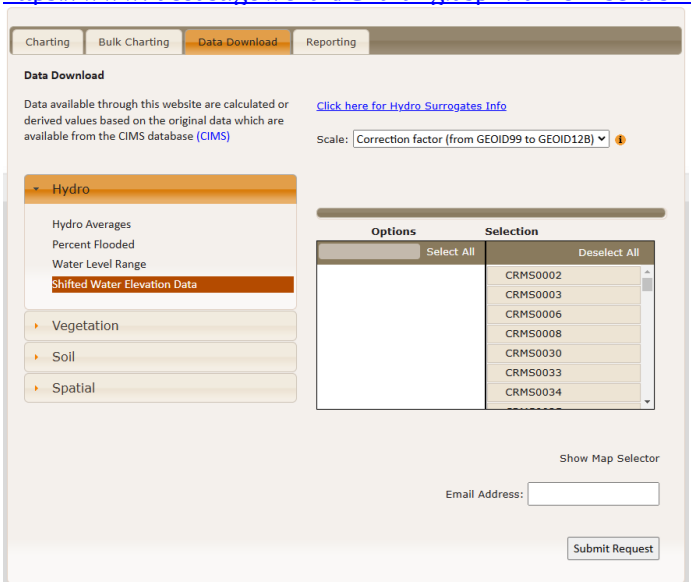
CRMS2Map: Data analytical and mapping tools for the Louisiana Coastal Reference Monitoring System (CRMS)
Repository: https://github.com/jinikeda/crms2map

Datasets

Available data list https://cims.coastal.la.gov/monitoring-data/
Bulk downloads: https://cims.coastal.la.gov/FullTableExports.aspx

CRMS data list

- Hydrographic Data (Continuous Hydrographic (Hourly), Discrete Hydrographic (Monthly)) using bulk download links
- Coastal Basin (GIS data -> Reference layers -> **Basins**)
  Input/Basin_NAD83.shp (ten coastal domains defined by CPRA)
  Input/Basin_NAD83_Dissolve.shp (merged single domain)
- Datum conversion for surface water elevation (**Geoid12B** after Oct 2, 2023. No more Geoid12A data are available)
  https://www.lacoast.gov/chart/Charting.aspx?laf=crms&tab=2



Environment Setting

Follow sections 1 to 3 in the Readme file: https://github.com/jinikeda/crms2map

CRMS2 Map package: Features and Workflow

1. Auto-Retrieve Hydrographic Data

- **CRMS2Map continuous**:
  - Retrieves and subsets continuous hydrographic data (hourly).

    - Estimated Time: 10 – 20 minutes.
- **CRMS2Map discrete**:
    - Retrieves and subsets discrete hydrographic data (monthly).
    - Estimated Time: ~1 minute.

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2. Data Processing of Hydrographic Data

- **CRMS2Map resample**:
    - Generates averaged datasets (hourly, daily, monthly, yearly) from continuous and discrete hydrographic data.
    - Processed datasets are saved in the "Input" folder.
    - Processed and output data are organized in their respective folders for easy access.
    - Estimated Time: ~3 minutes.

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3. Data Visualization of Hydrographic Data

- **CRMS2Map Plot**:
    - Creates time-series plots for the user's specified period.
    - Includes (moving-averaged) datasets for:
        - Salinity [ppt]
        - Water level [m, NAVD88]
        - Percent time inundation/Hydro period [-]
        - Inundation depth [m]
    - **Station Specification**:
        - When the user wants to specify the station(s), of interest, update the station_list.txt file located in the parent folder.
    - **Estimated Time**: ~3 minutes.

option

--sdate State date for the data analysis (format: YYYY-MM-DD) [Default: "2008-01-01"]
--edate End date for the data analysis (format: YYYY-MM-DD)[Default: "2024-12-31"]
--staionfile Path to station list file <station_list.txt> (format: CRMSxxxx)[Default: None]
--data_type Data type: hourly(H), daily(D), monthly(M), and yearly(Y)[Default: M]
--save Save as a single (bundled) dataset and MA_datasets. This is time-consuming when the user uses high spatial datasets. [Default: True]
--plotdata Plot original data (org) or moving average data (MA)[Default: MA]
--specify_ma [Optional] The user can specify a central moving average window size in days. [Default: yearly averaged]

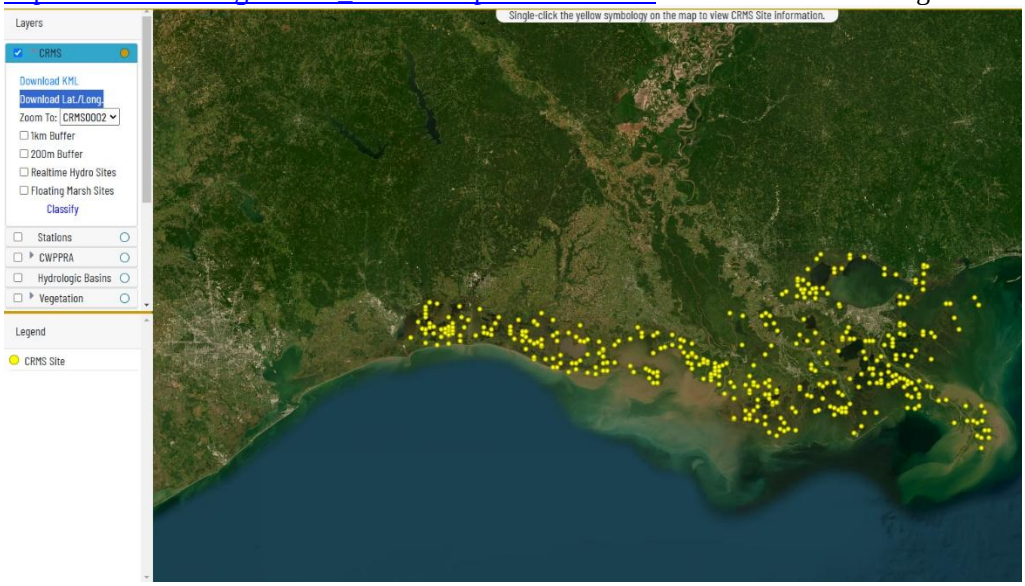
CRMS2Map Pytest

- **tests/test_CRMS_general_functions.py**
    - Test individual functions used in each submodule (Github Action automatically tests the CI/CD pipeline when changing the code).

Supplement Analysis (folder: CRMS2Map/Supplement)

Datasets

- **CRMS station coordinates**
  CRMS_Long_Lat.csv
  https://www.lacoast.gov/crms_viewer/Map/CRMSViewer -> Download Lat./Long.



- **Marsh Vegetation**
  (https://cims.coastal.la.gov/FullTableExports.aspx -> Full Table Exports - CRMS Data Only -> **Marsh Vegetation**)
  Processed CRMS_Long_Lat.csv and CRMS_Marsh_Vegetation.csv to make dominant marsh vegetation types and the station's coastal domains.
    - Location: Data/CRMS_station_Basin_Community.shp

- **Station list for each variable** (Surface_salinity, water elevation, temperature, etc)
    - Data/CRMS_stations_Surface_salinity.shp
    - Data/CRMS_stations_Water_Elevation_to_Datum.shp
    - Data/CRMS_stations_Water_Elevation_to_Marsh.shp
    - Data/CRMS_stations_Water_Temp.shp

- **Median monthly climate drivers** (sea surface temperature, river flow, precipitation, winds) in Coastal Louisiana (Processed data)
    - Locations: Data/MonthlySST.xlsx

Date	SST	AR_Q	Prcp	U10	V10	UV	GI_trend
1981-09-01 00:00:00	29.28783	3394.246	94.55	-2.28132	0.58002	2.332741	-0.380
1981-10-01 00:00:00	28.1729	2775.051	56.14	-2.95152	1.003608	3.252465	-0.352
1981-11-01 00:00:00	26.386	4179.567	41.39	-1.29317	0.598614	1.436008	-0.265

  Subdomain/community analysis:
    - Data/AR_daily_discharge_since_1970.csv (daily Atchafalaya River discharge)
    - Data/CS_discharge_since_2008.csv (daily Calcasieu River discharge)
    - Data/Basin_total_prcp Monthly.xlsx (total precipitation in each basin)

For the detailed datasets list, please refer to Table2 on *"Tempo-spatial variations in water level and salinity in Louisiana coastal wetlands over 15 years"*

1. Function of Monthly_analysis_practice.py

- Data Reading and Preparation
  - Read monthly continuous and discrete hydrographic datasets.
- Data Analysis
  - Generate 12-month moving average datasets.
  - Examine short- (15 years) and long-term (over 40 years) trends for climate driver and CRMS data.
- Data Grouping
  - Grouped by subdomain and vegetation datasets
- Data Visualization
  - Generates visualizations for subdomain and vegetation-specific datasets.
- Statistical Analysis
  - Analyzes correlations between subdomain/vegetation datasets and climate drivers

Output:

- Plots for subdomains and vegetation datasets.
- Display/output statistical results

2. Function of Bootstrap_Regression_analysis.py

- Run multiple regression models.
  - Automated bootstrap regression analysis using ordinal linear and random forest models
- Statistical Analysis
  - Evaluate the performance of models

Output:

- statistical results

3. Function of Regression_analysis_plot.py

- Data Visualization
  - Generates a time series of visualizations for each subdomain.
- Statistical Analysis
  - Generates a summary table of model performance for each subdomain