

# 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>

| Options    | Selection    |
|------------|--------------|
| Select All | Deselect All |
|            | CRMS0002     |
|            | CRMS0003     |
|            | CRMS0006     |
|            | CRMS0008     |
|            | CRMS0030     |
|            | CRMS0033     |
|            | CRMS0034     |

## 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.

## 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.

## 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:** ~2 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"]
--stationfile 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).

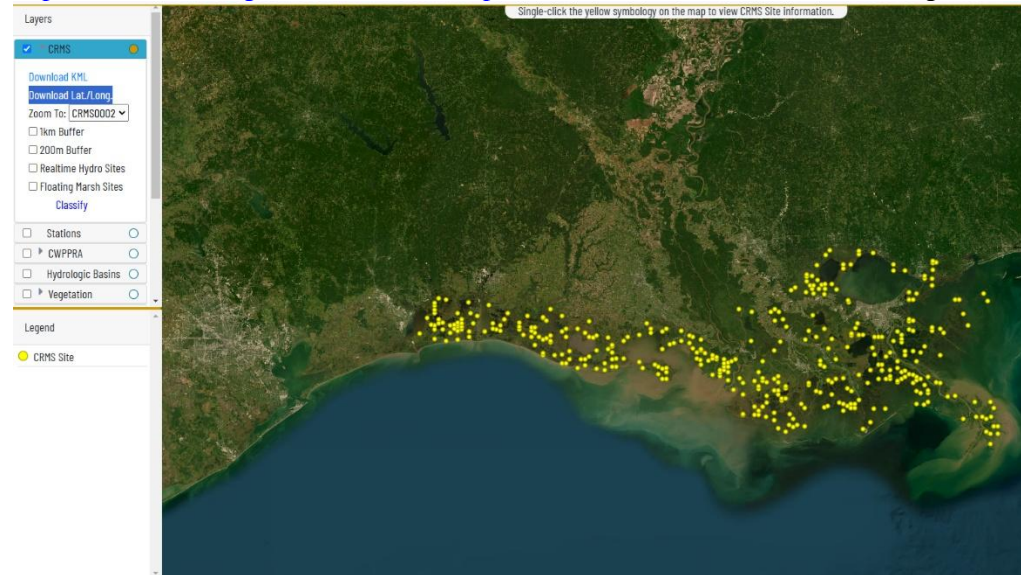
## Supplement Analysis (folder: CRMS2Map/Supplement)

### Datasets

- **CRMS station coordinates**

CRMS\_Long\_Lat.csv

[https://www.lacoast.gov/crms\\_viewer/Map/CRMSViewer](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.

### **Outputs:**

- Plots for subdomains and vegetation datasets (e.g., Photo folder).
- Display/output statistical results (e.g., Sub\_basin/Sub\_marsh folders).

## **2. Function of Bootstrap\_Regression\_analysis.py**

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

### **Outputs:**

- Statistical results (e.g. bootstrap\_Output folder).

## **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.

### **Outputs:**

- Plot a time series of model predictions and comparisons (Photo folder).
- Generate model performance and statistical results (bootstrap\_Output folder).