Coastal Data Information Program (CDIP) Wave and Current Monitoring in Louisiana

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ABSTRACT

The Coastal Data Information Program (CDIP) at Scripps Institution of Oceanography, UC San Diego, maintains an array of wave monitoring buoys in US waters worldwide, with primary funding from the US Army Corps of Engineers (USACE). In 2019 CDIP began a partnership with the Louisiana Coastal Protection and Restoration Agency (CPRA) and installed a wave buoy station off Grand Isle, LA. In 2021 the station was relocated to CDIP 256 Southwest Pass Entrance W. Every 30 minutes, it reports high precision data including wave height, period, direction, spectra, plus surface currents, water temperature, and air temperature, which is then made freely available to the public and disseminated via the National Weather Service.

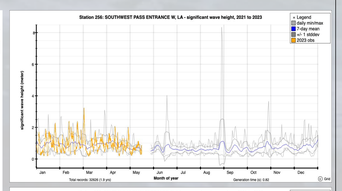
Funded by the Resources and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States (RESTORE) Act, the System-Wide Assessment and Monitoring Program (SWAMP) was developed by the Coastal Protection and Restoration Authority (CPRA) of Louisiana as a long-term monitoring program. The SWAMP design recommended documenting wave dynamics to improve understanding of the processes that impact water circulation, mixing and marsh edge erosion in the estuarine and nearshore environments, and to characterize offshore boundary conditions. The partnership between CDIP and CPRA provides critical data that will inform the Coastal Master Plan via SWAMP and contribute to informed decisions to protect Louisiana's coast and its citizens. In addition to coastal restoration, the data are available and useful to all coastal mariners for safety and situational awareness.

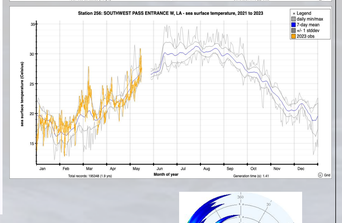
BUOY ARRAY

The Coastal Data Information Program's network of Datawell Waverider buoys has grown to >85 active stations nationwide, spanning Hawaii/Pacific, CONUS, Alaska, Puerto Rico.

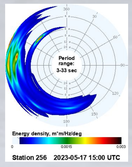
DATA ACQUISITION

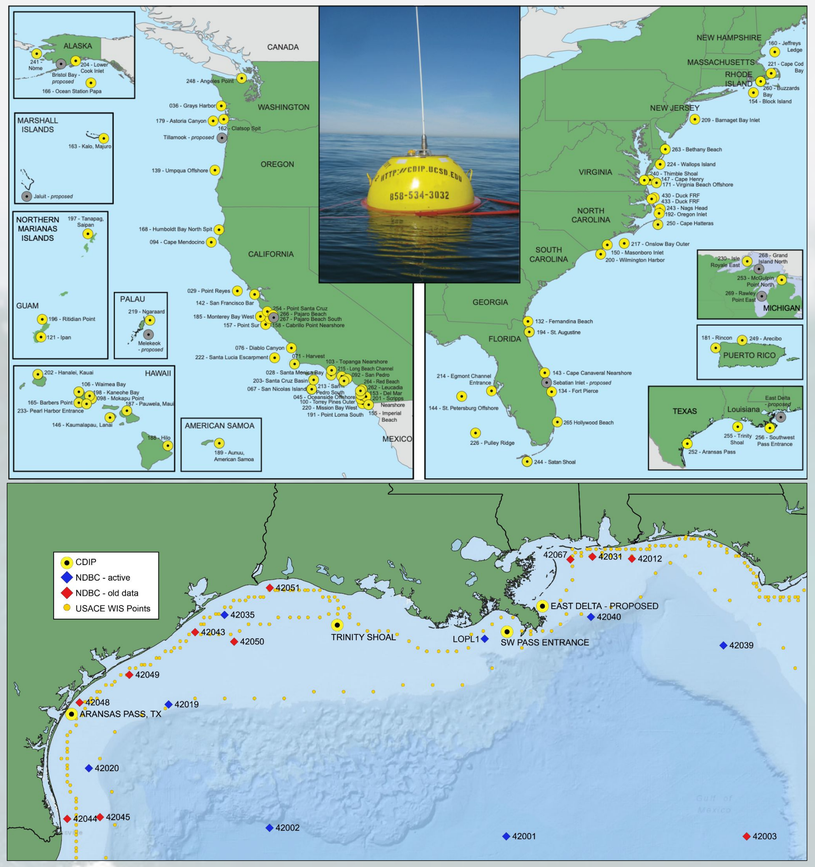
- Wave height, period, direction, sea surface temperature (SST).
- Buoy system engineered for high precision wave data as primary function.
- Available as directional spectra, parameters, time series of displacements, with myriad detailed metadata.
- Newest generation of buoys includes sensors for surface current speed and direction, and air temperature.
- Robust hardware for 2-3 year deployment duration.
- Primary sponsor for CDIP is USACE, for validation of Wave Information Study https://wis.erdc.dren.mil





The station page for CDIP 256 Southwest Pass Entrance, LA, found at: http://cdip.ucsd.edu/m/products/summary/?stn=256p1. The latest data are displayed along with station details. Additional data products can be found in the list on the left ('More Products'). Example products are shown here with climatology plots for wave height and sea surface temperature, and polar spectrum plot.





CDIP operates >85 buoy stations (top), with two stations in Louisiana. An additional station east of the Mississippi delta is being planned in collaboration with the CPRA. Also shown are NDBC stations that report wave data, and USACE Wave Information Study (WIS) output grid points.

DATA DISSEMINATION

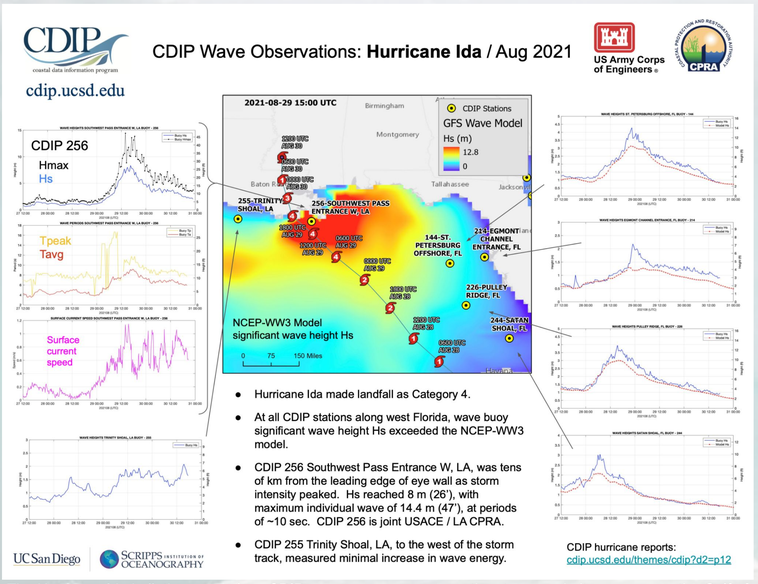
- Buoys report data every 30 minutes via Iridium (> 99% reliable).
- CDIP website receives ~20k unique visitors per day.
- All CDIP buoy data, real-time and archived, are available via fully compliant NetCDF (THREDDS, ERDDAP).
- Following QC, data disseminated in near real-time to NOAA/NDBC, and onward to NWS, NOAA PORTS®, IOOS RA data portals, etc.
- Monthly NCEI accession.

QA/QC

- CDIP has developed a testing and calibration facility for Datawell Waveriders.
- Heave accurate to 2%, direction to 2°.
- SST sensor is verified within ±0.2 °C. Air temp also verified.
- Automated QC of real-time data with detailed flags.
- Human-in-the-loop QC daily / weekly / upon buoy recovery.
- CDIP is deeply involved in Quality Assurance / Quality Control of Real-Time Oceanographic Data (QARTOD, https://ioos.noaa.gov/project/qartod/).

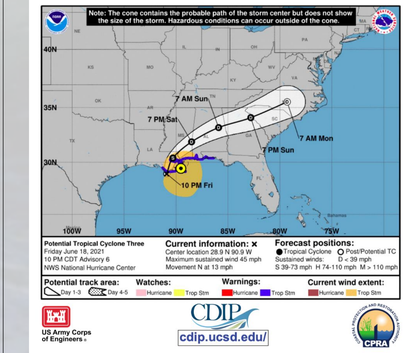
EXTREME EVENTS

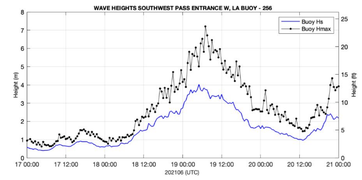
- Wave models commonly underestimate the most energetic events.
- In 2021, CDIP began issuing wave event bulletins to regional stakeholders following energetic wave events: agencies, researchers, etc.
- Bulletins are available at: http://cdip.ucsd.edu/themes/cdip?pb=1&d2=p12
- Email www@ucsd.edu to sign up for new bulletins.
- Wave data were recorded off Louisiana during Hurricane Ida and TS Claudette as a result of this CDIP/CPRA collaboration.

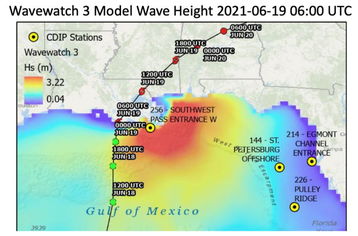


The Hurricane Ida bulletin summarizes CDIP wave measurements as the storm made its way across the Gulf of Mexico and into southern Louisiana. CDIP 256 Southwest Pass Entrance W, LA, collaboratively funded by USACE and the Louisiana Coastal Restoration and Protection Authority (CPRA), was in the path of maximum wave intensity as the storm made landfall.

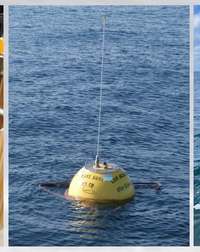
Tropical Storm Claudette / June 2021
CDIP 256 – Southwest Passage Entrance, LA
Max wave height: 23.65 ft (7.21 m) @ 7.19 sec period
Max Hs: 13.22 ft (4.03 m) @ 9.09 sec period

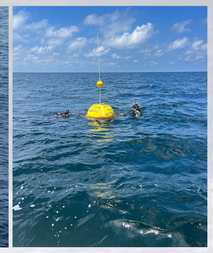


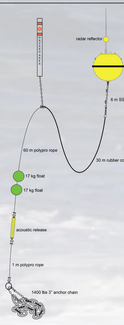




The Tropical Storm Claudette bulletin summarizes CDIP wave measurements as the storm made its way across the Gulf of Mexico and into southern Louisiana. CDIP 256 Southwest Pass Entrance W, LA, collaboratively funded by USACE and the Louisiana Coastal Restoration and Protection Authority (CPRA), was close to the path of maximum wave intensity as the storm made landfall.







cdip.ucsd.edu/