

Data Documentation

Dataset Information

Dataset Title:

NOAA RESTORE Science Program: Protecting Texas Coastlines from Potential Oil Spills in Galveston Bay using unmanned aerial system (UAS) Surveys and Maps of a New Response Effectiveness Index: Field test measurements of near-surface currents in Galveston Bay and Freeport, Texas 2024-02-13 to 2024-02-15

Description:

The dataset includes UAS drone surveys of the ocean surface with corresponding measurements of near-surface ocean currents along with the UTM coordinates, Acoustic Doppler Current Profiler (ADCP) measurements of ocean currents within the water column, CTD measurements of temperature and salinity across the water column. The data was collected at Galveston Bay (entrance channel and across the Houston ship channel inside the bay) and Freeport, Texas. The UAS surveys are stored as .MOV video files with a still image (JPG), and the accompanying txt files containing the processed near-surface ocean currents data. Please note that still image files will not be available for every survey. The ADCP measurements are stored as txt files, for each of the east(u), north(v) and vertical(w) components of velocity, along with the magnitude and direction. The temperature and salinity profiles are stored as CSV files. GPS data of the boat location from which some UAS surveys are conducted is stored as csv files.

Purpose:

The purpose of the dataset is to provide measurements of near-surface ocean currents in Galveston Bay and Freeport for insights into the dynamics of these currents. The ADCP measurements complement these surface measurements with insights into the interior flow behavior. The temperature and salinity profiles provide an understanding of the stratification across the water column in the Houston ship channel.

The project findings will be used in response to future oil spills.

This dataset is a result of research funded by the National Oceanic and Atmospheric Administration's RESTORE Science Program (ROR - <https://ror.org/0042xzm63>) under award NA23NOS4510309 to Texas A&M University.

Methods:

Measurements of near-surface ocean currents are obtained by processing footage of the ocean surface acquired from the UAS using an algorithm called CopterCurrents (Streßer et al., 2017). The ADCP measurements were collected by securing a downward facing ADCP to a horizontal pole that was mounted to the vessel. Temperature and salinity profiles were captured by lowering a CTD instrument into the water.

Data Documentation
RESTORE Drone Surveys and Oil Spill Response: Near Surface Currents

Citations

Cited Publications:

- Streßer, M., Carrasco, R., & Horstmann, J. (2017). Video-Based Estimation of Surface Currents Using a Low-Cost Quadcopter. *IEEE Geoscience and Remote Sensing Letters*, 14(11), 2027–2031. <https://doi.org/10.1109/LGRS.2017.2749120>

Associated Datasets:

- Bheeroo, Vivek (2025). NOAA RESTORE Science Program: Protecting Texas Coastlines from Potential Oil Spills in Galveston Bay using unmanned aerial system (UAS) Surveys and Maps of a New Response Effectiveness Index: measurements of near-surface currents in Galveston Bay and Freeport, Texas 2023 to 2028. NOAA National Centers for Environmental Information. Dataset.
https://www.ncei.noaa.gov/archive/accession/NCCOS-RESTORE-Surface_Currents_Texas
 - NCEI Collection of Accessions for all project data

Associated Online Resources:

- National Centers for Coastal Ocean Science. 2024. RESTORE Sponsored Research Project: Protecting Texas coastlines from potential oil spills in Galveston Bay using drone surveys and maps of a new response effectiveness index.
<https://www.fisheries.noaa.gov/inport/item/73334>
- RESTORE Project, Protecting Texas coastlines from potential oil spills in Galveston Bay using drone surveys and maps of a new response effectiveness index,
<https://restoreactscienceprogram.noaa.gov/projects/drone-surveys-and-oil-spill-response>
- GitHub Repository for project scripts and code:
https://github.com/Vbheeroo/Surface_currents_data_processing.git

People & Projects

Dataset Authors:

- Bheeroo, Vivek; Lee, Mu-Jung; Chang, Kuang-An; Socolofsky, Scott

Principal Investigator:

- Socolofsky, Scott Texas A&M University

Additional Principal Investigators:

- Chang, Kuang-An, Texas A&M University
- Barker, Chris , NOAA National Ocean Service, Office of Response and Restoration
- Koza, Brent, Texas General Land Office

Primary Point of Contact:

- Vivek Bheeroo, Vbheeroo09@tamu.edu, Texas A&M University
- Frank Parker, frank.parker@noaa.gov, US DOC; NOAA; NOS; NCCOS; RESTORE Science Program (ROR - <https://ror.org/0042xzm63>)
- US DOC; NOAA; NOS; NCCOS; RESTORE Science Program, noaarestorescience@noaa.gov (ROR - <https://ror.org/0042xzm63>)
- NCCOS Data Manager, nccos.data@noaa.gov, US DOC; NOAA; NOS; NCCOS (ROR- <https://ror.org/05ba43f71>)

Data Documentation
RESTORE Drone Surveys and Oil Spill Response: Near Surface Currents

Collaborators:

- Mu-Jung Lee (Texas A&M University)
- Soo Bum Bae (Texas A&M) University

Partners:

- Texas General Land Office

Funding:

- US DOC; NOAA; NOS; NCCOS; RESTORE Science Program (ROR - <https://ror.org/0042xzm63>) under award NA23NOS4510309 to Texas A&M University.

Extents

Start Date: 2024-02-13

End Date: 2024-02-15

Northern Boundary: 29.581263°, -95.027692°

Southern Boundary: 28.881278°, -95.009086°

Western Boundary: 28.909869°, -95.328672°

Eastern Boundary: 29.282220°, -94.493379°

Keywords

Sea Areas, Water Bodies, Marine Protected Areas:

- Gulf of America (formerly Gulf of Mexico)
- Galveston Bay, Texas
- Houston ship channel, Texas (Houston-ship-channel)
- Galveston Bay entrance channel (Gal_entrance_channel)
- Freeport, Texas
- Coastal Waters of Texas

NOAA Ships, Other Ships, Platforms:

- Texas General Land Office vessel

NCCOS Keywords:

- NCCOS Research Data Type > Field Observation
- NCCOS Research Location > Gulf of America (formerly Gulf of Mexico)
- NCCOS Research Location > Texas
- NCCOS Research Topic > Oil Spill Response/Recovery

Theme Keywords:

- Ocean Surface Currents
- Drone Video
- ADCP measurements
- CTD profiles

Data Documentation
RESTORE Drone Surveys and Oil Spill Response: Near Surface Currents

File Information

Total File Size: 70.6 GB (607 Files, 9 Folders)

Data File Format(s):

- UAS data:
 - Videos: .MOV
 - Still images: .JPG
 - Processed data: .txt
- ADCP data:
 - .txt
- CTD data:
 - .csv
- GPS data:
 - .csv

Data File Compression: n/a

Data Files:

UAS_surveys ; UAS_data; ADCP_data; CTD_data ; GPS_data

- [DataType]_[LocationCode]_[YYYYMMDD]_[Transect-#_Waypoint-#]
 - ADCP_[LocationCode]_[YYYYMMDD]_[Transect-#]_[component].txt
 - ADCP data is not collected over a Waypoint
 - CTD_[LocationCode]_[YYYYMMDD]_[Transect-#_Waypoint-#].xlsx
 - CTD data Waypoint is optional
 - UAS-Image_[LocationCode]_[YYYYMMDD]_[Transect-#_Waypoint-#].jpg
 - UAS-Video_[LocationCode]_[YYYYMMDD]_[Transect-#_Waypoint-#].mov
 - UAS-data_[LocationCode]_[YYYYMMDD]_[Transect-#_Waypoint-#].txt
 - GPS_[LocationCode]_[YYYYMMDD].csv

Documentation Files:

- BrowseGraphic.JPG
- DataDocumentation.PDF

Table 1: Data Dictionary for UAS Processed Currents data

Column	Variable	Label	Definition	Units	Range
1	Easting	x	x-coordinate in the UTM system	Meters	272957.49-354933.22
2	Northing	y	y-coordinate in the UTM system	Meters	3196491.95-3274103.46
3	x-component of surface currents	Ux	The x component of the surface current magnitude	Meters/second	-1 to 1
4	y-component of surface currents	Uy	The y component of the surface current magnitude	Meters/second	-1 to 1

Data Documentation
RESTORE Drone Surveys and Oil Spill Response: Near Surface Currents

5	Signal-to-Noise density	SNR _density	The SNR density provides an idea of the quality of the data	-	Approximately 3 to 50
---	-------------------------	--------------	---	---	-----------------------

Table 2: Data Dictionary for ADCP data

Column	Variable	Label	Definition	Units	Range
1	Ensemble	Ens	The ensemble refers to an averaged set of velocity data obtained from multiple pings	-	40-50
2	Year	YR	Year of ADCP measurement	YY	2024
3	Month	MO	Month of ADCP measurement	MM	02
4	Date	DA	Date of ADCP measurement	DA	14
5	Hour	HH	Hour of ADCP measurement	Hours	11-13
6	Minute	MM	Minute of ADCP measurement	Minutes	0-60
7	Seconds	SS	Second of ADCP measurement	Seconds	0-60
8	Hundredths of a second	HH	Hundredths of second of ADCP measurement	Seconds	0-100
9 +	Bin #	1+	The velocity measurement in each bin (m) along the ensemble	Millimeters/second	-

Table 3: Data Dictionary for CTD data

Column	Variable	Label	Definition	Units	Range
1	Date/time	Date/Time	Date and time of CTD recording	MM/DD/YYYY HH:MM	-
2	Temperature	Temp [°C]	Temperature from CTD recording	°C	0-30
3	Salinity	Sal [ppt]	Salinity from CTD recording	Parts per thousand	0-30
4	Depth	Dep100 [meters]	Depth of CTD recording	Meters	0-15

Data Documentation
RESTORE Drone Surveys and Oil Spill Response: Near Surface Currents

Table 4: Data Dictionary for GPS data

Column	Variable	Label	Definition	Units	Range
1	ID	ID	ID number of tracked GPS point	-	-
2	Latitude	Lat	Latitude point	Decimal degrees	-
3	Longitude	Lon	Longitude point	Decimal degrees	-
4	Time	Time	Time of tracked GPS point	YYYY-MM-DDTHH:MM:SSZ, time in GMT	-

Parameter Information

List of major parameters included in this accession:

- UAS surveys, UAS-processed data of near-surface currents, ADCP measurements of ocean currents, CTD profiles of temperature and salinity, GPS data of boat position

Parameter Description:

Parameters: UAS surveys

Property Type: N/A

Units: Pixels

Observation Category: in situ

Sampling Instrument: unmanned aerial system – DJI Mavic 2 Pro

Sampling and Analyzing Method:

The UAS is flown to an altitude of 120 m, and the downward facing camera is used to capture videos of the ocean surface. Each video length is 31 seconds long.

Data Quality Method:

N/A

Parameters: UAS-processed data of near-surface currents

Property Type: calculated

Units: meters/second [m/s]

Observation Category: in situ

Sampling Instrument: N/A

Sampling and Analyzing Method:

CopterCurrents (Streßer et al., 2017) is used to process the UAS recordings to obtain the near-surface ocean current measurements.

Data Quality Method:

(Streßer et al., 2017)

Parameters: ADCP measurements of ocean currents

Property Type: measured

Units: meters/second [m/s]

Observation Category: in situ

Sampling Instrument: ADCP Workhorse sentinel

Sampling and Analyzing Method:

The downward facing ADCP is secured to a floating pontoon which is attached to a horizontal pole that extends from the vessel. Velocity results are reported in all 3 components (east, north and vertical), as well as magnitude and direction.

Data Quality Method:

N/A

Data Documentation
RESTORE Drone Surveys and Oil Spill Response: Near Surface Currents

Parameters: CTD profiles of temperature and salinity
Property Type: measured
Units: temperature: degrees Celsius [°C]; salinity: parts per thousand [ppt]
Observation Category: in situ
Sampling Instrument: CTD Hydrolab DS 5
Sampling and Analyzing Method:
The CTD instrument is lowered from the side of the vessel to capture data points of temperature and salinity across the water column.
Data Quality Method:
N/A

Parameters: GPS data of boat position
Property Type: measured
Units: decimal degrees
Observation Category: in situ
Sampling Instrument: Garmin GPS 19x NMEA 2000
Sampling and Analyzing Method:
The GPS antenna is secured to the workboat and samples at 1Hz.
Data Quality Method:
N/A

Document Information

Date: 2025-06-12
Resource Provider: NCCOS Data Manager, nccos.data@noaa.gov, US DOC; NOAA; NOS; National Centers for Coastal Ocean Science (NCCOS)
Comment: This data documentation describes data files archived as a NOAA NCEI data accession, and is intended to provide dataset-level metadata for the purposes of discovery, use, and understanding.
Use Limitation: NOAA makes no warranty, expressed or implied, regarding these data, nor does the fact of distribution constitute such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data.