Delta-X Applications Workshop Instructions

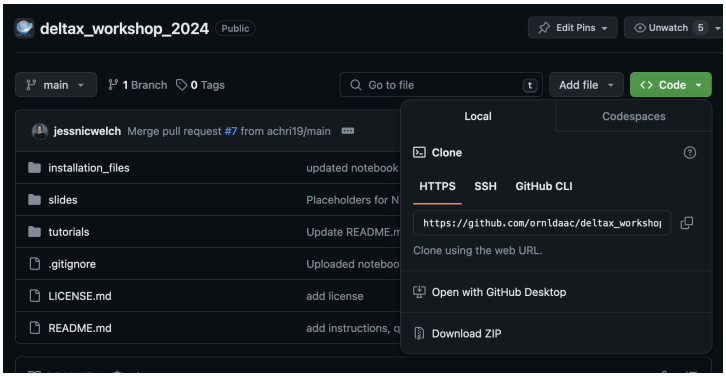
The Delta-X mission is a 5-year NASA Earth Venture Suborbital-3 mission to study the Mississippi River Delta in the United States, which is growing and sinking in different areas. River deltas and their wetlands are drowning as a result of sea level rise and reduced sediment inputs. The Delta-X mission will determine which parts will survive and continue to grow, and which parts will be lost. Delta-X begins with airborne and in-situ data acquisition and carries through data analysis, model integration, and validation to predict the extent and spatial patterns of future deltaic land loss or gain.

You can find more information about the Delta-X mission and datasets here:

- 2021_Delta-X_Open_Data_Workshop_Introduction.pdf (Introduction to Delta-X)
- 2021_Delta-X_Open_Data_Workshop_Datasets.pdf (Info on Delta-X datasets)
- 2021_Delta-X_Open_Data_Workshop_ORNL_DAAC.pdf (Introduction to ORNL archive)
- 2021_Delta-X_Open_Data_Workshop_Website.pdf (Introduction to DeltaX website)

Affiliation: Jet Propulsion Laboratory, California Institute of Technology
Acknowledgement: The research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration (80NM0018D0004)

Workshop Materials:
Most of the course materials (slides, code, references, examples) are available in a Github repository https://github.com/ornldaac/deltax_workshop_2024. We will continue to update this repository, so please get the latest version for the workshop.



Please complete all installations (Section 1 - 6) before the workshop. Instructions for each item are detailed below. If you have any issues, please let us know.

Table of Contents

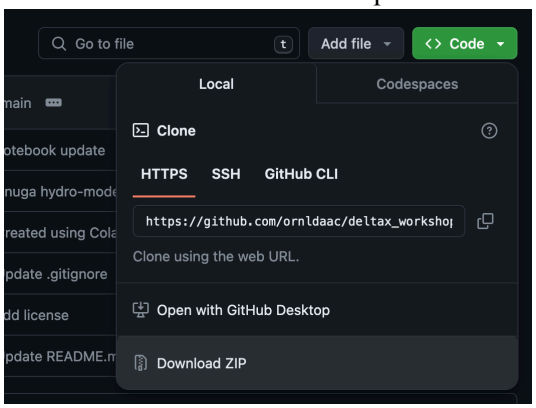
Section 1: Prerequisites

Git Repository

Most of the course materials (slides, code, references, examples) are available in a Github repository https://github.com/ornldaac/deltax_workshop_2024.

If you're familiar with git, please use git clone to copy the repository to your local machine. We will be making updates, so please git stash and git pull to make sure you have the latest version.

If you're not familiar with git, please download the zip file from https://github.com/ornldaac/deltax_workshop_2024 using the green button that says Code. Unzip this folder to create the deltax_workshop_2024 repository on your local machine. We will continue to update this repository, so please get the latest version for the workshop.



Once you have copied the deltax_workshop_2024 repository to your local machine, this will be your working directory.

Please avoid using spaces in your folder names - this will cause issues with some software.

Earthdata Account

In order to access data through the ORNL DAAC, you will need to create a NASA Earthdata account. Register for a free account before the workshop https://urs.earthdata.nasa.gov/users/new.

Google Account

If you choose to run the Python tutorials on Google Colab instead of your local computer, you will need a Google account. If you don't have one, please register here: https://support.google.com/accounts/answer/27441?hl=en

Python for ANUGA, Dorado, and NUMAR

Python will be used in several tutorials in this workshop. It's easy to use, open-source, and has many packages that are great for geospatial analysis. Instructions for installing Python on your local computer are listed below. However, if you have any issues with installation, you can also use Google Colab to

Installing Anaconda

Follow the installation instructions for your operating system:
https://www.anaconda.com/download/success

Installing Packages

We will build two different Conda Python environments that contain the packages required for running the Python tutorials. Installation will be through the command line.

For Windows:
Open the command prompt (Start menu → search for ANACONDA prompt)
For Mac:
Open a new terminal (Finder → Applications/Utilities/Terminal.app

For Windows and Mac:

1. NUMAR conda environment
    a. Download *numar.yml* and navigate to the folder where it is saved and run the following commands

       conda env create --name numar --file numar.yml

       conda activate numar

       python -m ipykernel install --user --name=numar

2. ANUGA and DORADO conda environment
    a. Download *anuga_dorado.yml* and navigate to the folder where it is saved and run the following commands

       conda env create --name anuga_dx --file=anuga_dorado.yml

       conda activate anuga_dx

       python -m ipykernel install --user --name=anuga_dorado

b. Test the installation of ANUGA and DORADO by running the following command:
python

Wait a few seconds while python initializes. When ">>>" appears on the left side of the window, copy-paste the following lines and hit return:
import anuga
import dorado

If for some reason something is not working, you will be prompted with an "Error" message ("Warnings" are not an issue). In such cases, please refer to Section 4: ANUGA and DORADO - Manual Installation.

Jupyter Notebooks

Jupyter Notebook is a great tool for learning Python and testing code. Several training sessions in this workshop will have a notebook with pre-written code that you can run, modify, and take home for further study. If you run into any errors, please let us know immediately so we can work out issues before you come to the workshop. We won't have time to work out Python issues during the workshop, so please be prepared to participate by asking questions beforehand.

We will be using Jupyter Notebooks for these exercises.
For Windows:
Open the command prompt (Start menu → search for ANACONDA prompt)

For Mac:
Open a new terminal (Finder → Applications/Utilities/Terminal.app

For Windows and Mac:
Navigate to the folder where cloned/saved the Github repository.

Run the following commands:
conda activate numar

jupyter notebook

This should pull up a new tab in your web browser showing your home directory. Navigate to deltax_workshop_2024/tutorials/6_NUMARModel/Site_example and double click on 6A_Build-Run_NUMAR_UnitModel.ipynb. This should open a new tab with the notebook.

Google Colab

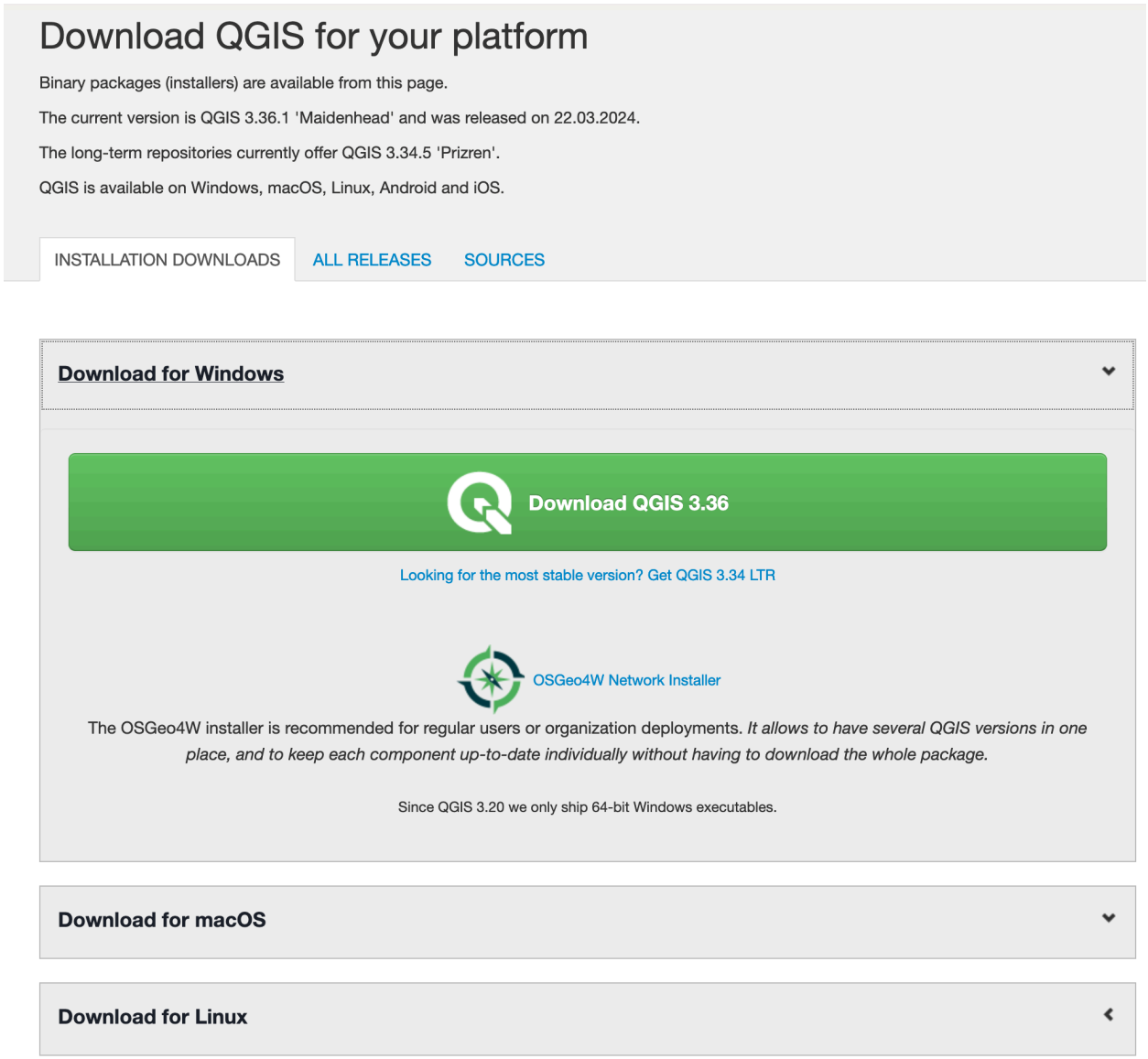
If you have any issues installing python packages, we also have a cloud version of the Python Notebooks that can be run online, using Google Colaboratory. Google Colab is similar to Jupyter Notebooks, but is run on the Google cloud and comes with many packages already installed.

Please explore Google Colab examples here: https://colab.research.google.com/notebooks/basic_features_overview.ipynb and make sure you have a Google account.

QGIS

QGIS is a great tool for processing remote sensing data and especially useful for visualizing data quickly and effectively. It is open-source and can be downloaded here:

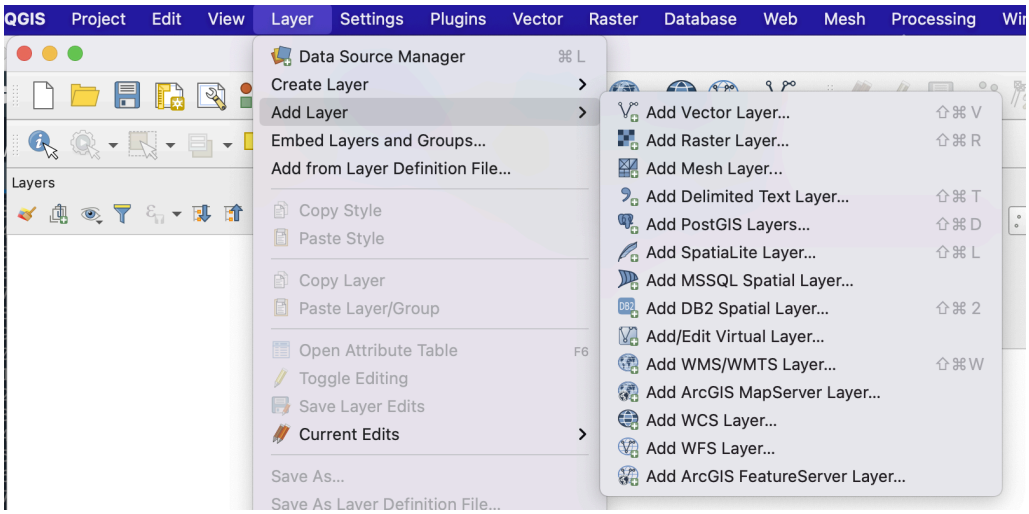
https://qgis.org/en/site/forusers/download.html

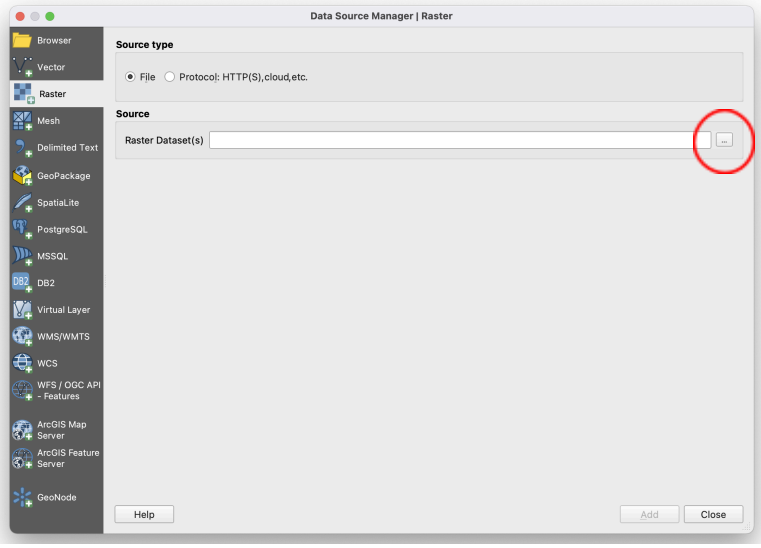


Common issues:

- If you're using a PC and get error 2503 or 2503, you need to set permissions on C:\\WINDOWS\TEMP to Authenticated users = Full Control
    - More info here

Once you have installed QGIS, run the application. Find the **Layer** tab, select **Add Layer**, and then select **Add Raster Layer …**





Section 2: ANUGA and DORADO

Please be sure to download all datasets before the start of the workshop

Instructors: Antoine Soloy and Muriel Brückner

Slides:

- ANUGA: https://github.com/ornldaac/deltax_workshop_2024/blob/main/slides/HydrodynamicModeling_ANUGA.pdf
- DORADO: https://github.com/ornldaac/deltax_workshop_2024/blob/main/slides/SedimentTransport_Dorado.pdf

Datasets:

- Delta-X Digital Elevation Model (DEM) and Water Mask
  - Download link: https://doi.org/10.3334/ORNLDAAC/2181
  - Citation: Christensen, A.L., M.W. Denbina, and M. Simard. 2023. Delta-X: Digital Elevation Model, MRD, LA, USA, 2021. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2181
- Delta-X Vegetation Classification Map
  - Download link: https://zenodo.org/records/12519229/files/DeltaX_10m_VegClass_Combined.tif?download=1
  - Citation: Jensen, D.J., E. Castañeda-Moya, E. Solohin, D.R. Thompson, and M. Simard. 2024. Delta-X AVIRIS-NG L3 Derived Vegetation Types, MRD, Louisiana, USA. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2352
- Delta-X AirSWOT L3 Water Surface Elevations
  - Download link: https://doi.org/10.3334/ORNLDAAC/2349
  - Citation: Denbina, M.W., M. Simard, and E. Rodriguez. 2024. Delta-X: AirSWOT L3 Water Surface Elevations, MRD, Louisiana, 2021, V2. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2349
- JPL Mississippi River Centerlines
  - Download link: https://landscape.jpl.nasa.gov/cgi-bin/data-search.pl
  - Citation: Christensen, A.L., Soloy, A., Savelli, R., Moritz, J.M., & Simard, M. (2023b). Centerlines of the Mississippi River (V1.0) [Data file]. Retrieved from https://landscape.jpl.nasa.gov/cgi-bin/data-search.pl
- CRMS water level gauges
  - Citation: Coastal Protection and Restoration Authority (CPRA) of Louisiana. 2024. Coastwide Reference Monitoring System-Wetlands Monitoring Data. Retrieved from Coastal Information Management System (CIMS) database. http://cims.coastal.louisiana.gov. Accessed 24 January 2024
  - *Visit https://www.lacoast.gov/crms/Tutorials.aspx#DataDownload to learn more about data access*

Jupyter Notebooks:

- ANUGA: https://github.com/ornldaac/deltax_workshop_2024/tree/main/tutorials/1_HydrodynamicModeling_ANUGA
- DORADO: https://github.com/ornldaac/deltax_workshop_2024/tree/main/tutorials/2_SedimentTransport_Dorado

Recording:
- Hydrodynamic Modeling with ANUGA: Part One
- Hydrodynamic Modeling with ANUGA: Part Two
- Demonstration of Dorado Sediment Transport

Please download all datasets prior to the workshop

ANUGA is an open-source hydrodynamic modeling software we will be using for one training session. DORADO is a lagrangian particle routing model that will be run on top of outputs from ANUGA to estimate the path of various types of particles within the flow of water. You can find more information about ANUGA and DORADO here (https://github.com/GeoscienceAustralia/anuga_core and https://github.com/passaH2O/dorado), but instructions for a simple manual installation are detailed below.

Manual Installation

This software requires the installation of Python to be performed first. Please refer to Section 2: Prerequisites

*If the installation process of Python went correctly, you can **skip the manual installation part**.*

In order to install this software, you will need to create a dedicated python environment. This will prevent potential package version conflicts between ANUGA, DORADO and other packages from other tutorials. It can be done from the command line.

For Windows:
Open the command prompt (Start menu → search for ANACONDA prompt)

For Mac:
Open a new terminal (Finder → Applications/Utilities/Terminal.app

For Windows and Mac:
Then you need to create a new python environment.
Copy the following text into the Terminal and hit return:
conda update -n base -c conda-forge conda
conda create --name anuga_dx python=3.9

Wait a few seconds/minutes until being prompted with the question "**Proceed ([y]/n)?**", type "**y**" and hit return.

Then activate the newly created environment:
conda activate anuga_dx

We will now install a few additional packages.
First, let us install install anuga along with a few packages by copying the following lines:
conda config --add channels conda-forge
conda config --set channel_priority strict
conda install -c conda-forge pip anuga pydorado jupyterlab gdal ffmpeg mpi4py

Once again, wait a few seconds/minutes until being prompted with the question "**Proceed ([y]/n)**?", type "**y**" and hit return
Copy the following text into the Terminal and hit return:
pip install numpy==1.23 scipy scikit-image pandas gmsh-interop triangle rasterio geopandas ipyleaflet ipywidgets cmocean statsmodels dataretrieval noaa_coops utm Cython dill pymetis

Test the installation of ANUGA and DORADO by running the following command:
python

Wait a few seconds while python initializes. When ">>>" appears on the left side of the window, copy-paste the following lines and hit return:
import anuga
import dorado

If for some reason something is not working, you will be prompted with an error message **(simple Warnings are not an issue)**. If everything runs successfully, you are ready to use ANUGA and DORADO for the workshop. If not, please reach out for assistance.

Section 3: Delft3D

Instructor: Ali Reza Payandeh

Slides:

- https://github.com/ornldaac/deltax_workshop_2024/blob/main/slides/HydrodynamicMorphodynamic_Delf3d.pdf

Datasets (Optional):

- Delta-X Digital Elevation Model (DEM) and Water Mask
  - https://doi.org/10.3334/ORNLDAAC/2181
- Delta-X Vegetation Classification Map
  - https://doi.org/10.3334/ORNLDAAC/2181
- Delta-X: AVIRIS-NG L3-derived Water Quality, TSS, and Turbidity, MRD, V3
  - https://doi.org/10.3334/ORNLDAAC/2152

Recording:

- Hydrodynamic Modeling of Deltas Using Delft3d
- The Fate of Deltas - Delft3d Morphodynamic Modeling

Installing Delft3D

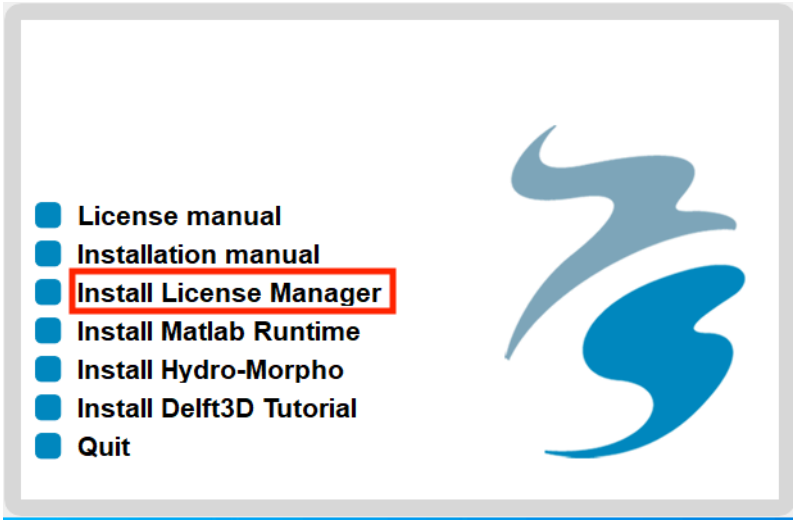
Delft3D 4 is an open-source modeling tool that utilizes structured grids. Delft3D is only available for Windows and Linux operating systems. If you are a Mac owner, please refer to the Windows Options section below for alternative options.

You can access Delft3D in one of two ways:

1. Compile Delft3D yourself: The source code is available for **free**, and you can download it from the Deltares website. You can compile it on either Windows or Linux. The process of compiling Delft3D can be challenging, and we won't cover it in this workshop. Please refer to the Deltares website for detailed instructions on downloading and compiling the source code.

2. Install precompiled Delft3D. If you have the precompiled version, please follow these steps to install:

- run the "Install-Shield.exe".
- You can skip the first two installations if you prefer and start with "Install License Manager."



- Continue with the installation process, and when prompted for the license key, locate the license key on your computer and proceed to complete the installation.
- Next, click "Install Matlab Runtime." Note that you do **not** need a Matlab license to install the Matlab Runtime.
- After installing the Matlab Runtime, proceed to "Install Delft3D," and optionally, "Install Delft3D Tutorials". The installation is now complete, and the model should work now.

Windows Options

If you don't have a Windows operating system, you can request assistance from the IT department in your organization. An alternative option is to use virtual Windows workspaces. Here are some choices:

- Virtualization Software: Software such as Parallels Desktop, and VirtualBox(free!) allow you to run Windows and other operating systems in a virtual machine on your Mac.
- Remote Desktop: If you don't want to install Windows on your Mac, you can use a remote desktop connection to access a Windows PC from your Mac. Here are some options: LSU Virtual Desktops and Amazon Virtual Desktops.

Delft3d Dashboard

Delft Dashboard is a standalone Matlab-based GUI that we will use to set up Case1.
Download the standalone executable version of the Delft Dashboard here. Please note that it is only available for Windows operating systems. Using the executable version of Delft Dashboard means you don't need a Matlab license, but you will need to install the Matlab Compiler Runtime 9.6 (R2019a). You can download the Matlab Compiler Runtime here:

Test Cases

In the Delft3d portion of the workshop, we'll work through four test cases. Working together we will generate the inputs and run each scenario. You can also access the files needed to run each case and the outputs using the links provided below:

Case1

Case2
Case3
Case4

Additionally, please download the **reduced version of the DeltaX DEM** here

Section 4: Matlab (Optional)

Instructor: Dongchen Wang

Slides:

- Overview: https://github.com/ornldaac/deltax_workshop_2024/blob/main/slides/SedimentTransport_MATLAB.pdf

Datasets:

- Wang, D., G. Salter, and M.P. Lamb. 2023. Delta-X: Modeled Land Accretion Rate Maps, Wax Lake Delta, MRD, LA, USA, 2021. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2308
- Wang, D., G. Salter, and M.P. Lamb. 2023. Delta-X: Matlab Model for Wax Lake Delta Land Accretion. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2309
- Wright, K.A., and P. Passalacqua. 2024. Delta-X: Calibrated ANUGA Hydrodynamic Outputs for the Atchafalaya Basin, MRD, LA. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2306

Recording:

- Sediment transport model

Prerequisites:

Matlab version that contains optimization function "**fmincon**" (https://www.mathworks.com/help/optim/ug/fmincon.html) and basic Matlab skills. Recommended: Sediment transport theory background, Basic knowledge on numerical analysis, and Python experience

Installations and environment setup: It is recommended to install Matlab before the workshop.

Introduction: This part of the workshop will introduce the **sediment transport code** that we developed to perform sediment transport simulation to calculate **short-term land accretion rate** using hydrodynamics model results from ANUGA model. The sediment transport code is developed using Matlab language and it is designed to be run on a personal computer. This workshop consists of step-by-step instructions on:

1. Pre-processing of the model inputs: convert ANUGA model results to model input file.
2. Detailed theory and implementations behind the sediment transport model. Particularly the method to use effective floc settling velocity to model cohesive sediment transport.
3. Post-processing of the model results.
4. Upscaling of the model results in generating a 1-yr estimated land accretion rate.

Section 5: NUMAR

Instructors: Pradipta Biswas, Ivan Vargas, Robert Twilley, Alex Christensen

Slides:
- NUMAR overview
- NUMAR tutorial

Datasets:
- Delta-X AVIRIS-NG Aboveground Biomass (Spring and Fall)
  - https://doi.org/10.3334/ORNLDAAC/2138
- ESA WorldCover 2021 Land Cover Maps
  - https://worldcover2021.esa.int/downloader
- CPRA Vegetation
  - https://cims.coastal.la.gov/Viewer/GISDownload.aspx
- Delta-X Delft3D Annual inorganic mass accumulation rate (IMAR)
  - https://doi.org/10.3334/ORNLDAAC/2301
  - https://doi.org/10.3334/ORNLDAAC/2302

Jupyter Notebooks:
- 6A_Build-Run_NUMAR_UnitModel.ipynb
- 6B_Build-Run_NUMAR_LandscapeModel.ipynb

Recording:
- NUMAR overview and tutorial

Prerequisites:

This software requires the installation of Python to be performed first. Please refer to Section 2: Prerequisites

(Windows): Open the command prompt (Start menu → search for ANACONDA prompt)
(Mac): Open a new terminal (Finder → Applications/Utilities/Terminal.app

Download *numar.yml* and navigate to the folder where it is saved and run the following commands

conda env create --name numar --file numar.yml

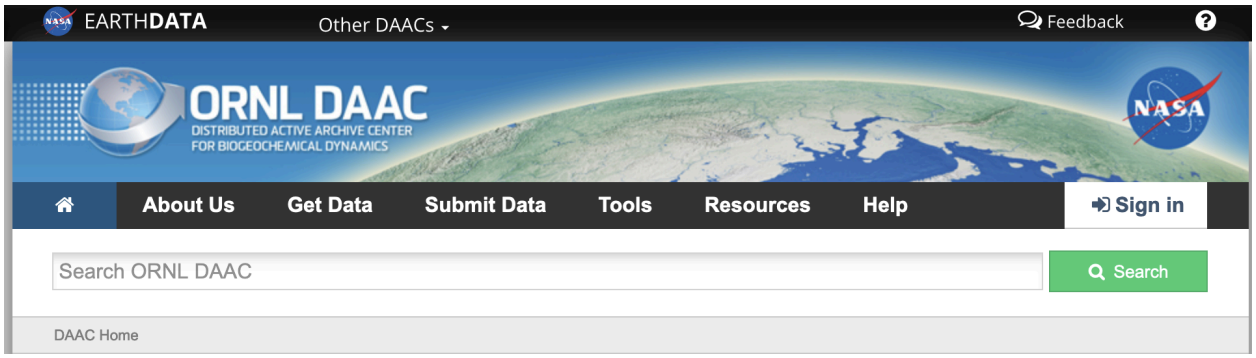
conda activate numar

python -m ipykernel install --user --name=numar

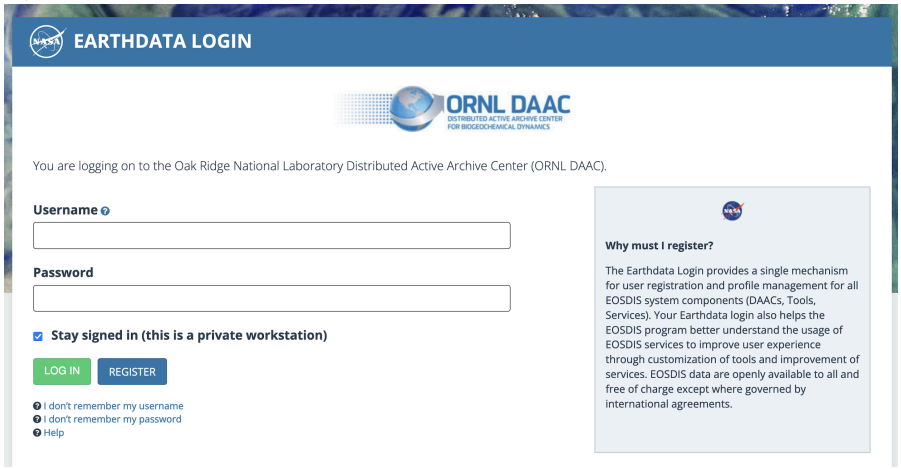
Section 6: Data Access

Data collected as part of Delta-X are processed and quality assessed by the science team. Once this process is complete, data are curated and made publicly available through the Oak Ridge National Laboratory Distributed Active Archive Center. At this time, several datasets are available through the ORNL website (https://daac.ornl.gov/) and can be found by searching for "Delta-X". However, most datasets are still in preprint form and await final approval before release. As part of this workshop, you will be given direct access to these data with the understanding that these data are preliminary and not yet approved for final release.

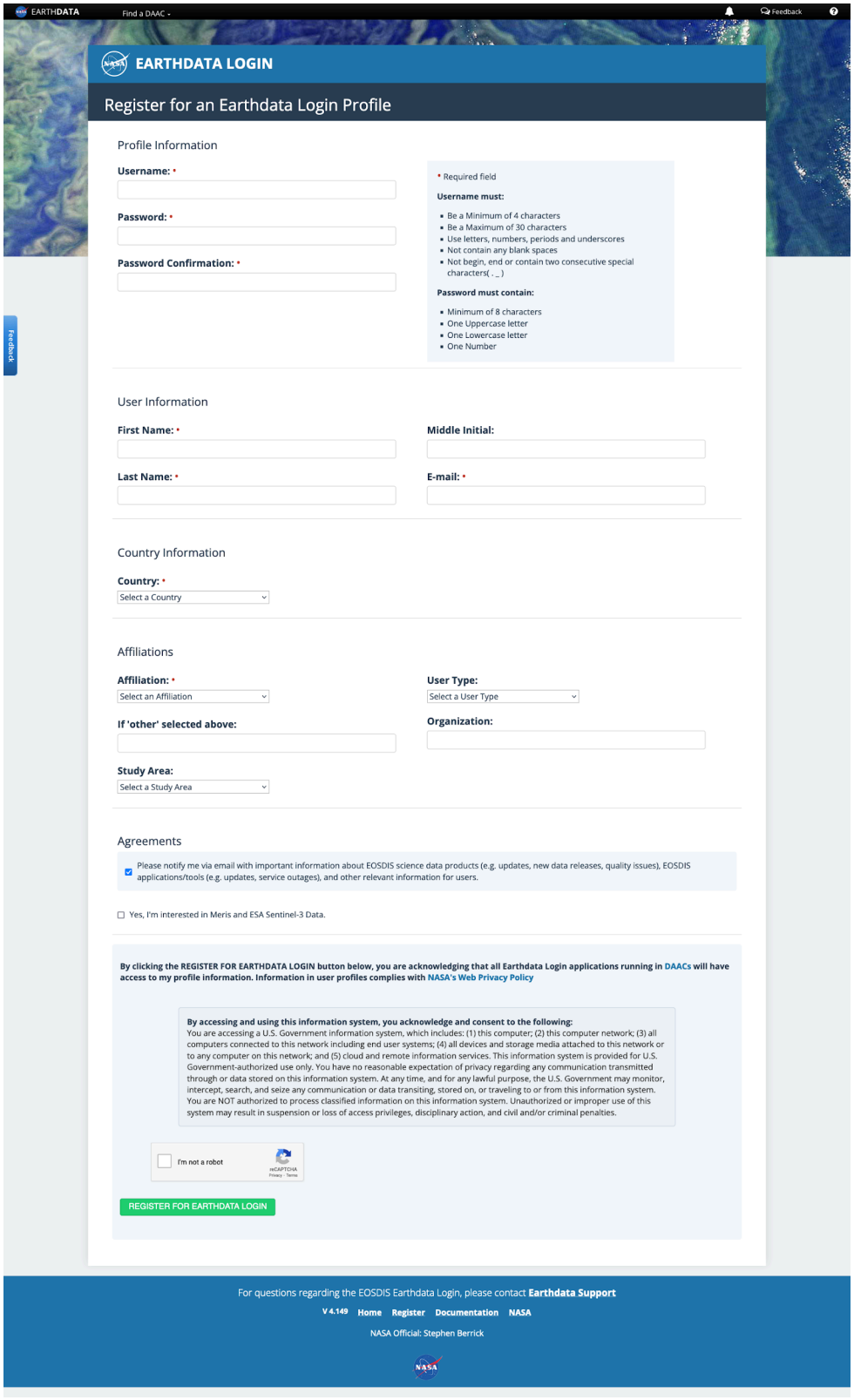
When you reach the ORNL website (https://daac.ornl.gov/), you will see a **Sign in** button.



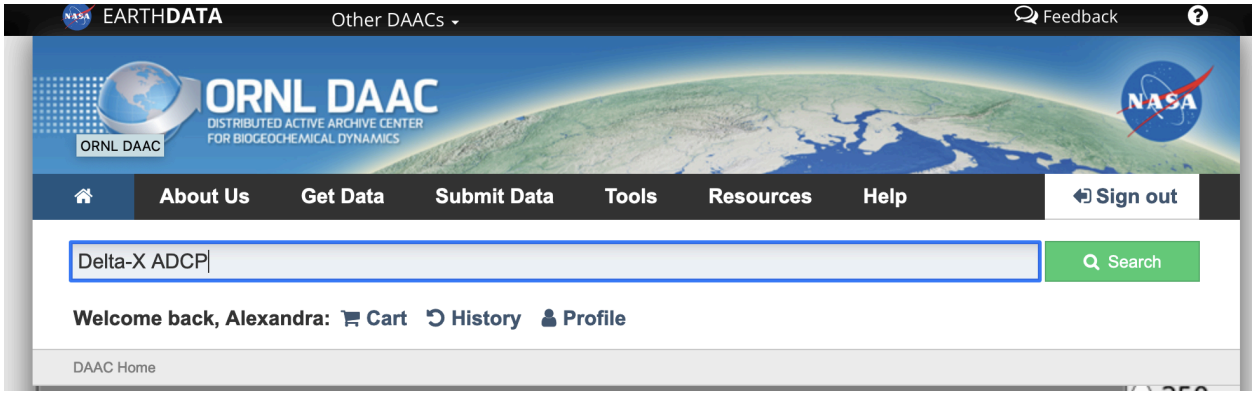
Clicking this takes you to a login page, where you can register for a Earthdata account (if you don't already have one)

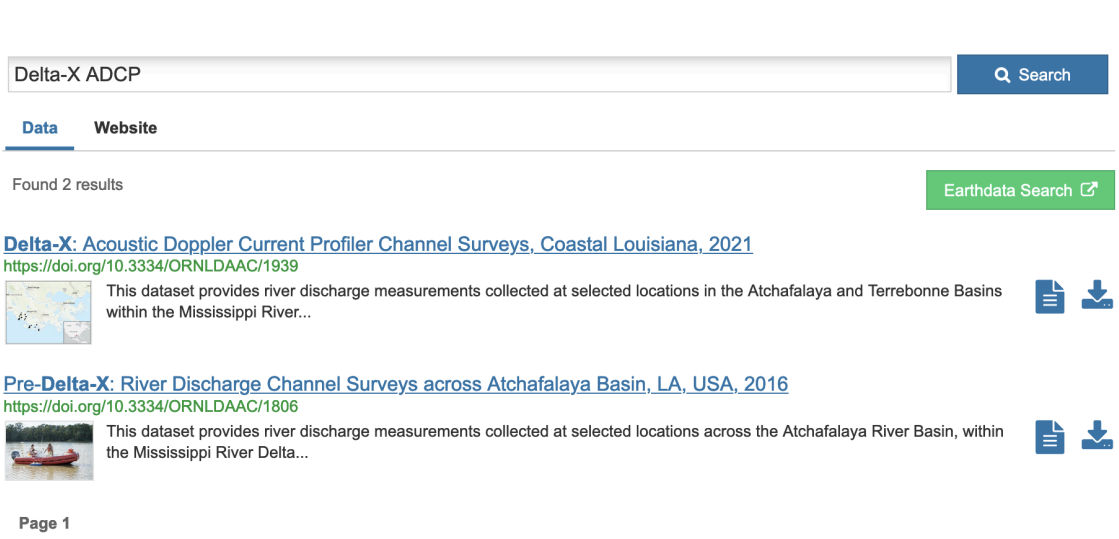


To create your account, click on the blue REGISTER button then fill out the registration form.



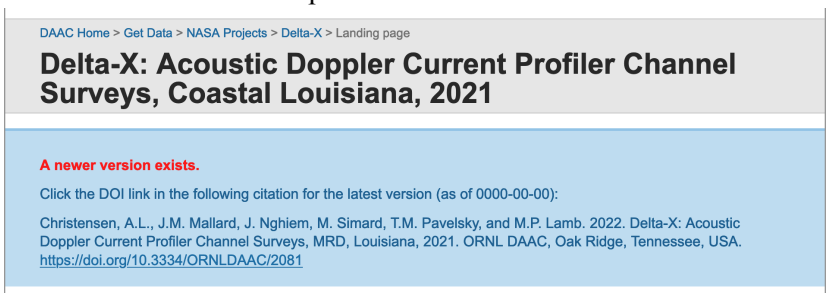
Once you have registered and logged in, you can begin by searching the archive using the search box near the top. The spring ADCP dataset will be used as an example.

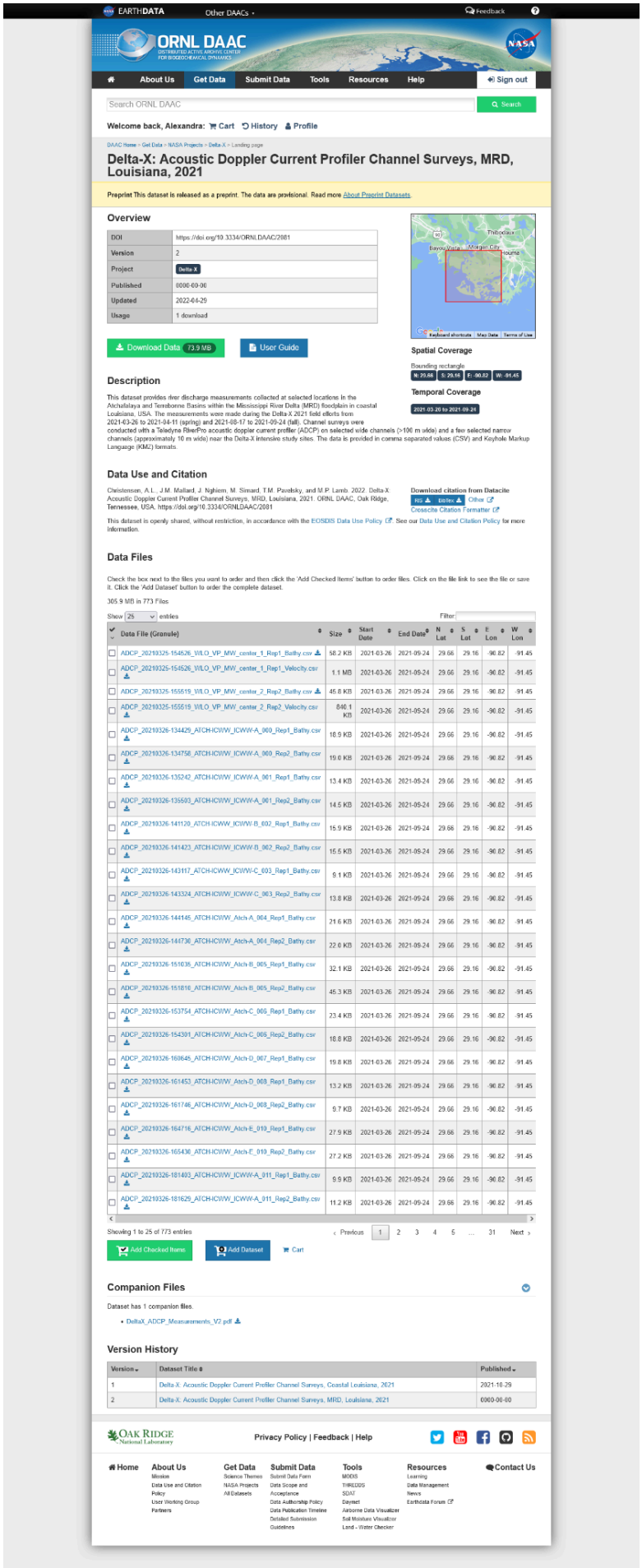




You'll notice 2 datasets appear. The first is the one you will download. The second is a dataset from the Pre-Delta-X campaign in 2016.

By clicking on the first entry, you will be taken to the page for the ADCP dataset. This will show a brief description, dates of publication, a citation, and the data files available. If you see the banner "A newer version exists" please click on the DOI link provided:




EARTHDATA
Other DAACs
Feedback
ORNL DAAC
DISTRIBUTED ACTIVE ARCHIVE CENTER FOR BIOGEOCHEMICAL DYNAMICS
About Us
Get Data
Submit Data
Tools
Resources
Help
Sign out
Search ORNL DAAC
Search
Welcome back, Alexandra: Cart History Profile
DAAC Home > Get Data > NASA Projects > Delta-X > Landing page
Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021
Preprint This dataset is released as a preprint. The data are provisional. Read more About Preprint Datasets.
Overview
DOI https://doi.org/10.3334/ORNLDAAC/2081
Version 2
Project Delta X
Published 0000-00-00
Updated 2022-04-29
Usage 1 download
Download Data 73.9 MB
User Guide
Spatial Coverage
Bounding rectangle
N: 29.66 S: 29.16 E: -90.82 W: -91.45
Temporal Coverage
2021-03-26 to 2021-09-24
Description
This dataset provides river discharge measurements collected at selected locations in the Atchafalaya and Terrebonne Basins within the Mississippi River Delta (MRD) floodplain in coastal Louisiana, USA. The measurements were made during the Delta-X 2021 field efforts from 2021-03-26 to 2021-04-11 (spring) and 2021-08-17 to 2021-09-24 (fall). Channel surveys were conducted with a Teledyne RiverPro acoustic doppler current profiler (ADCP) on selected wide channels (>100 m wide) and a few selected narrow channels (approximately 10 m wide) near the Delta-X intensive study sites. The data is provided in comma separated values (CSV) and Keyhole Markup Language (KMZ) formats.
Data Use and Citation
Christensen, A.L., J.M. Mallard, J. Nghiem, M. Simard, T.M. Pavelsky, and M.P. Lamb. 2022. Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2081
Download citation from Datacite
RIS BibTex Other
Crosscite Citation Formatter
This dataset is openly shared, without restriction, in accordance with the EOSDIS Data Use Policy. See our Data Use and Citation Policy for more information.
Data Files
Check the box next to the files you want to order and then click the 'Add Checked Items' button to order files. Click on the file link to see the file or save it. Click the 'Add Dataset' button to order the complete dataset.
365.9 MB in 773 Files
Show 25 entries
Filter:
Data File (Granule)
Size
Start Date
End Date
N Lat
S Lat
E Lon
W Lon
ADCP_20210325-154526_WLO_VP_MW_center_1_Rep1_Bathy.csv 58.2 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210325-154526_WLO_VP_MW_center_1_Rep1_Velocity.csv 1.1 MB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210325-155519_WLO_VP_MW_center_2_Rep2_Bathy.csv 45.8 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210325-155519_WLO_VP_MW_center_2_Rep2_Velocity.csv 840.1 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-134429_ATCH-ICWW_ICWW-A_000_Rep1_Bathy.csv 18.9 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-134758_ATCH-ICWW_ICWW-A_000_Rep2_Bathy.csv 19.0 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-135242_ATCH-ICWW_ICWW-A_001_Rep1_Bathy.csv 13.4 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-135503_ATCH-ICWW_ICWW-A_001_Rep2_Bathy.csv 14.5 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-141120_ATCH-ICWW_ICWW-B_002_Rep1_Bathy.csv 15.9 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-141423_ATCH-ICWW_ICWW-B_002_Rep2_Bathy.csv 15.5 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-143117_ATCH-ICWW_ICWW-C_003_Rep1_Bathy.csv 9.1 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-143324_ATCH-ICWW_ICWW-C_003_Rep2_Bathy.csv 13.8 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-144145_ATCH-ICWW_Atch-A_004_Rep1_Bathy.csv 21.6 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-144736_ATCH-ICWW_Atch-A_004_Rep2_Bathy.csv 22.6 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-151035_ATCH-ICWW_Atch-B_005_Rep1_Bathy.csv 32.1 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-151816_ATCH-ICWW_Atch-B_005_Rep2_Bathy.csv 45.3 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-153754_ATCH-ICWW_Atch-C_006_Rep1_Bathy.csv 23.4 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-154301_ATCH-ICWW_Atch-C_006_Rep2_Bathy.csv 18.8 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-160645_ATCH-ICWW_Atch-D_007_Rep1_Bathy.csv 19.8 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-161453_ATCH-ICWW_Atch-D_008_Rep1_Bathy.csv 13.2 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-161746_ATCH-ICWW_Atch-D_008_Rep2_Bathy.csv 9.7 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-164716_ATCH-ICWW_Atch-E_010_Rep1_Bathy.csv 27.9 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-165436_ATCH-ICWW_Atch-E_010_Rep2_Bathy.csv 27.2 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-181403_ATCH-ICWW_ICWW-A_011_Rep1_Bathy.csv 9.9 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
ADCP_20210326-181629_ATCH-ICWW_ICWW-A_011_Rep2_Bathy.csv 11.2 KB 2021-03-26 2021-09-24 29.66 29.16 -90.82 -91.45
Showing 1 to 25 of 773 entries
Previous 1 2 3 4 5 ... 31 Next
Add Checked Items
Add Dataset
Cart
Companion Files
Dataset has 1 companion files.
DeltaX_ADCP_Measurements_V2.pdf
Version History
Version
Dataset Title
Published
1 Delta-X: Acoustic Doppler Current Profiler Channel Surveys, Coastal Louisiana, 2021 2021-10-29
2 Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021 0000-00-00
OAK RIDGE National Laboratory
Privacy Policy | Feedback | Help
Home
About Us
Mission
Data Use and Citation Policy
User Working Group
Partners
Get Data
Science Themes
NASA Projects
All Datasets
Submit Data
Submit Data Form
Publication Timeline
Tools
MODIS
THREDDS
SOAT
Daymet
Airborne Data Visualizer
Soil Moisture Visualizer
Land - Water Checker
Resources
Learning
Data Management
News
Earthdata Forum
Contact Us

You can download all of the data and the user guide using the green and blue buttons at the top of the

page.

Or you can download individual files at the bottom of the page. You can use the filter search box to find specific files, then use the download button to download individual files.