



Delta-X Applications Workshop

May 8-9, 2024

MODEL AND DATA ACCESS

CATHLEEN JONES

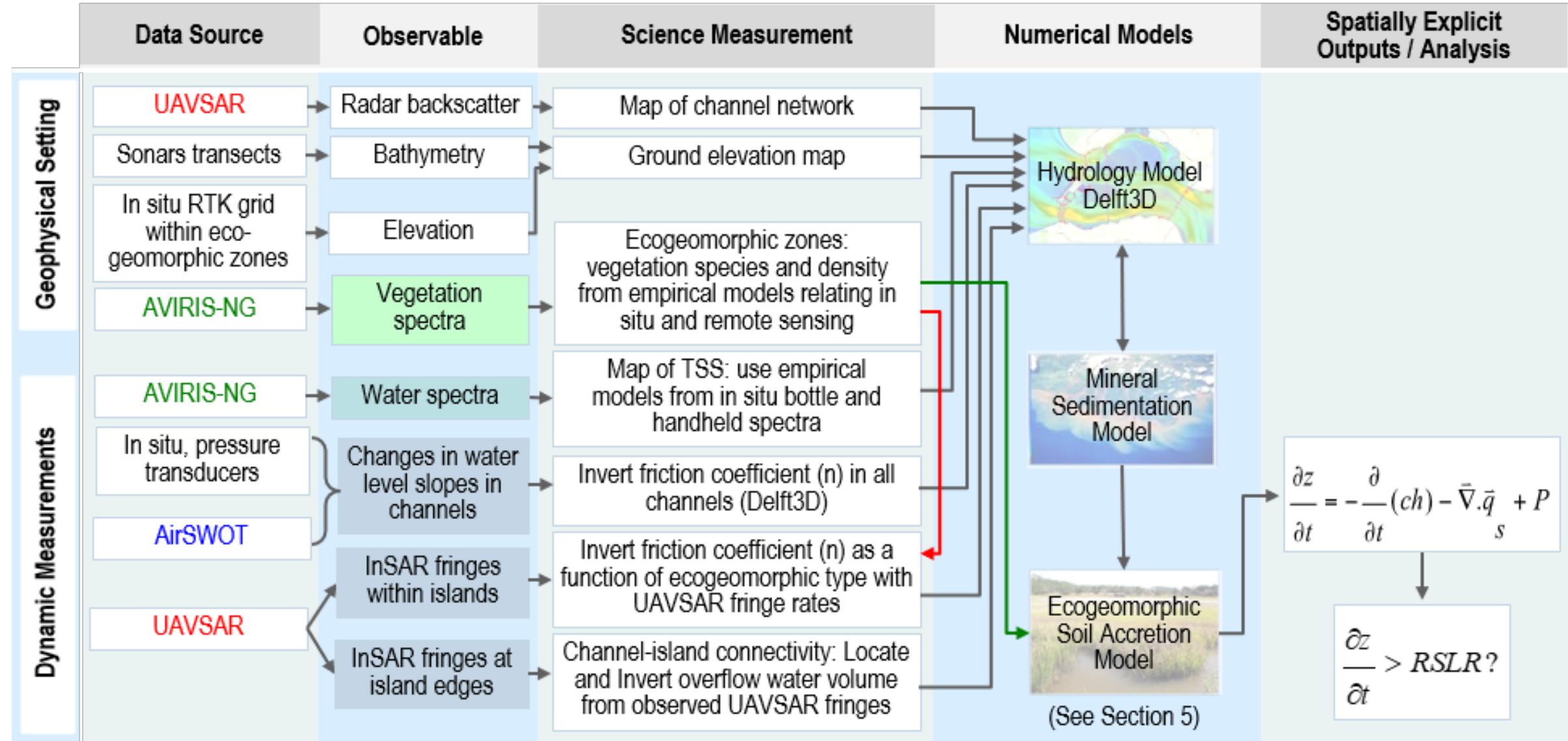
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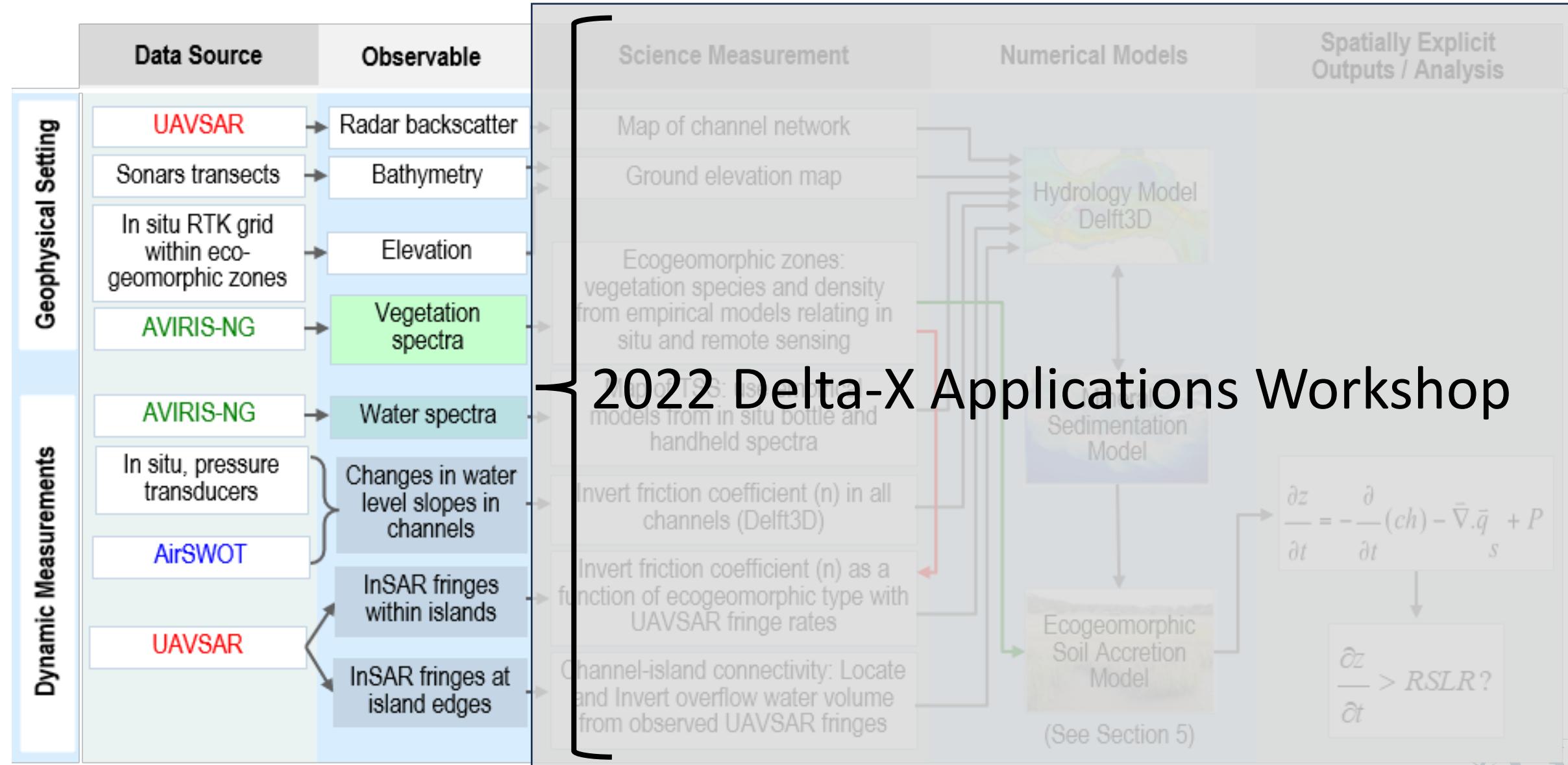
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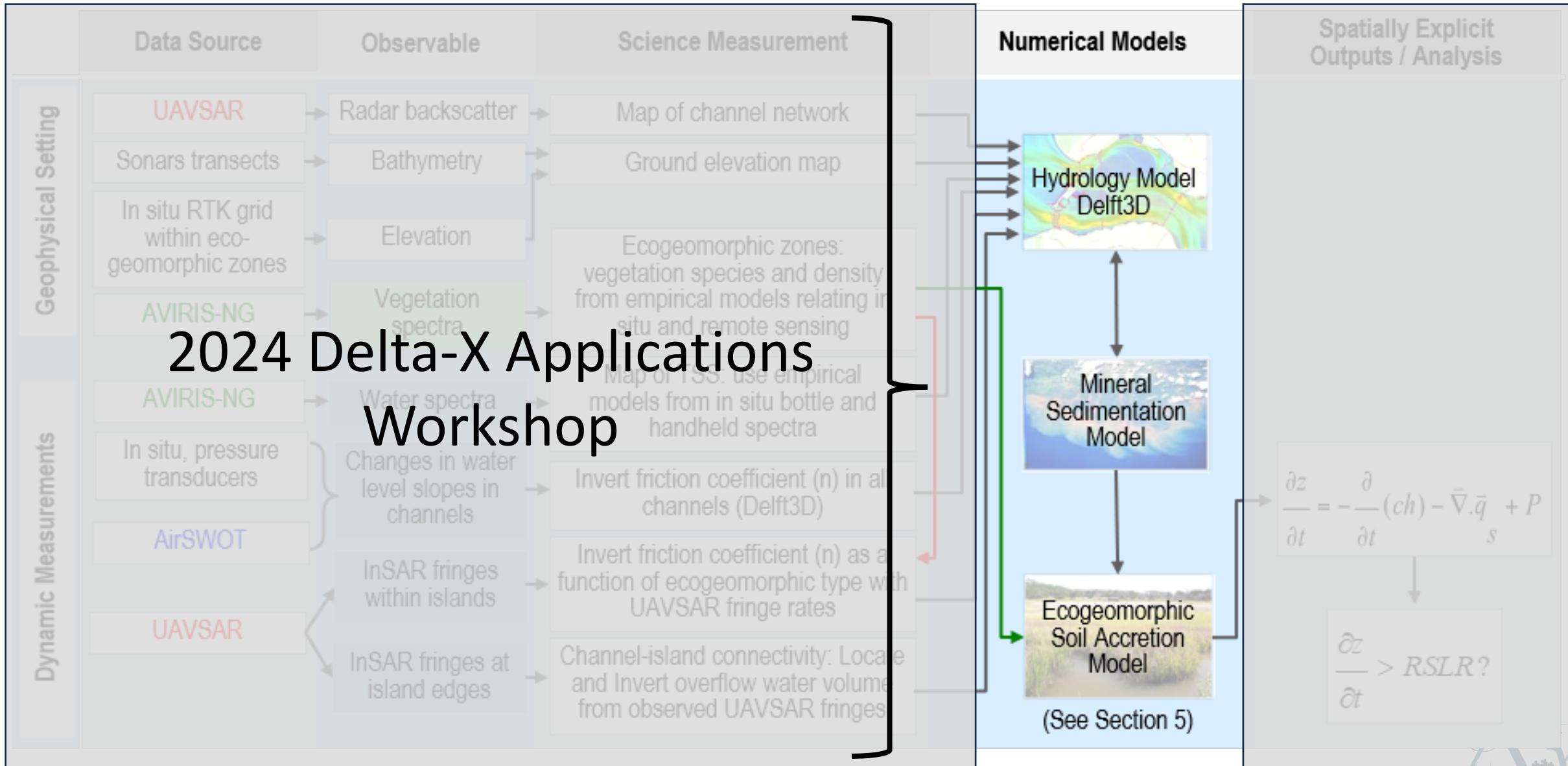
Delta-X: Measurements-to-Models Flowdown



Delta-X: Measurements-to-Models Flowdown



Delta-X: Measurements-to-Models Flowdown



Delta-X NASA Airborne Instrument Collections

Instrument	Spring 2021	Fall 2021
UAVSAR	Collected (3 tidal stages)	Collected (2 tidal stages)
AVIRIS-NG	Collected	Collected
AirSWOT	Collected (3 tidal stages)	Collected (3 tidal stages)

Spring campaign ended April 24, 2021. Fall campaign ended Sept. 25, 2021.

Extensive field data were acquired during each campaign.



Spring and Fall 2021 Field / In Situ Data Collections (1)

Field Measurements	Spring 2021	Fall 2021
Water level gauges	Collected	Collected
GPS	<i>Not collected</i>	Collected
Sonar	<i>Not collected</i>	Collected
ADCP (water velocity)	Collected	Collected
Total suspended sediments (TSS) concentration from discrete water samples	Collected	Collected
Particulate organic carbon (POC) concentrations	Collected	Collected
Water quality indicators	Collected	Collected
In situ remote-sensing reflectance $R_{rs}(l)$ of water from field spectrometer	Collected	Collected
In situ beam attenuation and particle size distribution from LISST sensor	Collected	Collected
Vegetation structure	Collected	Collected
Sediment core	Collected	Collected
Soil accretion (feldspar plots)	Collected	Collected

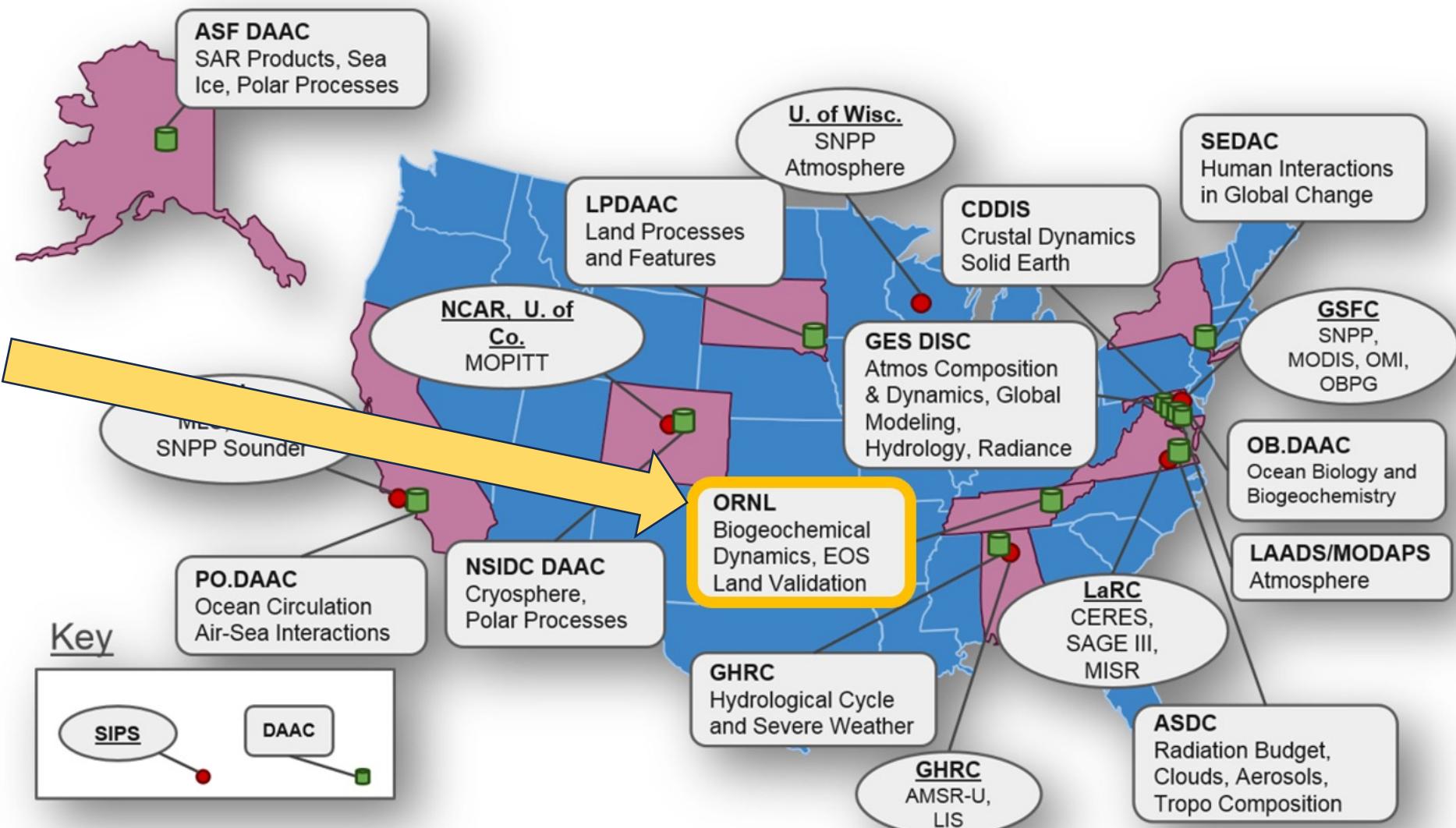


Spring and Fall 2021 Field / In Situ Data Collections (2)

Field Measurements	Spring 2021	Fall 2021
Anemometers	<i>Not collected</i>	Collected
Turbidity sensor (within islands)	Collected	Collected
Suspended and bed-sediment samples for concentration and grain size (transects)	Collected	Collected
Fallout radionuclide (^{210}Pb , ^{137}Cs)	<i>Not collected</i>	Collected



EOSDIS Distributed Active Archive Centers



Accessing Datasets Via ORNL DAAC Site

Sign in using an Earthdata Login:

The screenshot shows the ORNL DAAC dataset page for the "Delta-X: Acoustic Doppler Current Profiler Channel Surveys, Coastal Louisiana, 2021". The top navigation bar includes links for About Us, Get Data, Submit Data, Tools, Resources, Help, and Sign in (which is highlighted with a red circle). A search bar and a green "Search" button are also present. The main content area displays the dataset title, an overview table with details like DOI, Version, Project, Published, Updated, and Usage, and download links for "Download Data" (3.5 MB) and "User Guide". Below this is a "Description" section and a "Science Keywords" section. At the bottom, there are links for BIOSPHERE, ECOSYSTEMS, AQUATIC ECOSYSTEMS, and WETLANDS.

The screenshot shows the Earthdata Login page. It features a login form with fields for "Username" and "Password", a "Stay signed in (this is a private workstation)" checkbox, and "LOG IN" and "REGISTER" buttons. To the right of the form is a "Why must I register?" section containing text about the benefits of using Earthdata Login for EOSDIS services. At the bottom, a call-to-action button says "Get single sign-on access to all your favorite EOSDIS sites".



[DAAC Home](#) > [Get Data](#) > [NASA Projects](#) > Delta-X

Delta-X

Overview



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.

Data products from the 2016 Pre-Delta-X Demonstration Campaign are available now. The Spring 2021 campaign completed in April 2021 and the resulting data products are now being finalized for distribution.

Related Links

[Browse Delta-X datasets](#)
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Delta-X Datasets List

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21 Delta-X datasets

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<input checked="" type="checkbox"/> Delta-X dataset	Updated	Published	User Guide	Download	Size	SDAT
* Delta-X: Aboveground Biomass and Necromass across Wetlands in the MRD, LA, USA, 2021	2022-04-25	2022-04-25				
* Delta-X: Belowground Biomass and Necromass across Wetlands in the MRD, LA, USA, 2021	2022-04-25	2022-04-25				
* Delta-X: AVIRIS-NG L1B Spectral Radiance Products, Mississippi River Delta, USA, 2021	2022-04-21	2022-04-21				
* Delta-X: UAVSAR Interferometric L1B Products, Atchafalaya and Terrebonne Basins, 2021	2022-04-21	2022-04-21				
* Delta-X: UAVSAR Single Look Complex (SLC) Stack L1 Products, Louisiana, USA, 2021	2022-04-21	2022-04-21				
* Delta-X: Acoustic Doppler Current Profiler Channel Surveys, Coastal Louisiana, 2021	2021-10-29	2021-10-29			3.5MB	

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[Delta-X - ORNL DAAC](#)

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 ...

- All NASA Earth Venture-Suborbital Missions data and models are archived in a NASA Distributed Data Archive Center (DAAC)

- Delta-X archive is at the Oak Ridge National Lab (ORNL) DAAC
- This repository archives all final processed datasets and models
- There is a Product Description for each dataset

2022 Applications Workshop – Tutorials Available Online

The screenshot shows the ORNL DAAC website homepage with a search bar and navigation menu. Below the header, a banner for the "Delta-X Applications Workshop" is displayed. The workshop details include:

- Hosted by: Delta-X Science Team
- Date: May 4-5, 2022
- Contact for the ORNL DAAC: uso@daac.ornl.gov
- Keywords: Tutorial, Airborne, Data Management, Python, SAR

Overview

On May 4th and 5th, 2022, the Delta-X Science Team developed and conducted a Delta-X Applications Workshop which was held virtually and in person at The Estuary at the Water Campus Baton Rouge, Louisiana. In this two-day workshop, the scientists covered an introduction to Delta-X datasets and steps for analyzing field, airborne, and modeling datasets. Scientists presented material in the form of lecture presentation, hands-on data access demonstrations, and data analysis methods tutorials mostly in the form of Jupyter Notebook content. The Delta-X Science Team has provided videos of presentations, slide content, and Notebook material. That material is organized and available from the ORNL DAAC from the Workshop Content repository link below. The ORNL DAAC archives and distributes datasets from the Delta-X EVS-3 Mission. Read more about the mission at the [Delta-X website](#).

Workshop Content

[Delta-X Applications Workshop \(May 4-5, 2022\)](#)

A thumbnail image of a video titled "Delta-X Applications Workshop 2022: Introduction" is shown, featuring a satellite view of a river delta and the Delta-X logo.

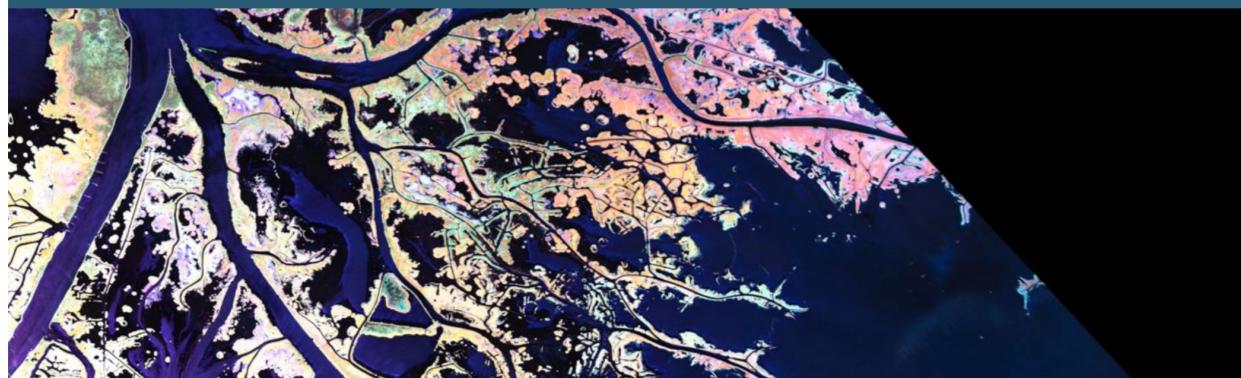
Agenda

May 4

- Introduction
- Delta-X Overview - Marc Simard
- Data Management Plan & Data Archive - Cathleen Jones
- Field Data Overview, Access & Analysis - Alex Christensen
- AVIRIS-NG Data Overview, Access & Application - Daniel Jensen
- AirSWOT Data Overview, Access & Application - Michael Denbina

May 5

- AirSWOT Application - Michael Denbina
- UAVSAR Data Overview, Access & Application - Talib Oliver Cabrera
- ANUGA Model - Kyle Wright
- Delft3D Model - Luca Cortese
- Closeout



Data Download

Final datasets

Final Delta-X (and Pre-Delta-X) products are made available to download at the **Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC)**.

[View datasets at the ORNL DAAC](#)

Level 1 (raw remote sensing data)

UAVSAR L1 SLC quad-pol stack data is available on the project website.
NOTE: **UAVSAR login required**.

- [atchaf_06309_02](#) (Mar 27–Apr 2, 2021), Atchafalaya River Delta, LA
 - [atchaf_19809_02](#) (Mar 27–Apr 2, 2021), Atchafalaya River Delta, LA
 - [wterre_16300_02](#) (Apr 5–7, 2021), West Terrebonne Basin, LA
 - [wterre_34202_02](#) (Apr 5–7, 2021), West Terrebonne Basin, LA
 - [eterre_08705_02](#) (Apr 12–18, 2021), East Terrebonne Basin, LA
 - [eterre_27309_01](#) (Apr 12–18, 2021), East Terrebonne Basin, LA
-
- [atchaf_06309_03](#) (Sep 5–13, 2021), Atchafalaya River Delta, LA

<https://deltax.jpl.nasa.gov/data/download/>

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Delta-X - ORNL DAAC

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 ...

<https://daac-news.ornl.gov/content/delta-x-open-dat...> :

Delta-X Open Data Workshop | ORNL DAAC News

Nov 14, 2021 — The Delta-X team has completed their Spring and Fall 2021 airborne and field campaigns. Learn about the data and how to access it November ...

<https://deltax.jpl.nasa.gov/data/download> :

Data Download | Delta-X

Final Delta-X (and Pre-Delta-X) products are made available to download at the Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC).

<https://deltax.jpl.nasa.gov/>



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Delta-X

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Field Data

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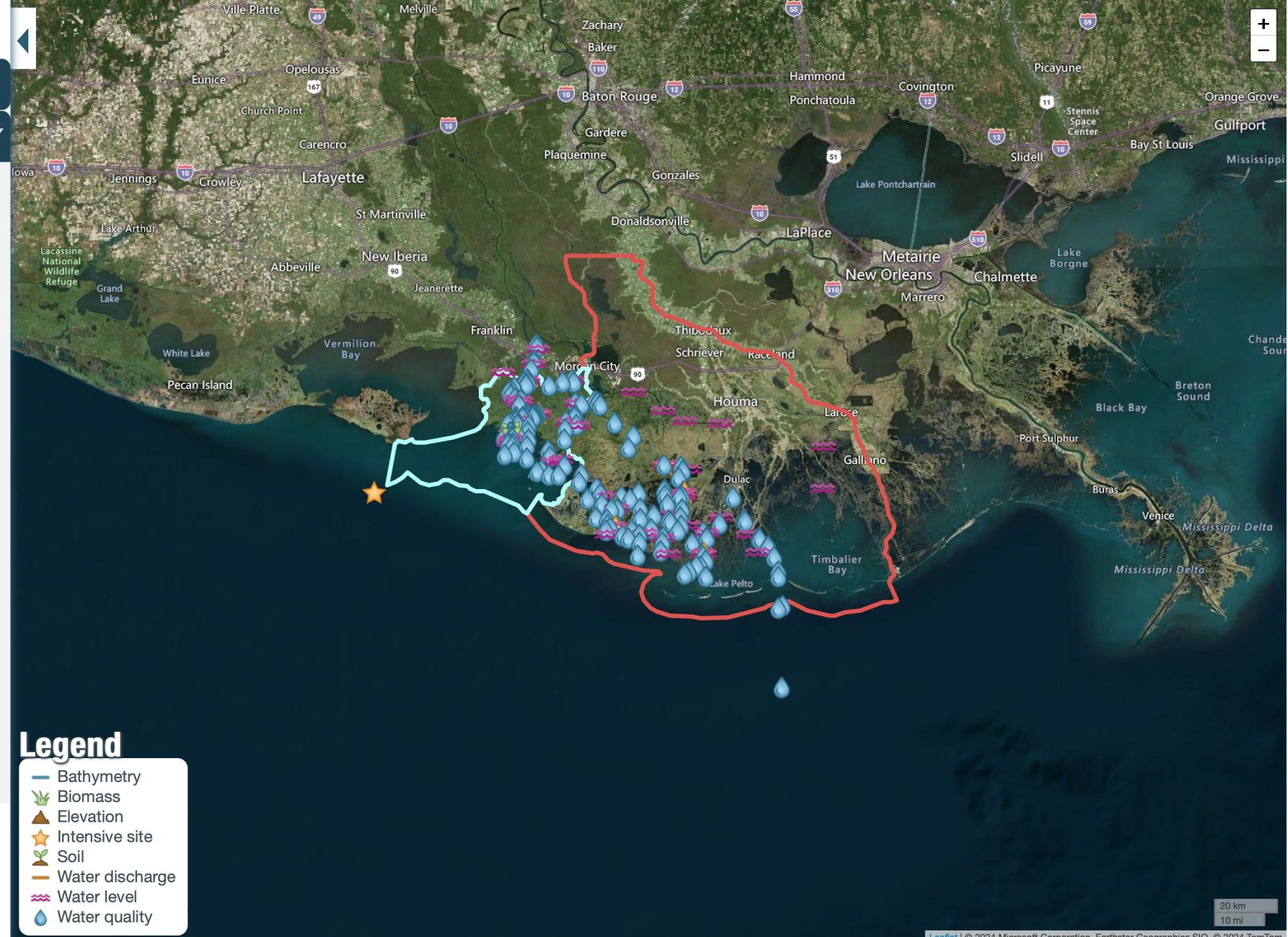
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- Water level [download](#)

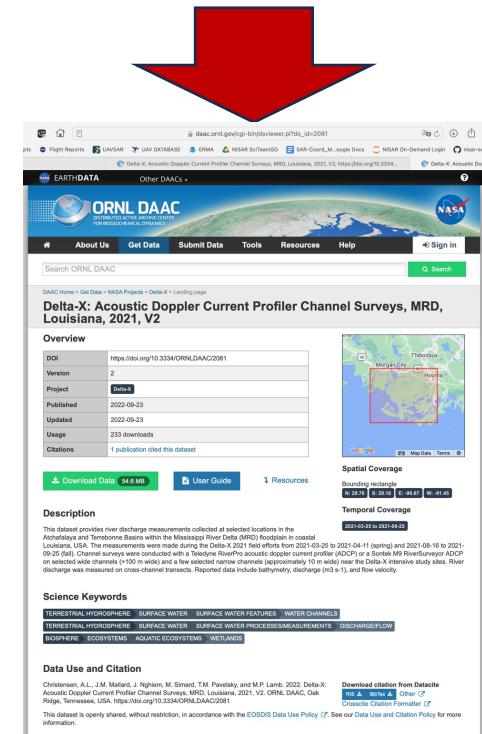
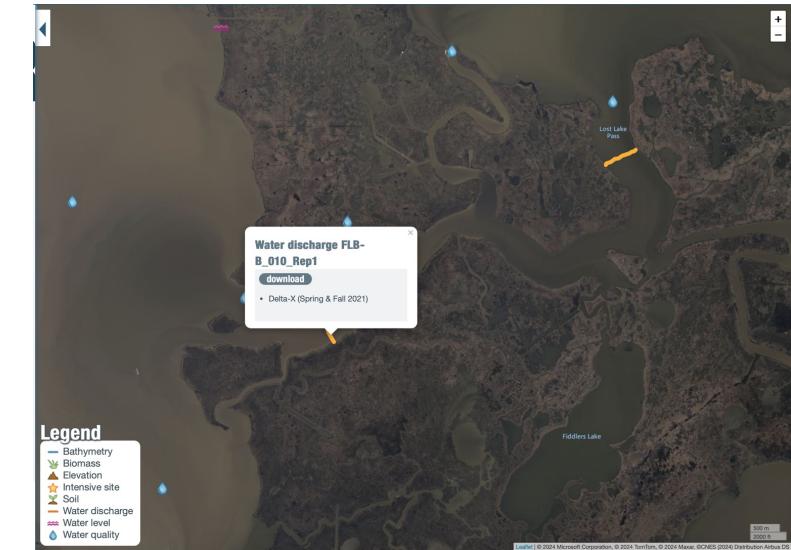
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- Soil properties [download](#)

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- Particle size distribution (LISST) [download](#)
- POC concentrations [download](#)
- Spectral reflectance [download](#)
- Total suspended solids (TSS) [download](#)
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daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=2081

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Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021, V2, https://doi.org/10.3334... Delta-X: Acoustic Dop...

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Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021, V2

Overview

DOI	https://doi.org/10.3334/ORNLDAAAC/2081
Version	2
Project	Delta-X
Published	2022-09-23
Updated	2022-09-23
Usage	233 downloads
Citations	1 publication cited this dataset

[Download Data](#) 5.6 MB [User Guide](#) [Resources](#)

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 2021-03-25 to 2021-04-11 (spring) and 2021-08-16 to 2021-09-25 (fall). Channel surveys were conducted with a Teledyne RiverPro acoustic doppler current profiler (ADCP) or a Sontek M9 RiverSurveyor 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. River discharge was measured on cross-channel transects. Reported data include bathymetry, discharge (m³ s⁻¹), and flow velocity.

Science Keywords

- TERRESTRIAL HYDROSPHERE SURFACE WATER SURFACE WATER FEATURES WATER CHANNELS
- TERRESTRIAL HYDROSPHERE SURFACE WATER SURFACE WATER PROCESSES/MEASUREMENTS DISCHARGE/FLOW
- BIOSPHERE ECOSYSTEMS AQUATIC ECOSYSTEMS WETLANDS

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, V2. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAAC/2081>

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.

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Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021, V2

Get Data

Documentation Revision Date: 2022-09-23

Dataset Version: 2

Summary

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 2021-03-25 to 2021-04-11 (spring) and 2021-08-16 to 2021-09-25 (fall). Channel surveys were conducted with a Teledyne RiverPro acoustic doppler current profiler (ADCP) or a Sontek M9 RiverSurveyor 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. River discharge was measured on cross-channel transects. Reported data include bathymetry, discharge (m³ s⁻¹), and flow velocity.

This dataset includes 771 files in comma-separated values (*.csv) format and 2 files in compressed Keyhole Markup Language (*.kmz) format.

Figure 1. Locations of river discharge measurements (black triangles) in the Atchafalaya and Terrebonne Basins within the Mississippi River Delta (MRD) floodplain in coastal Louisiana, U.S. Measurements were taken by Delta-X project in March and April 2021. Source: DeltaX_RiverDischarge_Spring2021.csv

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Delta-X: Acoustic Doppler Current Profiler Channel Surveys, MRD, Louisiana, 2021, V2

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Figure 1. Locations of river discharge measurements (black triangles) in the Atchafalaya and Terrebonne Basins within the Mississippi River Delta (MRD) floodplain in coastal Louisiana, U.S. Measurements were taken by Delta-X project in March and April 2021. Source: DeltaX_RiverDischarge_Spring2021.csv

Data File Details

The files contain location coordinates in longitude, latitude (EPSG: 4326).

Missing text data are indicated by NaN, and missing numeric data are indicated by the value -9999.

Table 2. Variables in the summary files *DeltaX_RiverDischarge_Spring2021.csv* and *DeltaX_RiverDischarge_Fall2021.csv*.

Variable	Units	Description	Collected During Pre-Delta-X Campaign?
profiler_id	text	Instrument used: "Sontek RiverSurveyor M9" or "Teledyne RiverPro"	Yes
team	text	Name of team that collected data	No
basin	text	Name of estuary basin: "Atchafalaya" or "Terrebonne"	Yes
campaign	text	Campaign name: "Spring 2016" or "Fall 2016"	Yes
filename	text	Name of raw data file for bathymetry or velocity readings.	Yes
transect	1	Order number of transect at a site	Yes
location	text	General location of transect (e.g. ATCH, ICWW, FLB)	No
site_name	text	Name of site	No
replicate	1	The replicate number for given transect	No
planned_latitude	degree_north	Planned location of transect	Yes
planned_longitude	degree_east	Planned location of transect	Yes
start_date	YYYY-MM-DD	Start date of the transect in year (YYYY), month (MM), and day (DD)	Yes
start_time	hh:mm:ss	Start time of the transect in hour (hh), minute (mm), second (ss) UTC	Yes
start_ensemble	1	The first ensemble included in the transect	No
start_latitude	degree_north	Location of transect start. '-9999' values indicate no valid GPS data available	Yes
start_longitude	degree_east	Location of transect start. '-9999' values indicate no valid GPS data available	Yes
end_date	YYYYMMDD	End date of the transect in year (YYYY), month (MM), day (DD)	No
end_time	hh:mm:ss	End time of the transect in UTC	No
end_ensemble	1	The last ensemble included in the transect	No
end_latitude	degree_north	Location of transect end. '-9999' values indicate no valid GPS data available	No
end_longitude	degree_east	Location of transect end. '-9999' values indicate no valid GPS data available	No
width	m	Width of the channel	Yes
area	m^2	Area of the channel	Yes
boat_speed	$m s^{-1}$	Average boat speed during the transect	Yes
mean_speed	$m s^{-1}$	Average water speed during the transect	Yes
discharge_side	$m^3 s^{-1}$	Sum of discharge on the left and right edges of the transect	Yes
discharge_top	$m^3 s^{-1}$	Discharge in the top portion of the transect	Yes
discharge_middle	$m^3 s^{-1}$	Discharge in the middle portion of the transect	Yes
discharge_bottom	$m^3 s^{-1}$	Discharge in the bottom portion of the transect	Yes
discharge_total	$m^3 s^{-1}$	Total discharge	Yes

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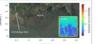
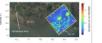
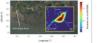
ORNL DAAC – Hosts Delta-X Models

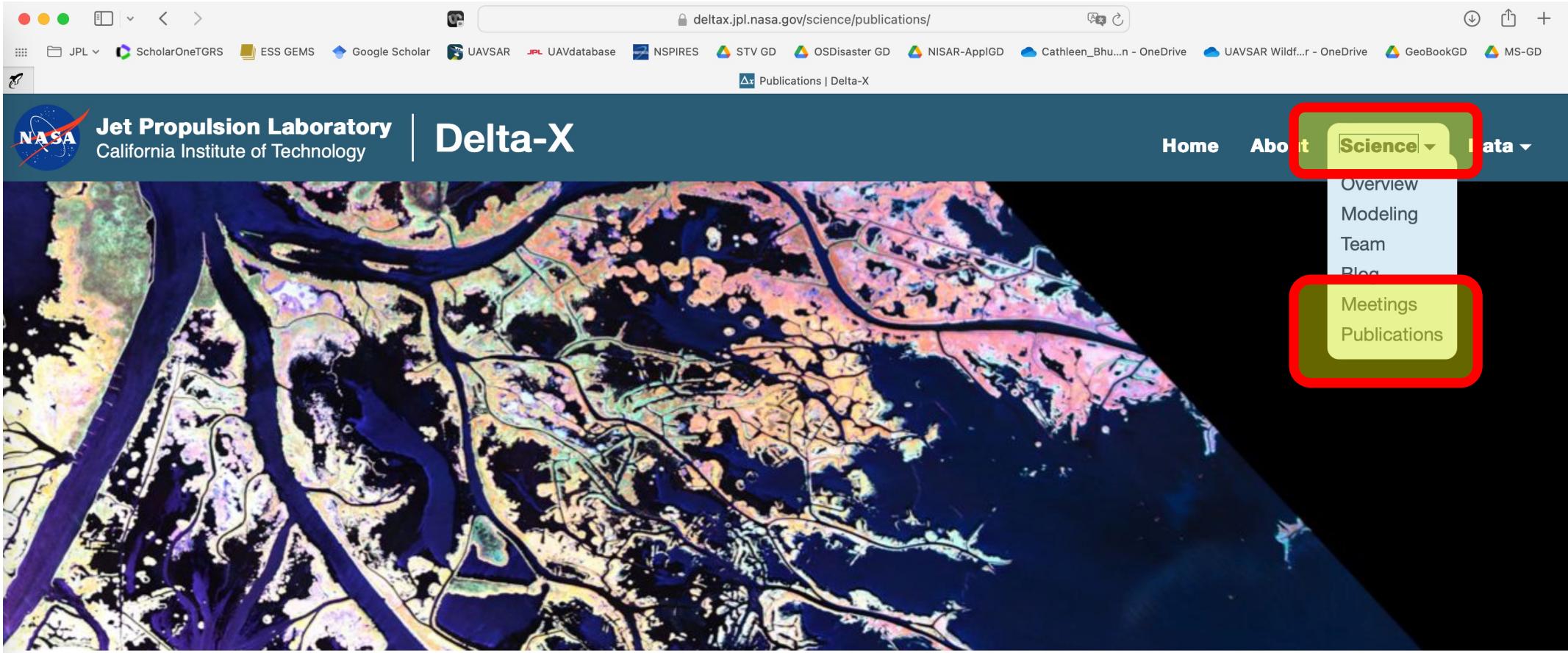
Delta-X Model

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Delta-X: Delft3D Sediment Model, Site 396, Terrebonne Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2314	 This dataset contains the Delft3D model of the intensive site 396 in the Terrebonne Basin along the Mississippi River Delta (MRD) in coastal Louisiana...	
Delta-X: Delft3D Sediment Model, Site 399, Terrebonne Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2313	 This dataset contains the Delft3D model of the intensive site 399 in the Terrebonne Basin along the Mississippi River Delta (MRD) in coastal Louisiana...	
Delta-X: Delft3D Sediment Model, Site 322, Terrebonne Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2312	 This dataset contains the Delft3D model of the intensive site 322 in the Terrebonne Basin along the Mississippi River Delta (MRD) in coastal Louisiana...	
Delta-X: Delft3D Sediment Model, Site 421, Terrebonne Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2304	 This dataset contains the Delft3D model of the intensive site 421 in the Terrebonne Basin along the Mississippi River Delta (MRD) in coastal Louisiana...	
Delta-X: Delft3D Sediment Model, Site 294, Terrebonne Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2303	 This dataset contains the Delft3D model of the intensive site 294 in the Terrebonne Basin along the Mississippi River Delta (MRD) in coastal Louisiana...	
Delta-X: Delft3D Broad-Scale Sediment Model, Atchafalaya Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2302	 This dataset contains the Delft3D model of the Atchafalaya Basin along the Mississippi River Delta (MRD) in coastal Louisiana. Simulations cover the...	
Delta-X: Delft3D Broad-Scale Sediment Model, Terrebonne Basin, MRD, Louisiana, USA https://doi.org/10.3334/ORNLDAA/2301	 This dataset contains the Delft3D model of the Terrebonne Basin along the Mississippi River Delta (MRD) in coastal Louisiana. Simulations cover the Delta-X...	
Delta-X: Digital Elevation Model, MRD, LA, USA, 2021 https://doi.org/10.3334/ORNLDAA/2181	 This dataset provides an updated digital elevation model (DEM) for the Atchafalaya and Terrebonne basins in coastal Louisiana, USA. The DEM is updated from...	
Delta-X: Island and Secondary Channel Model, MRD, LA, USA, 2022 https://doi.org/10.3334/ORNLDAA/2106	 This dataset includes model code and output for a model that simulates changes in islands and small water channels of river delta systems in response to...	



Publications

Hemati, M., Mahdianpari, M., Shiri, H. and Mohammadimanesh, F., 2024. Integrating SAR and Optical Data for Aboveground Biomass Estimation of Coastal Wetlands Using Machine Learning: Multi-Scale Approach. *Remote Sensing*, 16(5), p.831.

[View data](#) | [Paper \(PDF\)](#) | DOI: [10.3390/rs16050831](https://doi.org/10.3390/rs16050831)

Cortese, L., Zhang, X., Simard, M. and Fagherazzi, S., 2024. Storm impacts on mineral mass accumulation rates of coastal marshes. *Journal of Geophysical Research: Earth Surface*, 129(3), p.e2023JF007065.

Publications

Hemati, M., Mahdianpari, M., Shiri, H. and Mohammadimanesh, F., 2024. Integrating SAR and Optical Data for Aboveground Biomass Estimation of Coastal Wetlands Using Machine Learning: Multi-Scale Approach. *Remote Sensing*, 16(5), p.831.

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[View data](#) | [Paper \(PDF\)](#) | DOI: [10.1029/2023JF007065](https://doi.org/10.1029/2023JF007065)

Harrington, J.P., Ghosh, N., Weiser, M.W., Thompson, D.R., Simard, M., Lohrenz, S.E. and Fichot, C.G., 2024. A hyperspectral view of the nearshore Mississippi River Delta: Characterizing suspended particles in coastal wetlands using imaging spectroscopy. *Remote Sensing of Environment*, 301, p.113943.

[View data](#) | [Paper \(PDF\)](#) | DOI: [10.1016/j.rse.2023.113943](https://doi.org/10.1016/j.rse.2023.113943)

Cortese, L., Donatelli, C., Zhang, X., Nghiem, J.A., Simard, M., Jones, C.E., Denbina, M., Fichot, C.G., Harrington, J.P. and Fagherazzi, S., 2023. Coupling numerical models of deltaic wetlands with AirSWOT, UAVSAR, and AVIRIS-NG remote sensing data. *Biogeosciences Discussions*, 2023, pp.1-28.

[View data](#) | [Paper \(PDF\)](#) | DOI: [10.5194/bg-21-241-2024](https://doi.org/10.5194/bg-21-241-2024)

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[View data](#) | [Paper \(PDF\)](#) | DOI: [10.1029/2023JF007219](https://doi.org/10.1029/2023JF007219)

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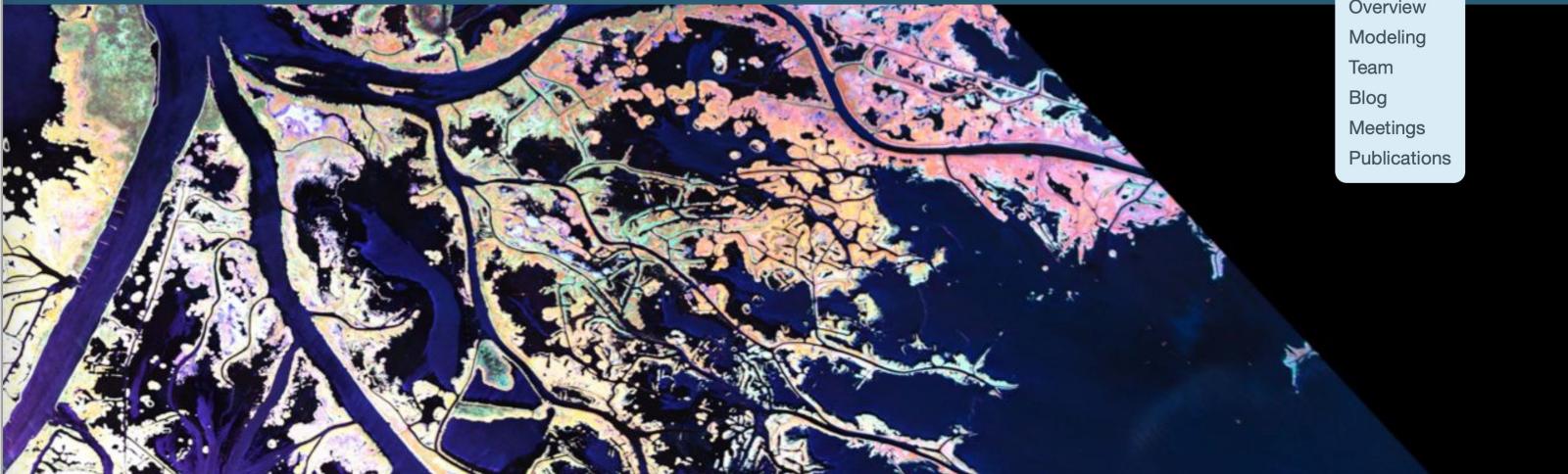
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Meetings & Presentations

- [2024 Delta-X Applications Workshop](#)
- [2023 AGU Fall Meeting](#)
- [2023 Delta-X Open Data Workshop](#)
- [2022 EGU Meeting](#)
- [2022 Delta-X Applications Workshop](#)
- [2021 AGU Fall Meeting](#)

2022 EGU Meeting

May 23–27 | Vienna, Austria

ORAL PRESENTATIONS

EGU22-2073: Towards sustainable landscapes: insights from the network and connectivity

[View data & model](#) | [Abstract](#)

Paola Passalacqua

EGU22-2072: Connected or disconnected? Spatial and temporal patterns of river-floodplain connectivity

[View data & model](#) | [Abstract](#)

Paola Passalacqua, Kyle Wright, Nelson Tull, Hima Hassencruck-Gudipati, and David Mohrig

2022 Delta-X Applications Workshop

May 4–5 | Baton Rouge, Louisiana

In this two-day workshop, the scientists covered an introduction to Delta-X datasets and steps for analyzing field, airborne, and modeling datasets. Scientists presented material in the form of lecture presentations, hands-on data access demonstrations, and data analysis methods tutorials mostly in the form of Jupyter Notebook content. [View all resources at the ORNL DAAC](#).

Summary

- At this workshop, you will be shown the models available from the Delta-X mission, where to obtain them, and how to use them.
- ORNL: https://daac.ornl.gov/cgi-bin/dataset_lister.pl?p=41
 - THE ORNL DAAC ARCHIVES THE FINAL VERSIONS OF ALL DATASETS AND MODELS.
- DELTA-X SITE: <https://deltax.jpl.nasa.gov>, <https://deltax.jpl.nasa.gov/data/download/>



May 8th Agenda

Time (CT)	Topic	Presenter
8:00 – 8:30	Meet and greet	
8:30 – 9:30	Introduction	Marc Simard Cathleen Jones Yang Zheng
9:30 – 9:45	Hydrodynamic modeling with ANUGA: introduction	Antoine Soloy
	<i>Break 15'</i>	
10:00 – 12:00	Hydrodynamic modeling with ANUGA: model run	Antoine Soloy
	<i>Lunch 90'</i>	
13:30 – 14:30	Hydrodynamic modeling with ANUGA: simulations	Antoine Soloy
14:30 – 15:15	Demonstration of Dorado sediment transport	Muriel Brückner Antoine Soloy
	<i>Break 15'</i>	
15:30 – 17:00	Demonstration of Dorado sediment transport	Brückner, Soloy
17:00 – 17:30	Hands-on exercises and discussions	Brückner, Soloy

May 9th Agenda

Time (CT)	Topic	Presenter
8:00 – 10:00	Hydrodynamic Modeling of Deltas using Delft3d	Ali Payandeh
	<i>Break 15'</i>	
10:15 – 12:00	The fate of Deltas - Delft3d <u>Morphodynamic</u> modeling	Ali Payandeh
	<i>Lunch 90'</i>	
13:30 – 15:00	Sediment transport model	Dongchen Wang
	<i>Break 15'</i>	
15:15 – 17:15	NUMAR model, data, and how to use them	Robert Twilley Pradipta Biswas Ivan Vargas-Lopez Alex Christensen Muriel Brücker
17:15 – 18:30	River Model Tour	Ali Payandeh
18:30 – 18:45	Close-out	