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Pre-Delta-X: UAVSAR Georeferenced Channel Maps, Atchafalaya Basin, LA, USA, 2016, V2

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Documentation Revision Date: 2025-02-10

Dataset Version: 2

Summary

This dataset provides spatial data on water channels in the estuary of the Atchafalaya Basin of the Mississippi River Delta of coastal Louisiana. These Level-3 (L3) channel maps were developed from interferograms derived from Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) data collected on 2016-10-16 (low tides) and 2016-10-17 (high tides). The channel maps define open water paths in hydrodynamic models and are used to evaluate model performance. This is version 2 of this dataset. Data are provided in cloud optimized GeoTIFF format.

UAVSAR is a polarimetric L-band synthetic aperture radar (SAR) flown on the NASA Gulfstream-3 aircraft. Channel maps were generated from the InSAR interferograms for nearest-neighbor (NN), NN+1, and NN+2 pairs for data acquired on 2016-10-16 (low tide) and 2016-10-17 (high tide).

There are two files in cloud optimized GeoTIFF format.

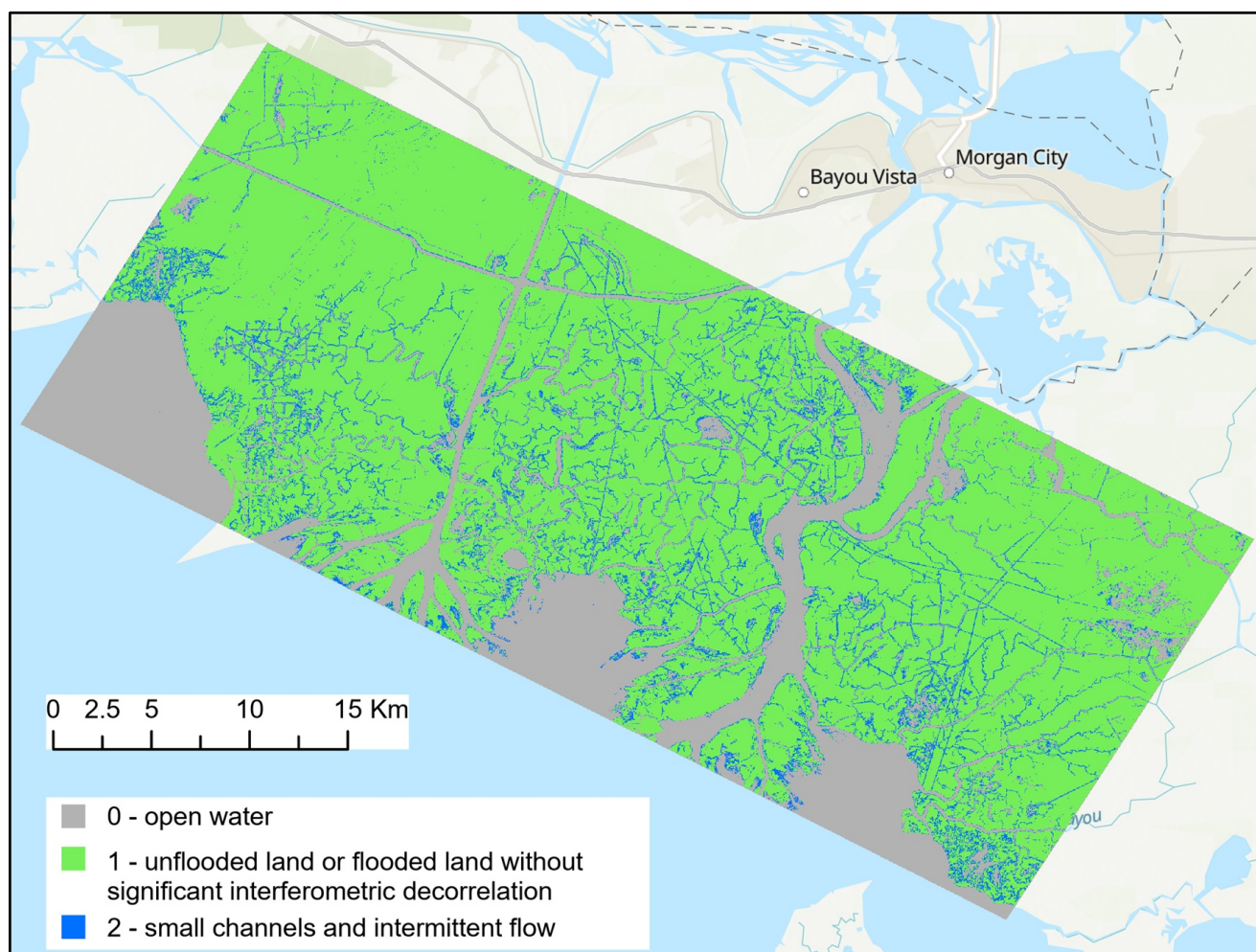


Figure 1. Water channels in the Atchafalaya Basin of the Mississippi River Delta of coastal Louisiana, U.S., during high tide derived from data acquired on October 17, 2016, between 19:37 and 21:51 UTC.

Citation

Jones, C., B. Varugu, T. Oliver-Cabrera, and Y. Lou. 2025. Pre-Delta-X: UAVSAR Georeferenced Channel Maps, Atchafalaya Basin, LA, USA, 2016, V2. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2366>

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1. Dataset Overview

This dataset provides spatial data on water channels in the estuary of the Atchafalaya Basin of the Mississippi River Delta of coastal Louisiana. UAVSAR is a polarimetric L-band synthetic aperture radar (SAR) flown on the NASA Gulfstream-3 aircraft. Channel maps were generated from the InSAR interferograms for nearest-neighbor (NN), NN+1, and NN+2 pairs for data acquired on 2016-10-16 (low tide) and 2016-10-17 (high tide). The channel maps define open water paths in hydrodynamic models and are used to evaluate model performance.

This is version 2 of this dataset.

Project: [Delta-X](#)

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.

Related Publication

Varugu, B. K., C. E. Jones, T. Oliver-Cabrera, M. Simard, and D. J. Jensen. 2025. Study of hydrologic connectivity and tidal influence on water flow across Louisiana coastal wetlands using rapid repeat InSAR, Remote Sensing, in revision.

Related Datasets

Jones, C., M. Simard, Y. Lou, and T. Oliver. 2021. Pre-Delta-X: L1 UAVSAR Single Look Complex and Interferograms, MRD, LA, USA, 2016. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1816>

- The single look complex (SLC) stack product is a standard UAVSAR product delivered by the UAVSAR processing team. The L1 interferograms were generated from the SLC stacks, which were the basis for L2 and L3 products.

Jones, C., M. Simard, and Y. Lou. 2021. Pre-Delta-X: UAVSAR-derived Water Level Change Maps, Atchafalaya Basin, LA, USA, 2016. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1823>

- This UAVSAR derived dataset characterizes tidal driven water level changes in the Atchafalaya Basin on 2016-10-16.

Jones, C., T. Oliver, and Y. Lou. 2021. Pre-Delta-X: UAVSAR Georeferenced Channel Maps, Atchafalaya Basin, LA, USA, 2016. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1954>

- This is version 1 of the current dataset.

Acknowledgments

This work was supported by the Jet Propulsion Laboratory Research and Technology Development (JPL-R&TD) FY17–19 (grants 01STCR / R.17.231.069) and by the NASA Science Mission Directorate’s Earth Science Division through the Earth Venture Suborbital-3 Program NNH17ZDA001N-EVS3.

2. Data Characteristics

Spatial Coverage: Atchafalaya Basin, Mississippi River Delta (MRD), southern coast of Louisiana, USA

Spatial Resolution: 0.0000556 degrees (approximately 5.5 m)

Temporal Coverage: 2016-10-16 to 2016-10-17

Temporal Resolution: Two daily estimates

Site Boundaries: Latitude and longitude are given in decimal degrees.

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Atchafalaya Basin	-91.6221	-91.0576	29.7584	29.3561

Data File Information

There are two data files in cloud optimized GeoTIFF (*.tif) format, which include the location of water channels, land, and open water during low and high tides.

Table 1. File names and descriptions.

File Name	Description
PreDeltaX_channels_161016_lowtide_01.tif	Channels and flooded lands during low tide. Raw data acquired 2016-10-16 14:08:00 to 2016-10-16 16:37:00 UTC.
PreDeltaX_channels_161017_hightide_01.tif	Channels and flooded lands during high tide. Raw data acquired 2016-10-17 19:37:00 to 2016-10-17 21:51:00 UTC.

Data File Details

- There are four categorical values (Table 2).
- The datatype is Int16
- Spatial reference system: WGS 84 (EPSG:4326)
- The pixel size is 5.556×10^{-5} decimal degrees (~5.5 m)
- There are 7239 rows and 10161 columns

Table 2. Categorical values describing the locations provided in the data files.

Value	Description
0	Open water
1	Unflooded land or flooded land without significant interferometric decorrelation
2	Small channels and intermittent flow (includes flooded land with interferometric decorrelation to an extent)
-9999	No data, where no imagery was acquired

3. Application and Derivation

Water surface elevation, land, and vegetation features were measured using UAVSAR, a synthetic aperture radar instrument. The UAVSAR data were used to measure hydrological parameters, and the L3 water channel maps served to define the open water paths in hydrodynamic models and to evaluate model performance.

4. Quality Assessment

Data quality of the channel map product was assessed through comparison with maps derived from optical imagery and with visual comparisons to Google Earth. In all products, pixels that lack data or for which the data fail quality tests will use the no data value.

5. Data Acquisition, Materials, and Methods

UAVSAR is a polarimetric L-band synthetic aperture radar operating with 80 MHz bandwidth from 1217.5–1297.5 GHz designed for interferometry (InSAR) (Hensley et al., 2009). UAVSAR's swath width is 22 km, which illuminates an area from ~22°–67° incidence angle, with 3 m (cross-track average) by 1 m (along-track) single look ground resolution. The instrument is flown on a Gulfstream-III (C20) aircraft, with the radar electronics and antenna housed in a pod mounted below the fuselage (Figure 2).

During the Pre-Delta-X campaign, the UAVSAR instrument was operated in its standard acquisition configuration, flown at an altitude of 12.5 km in quad-polarization mode, transmitting horizontally and vertically polarized radiation on alternate pulses and receiving both co-polarized (HH or VV) and cross-polarized (HV or VH) returns for each pulse.



Figure 2. UAVSAR is flown on a Gulfstream-III aircraft, mounted in a pod hung below the fuselage.

The UAVSAR was flown over the *gulfco_12011* flight line on 2016-10-16 14:08 UTC at low tide and on 2016-10-17 19:37 UTC at high tide (Figure 3). Each time, the flight covered the study area six times at approximately 30-minute intervals and collected images on each pass. These images, the Level-1 UAVSAR SLC HH_polarization coregisted stack product for flightline 12011 (SLC product name *gulfco_12011_01*; Jones et al., 2021)

were used to generate wrapped InSAR interferograms and interferometric coherence products for nearest-neighbor (NN), NN+1, and NN+2 pairs for low-tide and high-tide periods. These products were further interpreted to generate the channel maps.



Figure 3. The spatial coverage of UAVSAR flight line *gulfco_12011* flown on October 16-17 2016, over the Mississippi River Delta in coastal Louisiana, USA.

The water channel map corresponds to conditions between the period covering the first acquisition at time T1 to the sixth acquisition at time T6. The open water pixels were selected based on the average interferometric coherence of the nearest neighbor (NN) interferometric pairs made with all the acquisitions on a flight day applying a maximum average coherence threshold of 0.4. This threshold was selected to identify areas with open water during the entire flight, not flooded emergent vegetation, although some pixels with low coherence could represent disturbance from other sources (e.g., human activity at the ground sites). Some areas flooded with emergent vegetation can have high coherence in the NN interferograms, but lose coherence in the greater temporal baseline interferograms such as NN+1 and NN+2 formed with acquisitions taken at ~50-60 min and are identified as small/intermittent flow areas. These intermittent flow areas include narrow channels that run into the interior of the wetland islands and locations along the edges of open water channels that receive flow during high discharge conditions. The algorithm is described in Varugu et al. (2025).

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Pre-Delta-X: UAVSAR Georeferenced Channel Maps, Atchafalaya Basin, LA, USA, 2016, V2

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

Hensley, S., H. Zebker, C. Jones, T. Michel, R. Muellerschoen, and B. Chapman. 2009. First deformation results using the NASA/JPL UAVSAR instrument. 2009 2nd Asian-Pacific Conference on Synthetic Aperture Radar. <https://doi.org/10.1109/APSAR.2009.5374246>

Jones, C., M. Simard, and Y. Lou. 2021. Pre-Delta-X: UAVSAR-derived Water Level Change Maps, Atchafalaya Basin, LA, USA, 2016. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1823>

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8. Dataset Revisions

Version	Release Date	Revision Notes
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Version	Release Date	Revision Notes
2.0	2025-01-28	Version 2 updates the algorithm and references a paper describing the algorithm. The two data files were replaced with reprocessed data, and the user guide was updated.
1.0	2021-09-20	Initial publication. https://doi.org/10.3334/ORNLDAAC/1954



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