National Aeronautics and Space Administration

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NASA Commercial Satellite Data Acquisition (CSDA) Program Update

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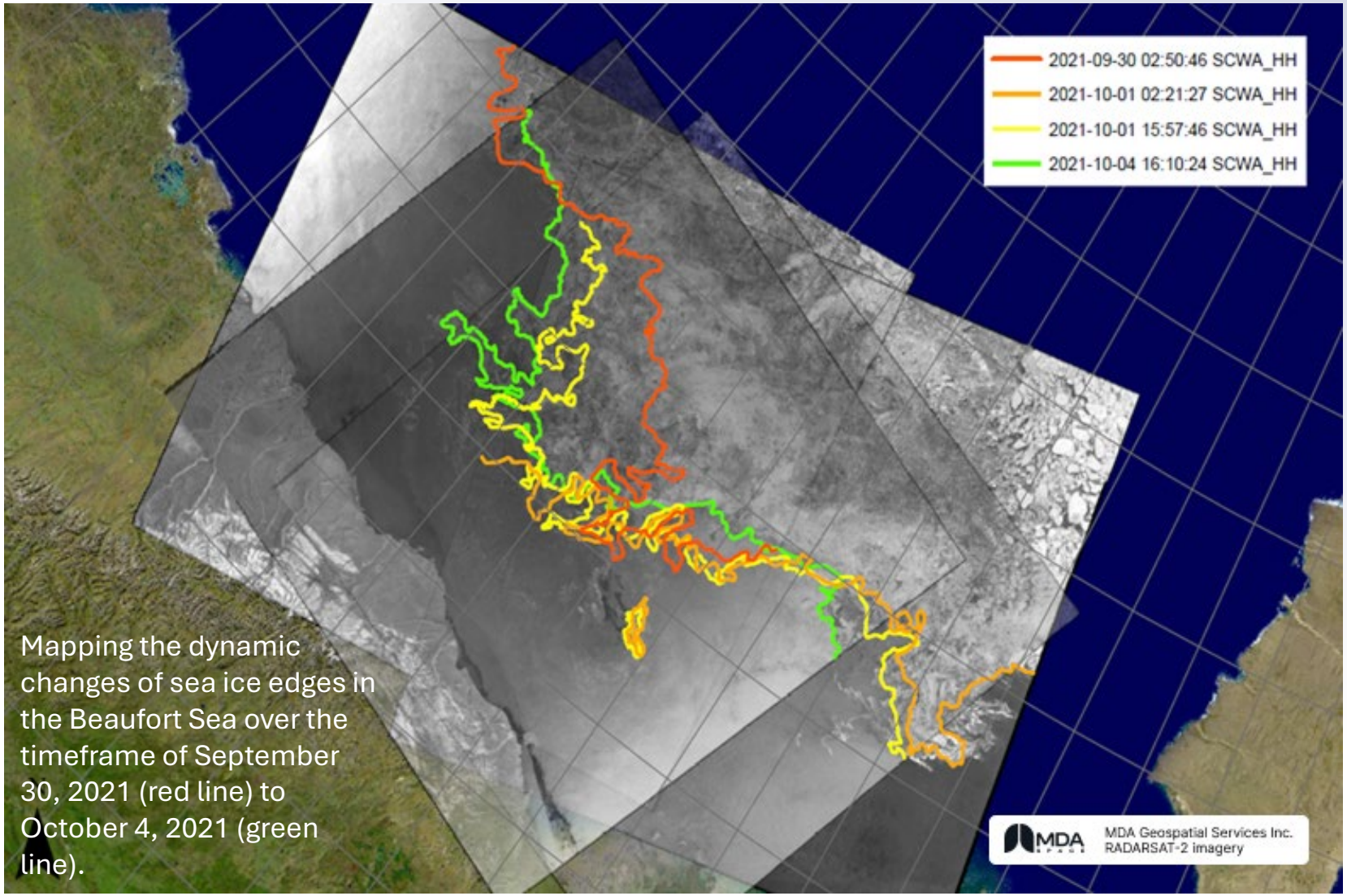
Sea Ice Mapping to Ensure Safety of Maritime Navigation using Commercial SAR data



Mapping the dynamic changes of sea ice edges in the Beaufort Sea over the timeframe of September 30, 2021 (red line) to October 4, 2021 (green line).

MDA Ice edge maps provide critical navigation assistance in ice-filled seas of the Polar region.

Deep Learning algorithms have been developed to automate the ice edge delineation as well as separation of first year ice and multi-year ice.

These efforts support ongoing science and operational needs such as vessel navigation.

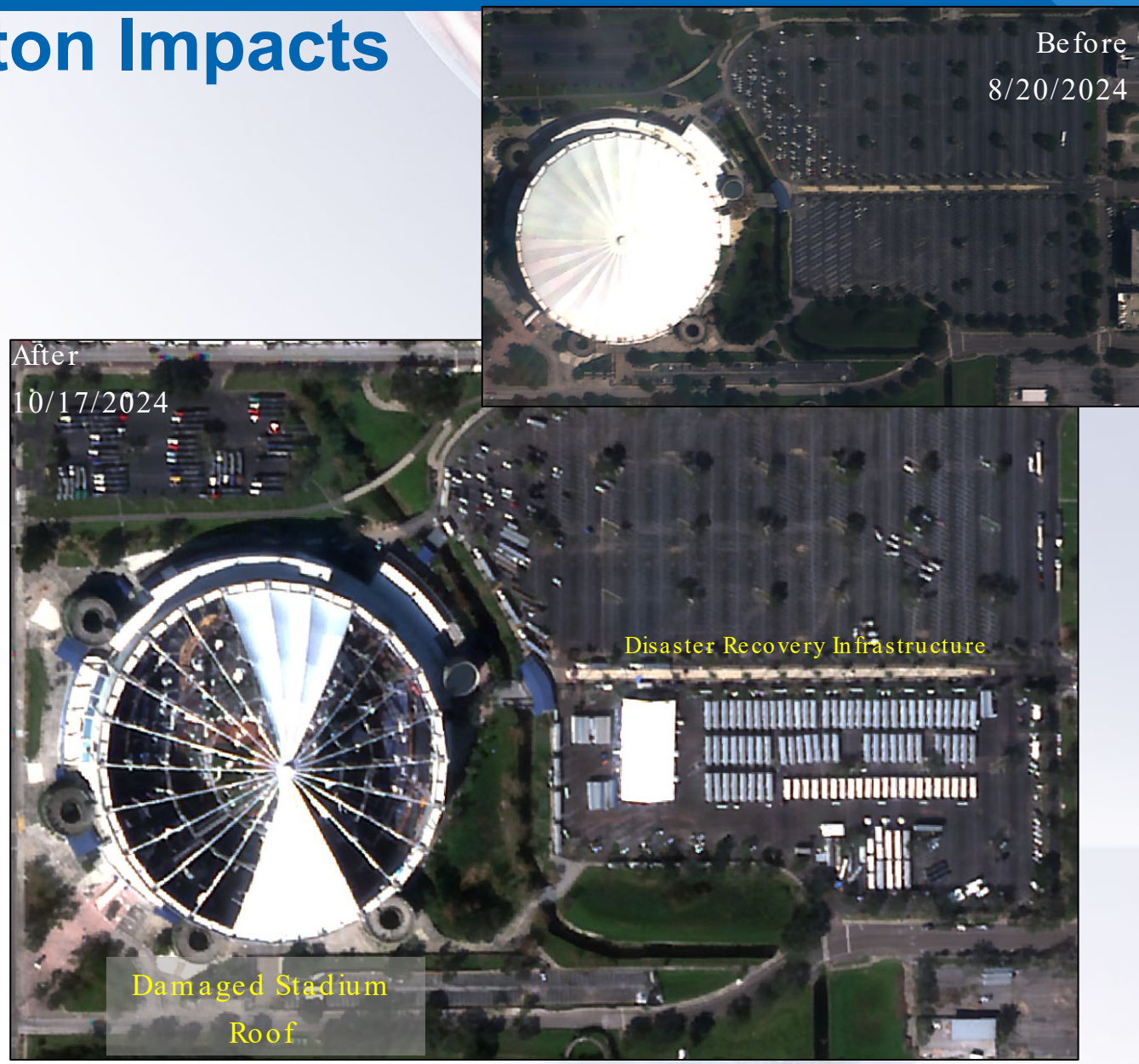
Responding to Hurricane Milton Impacts

(10/9/2024)

Satellogic's high-resolution multispectral satellites provide the following key benefits to Federal, State and Local responders:

- Frequent Revisit Rates – Ensuring the fastest access to cloud-free imagery pre and post event
- Detailed Imagery – Sub-meter resolution data enables characterization of infrastructure damage and recovery efforts planning
- Low Latency – Satellogic delivers up to 3 hours after capture to get information in the hands of a user in time to respond effectively

Satellogic imagery is in use by the International Disaster Charter and NASA to address emerging threats like hurricanes.



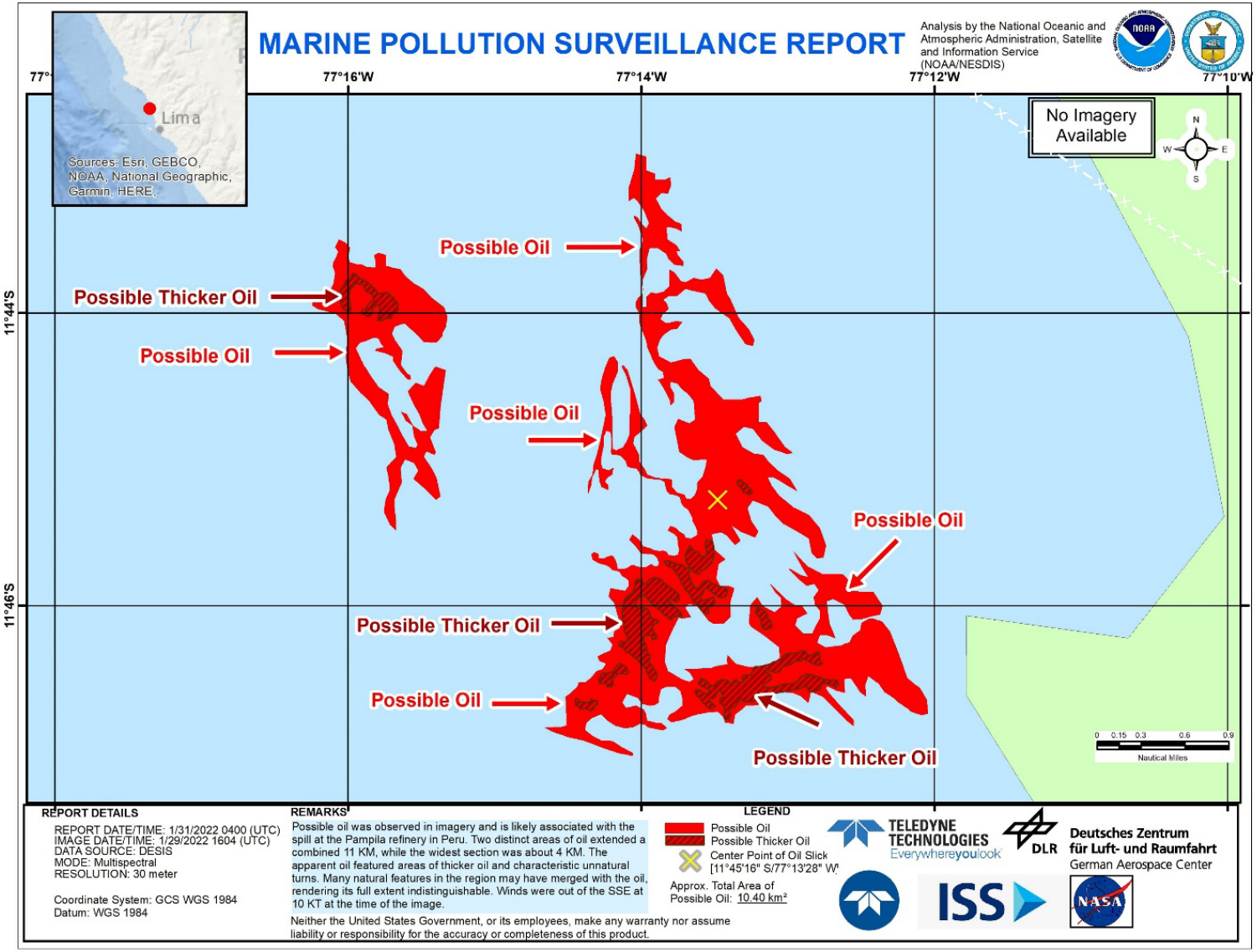
Tropicana Field | Tropicana Dr., St. Petersburg, FL 33705

Mapping Topography and Vegetation Structure Using Commercial Optical Imagery

NASA CSDA PI Hanan's Team generated a 3D point cloud over Corona Ranch in central New Mexico from a BlackSky stereo pair, showing topography and vegetation points above ground.

Darker areas in point cloud represent taller vegetation, with distinct areas of juniper-pinon dominated shrubland vegetation (dark) and grassland (lighter areas), and topographic features (mesas).

Tracking Oil Spill Extent and Thickness using Commercial Hyperspectral Imagery

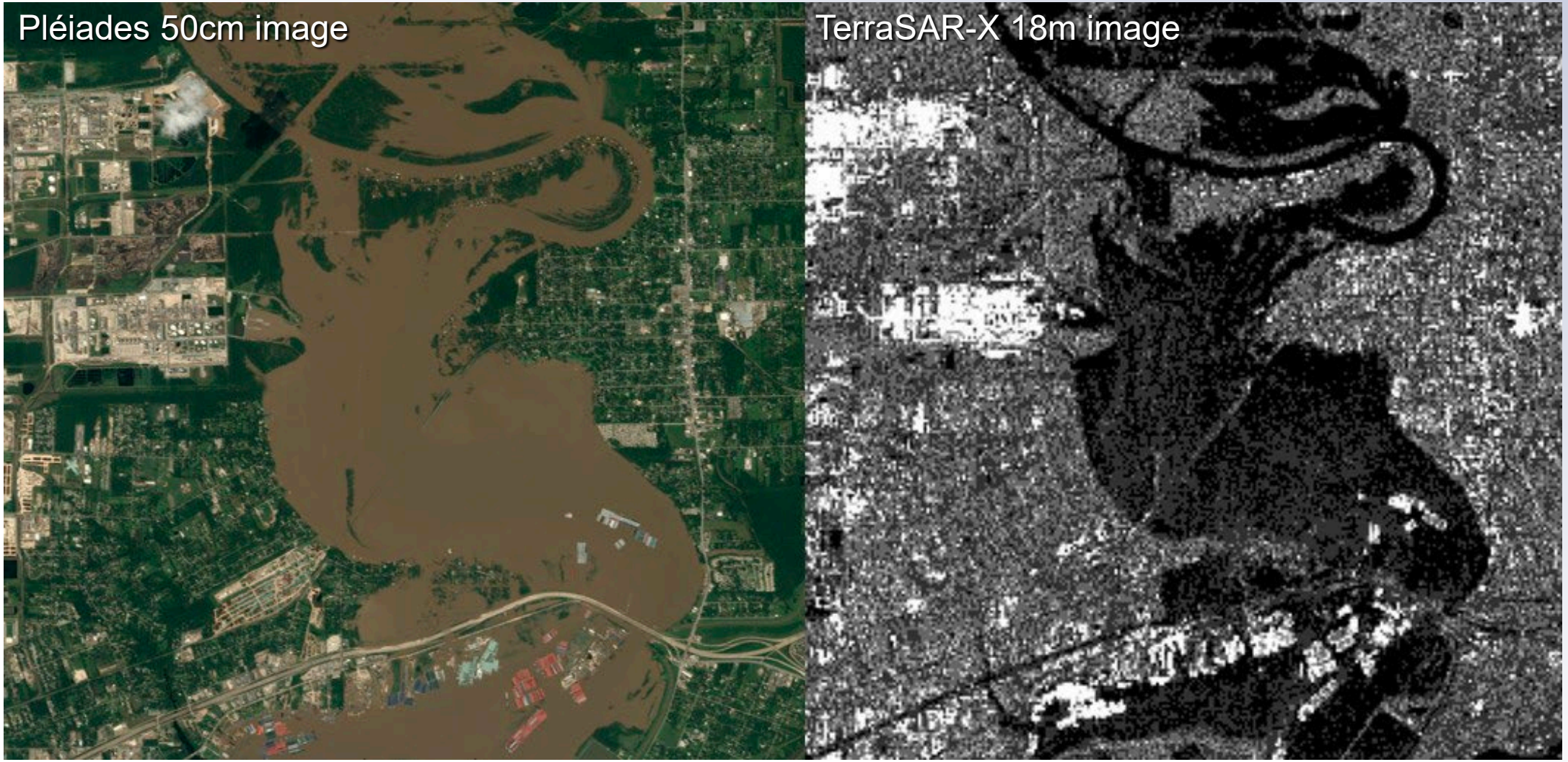


DESIS imagery collected near Pampila Refinery in Peru allowed to monitor and track an oil spill in January 2022.

DESIS data bridged a temporal data gap on January 29th allowing for better coordination across beach cleanup efforts.

DESIS data is being used for cross-sensor calibration, water quality determination, agriculture studies, environmental monitoring, snow algae investigation, and demonstration of rare earth element detection.

Flood Mapping using Commercial SAR and Optical Imagery



Houston: San Jacinto River – August 2017

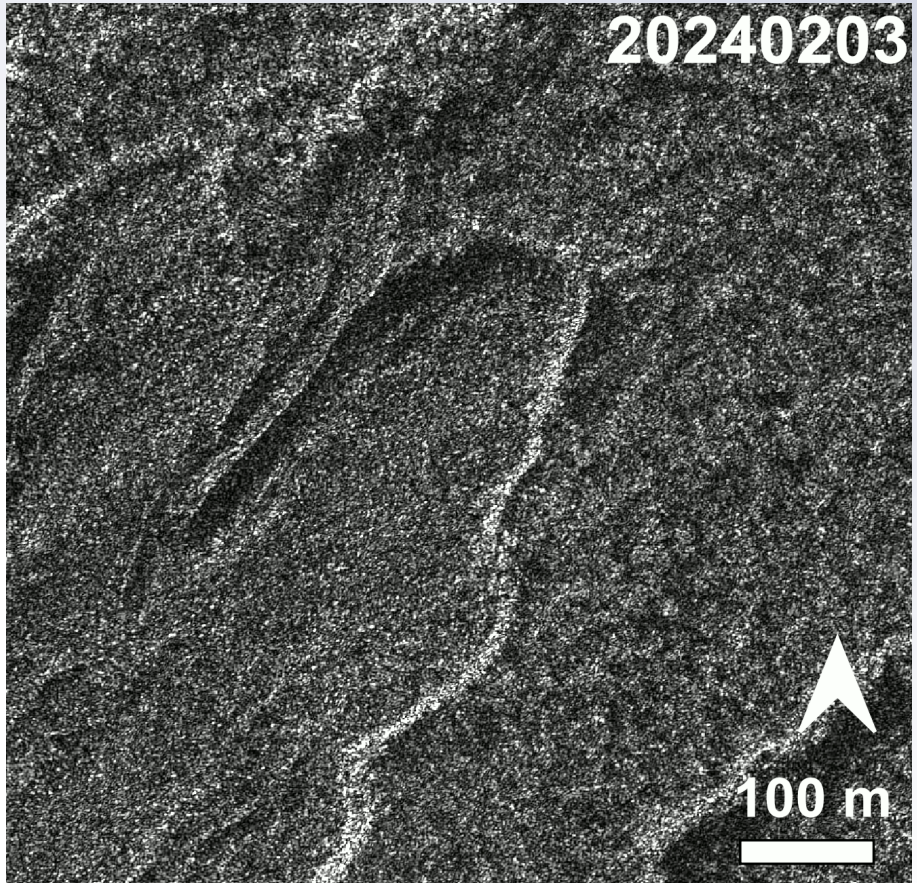
Hurricane Harvey in 2017, severely impacted Houston with rain and flooding. Both Airbus radar and optical images were collected immediately following the flood event, with cloud-free radar imaging being available up to **36 hours earlier** than optical.

Oceanic and Volcanic Applications using Commercial SAR Imagery

Ocean and volcano remote sensing using high temporal and spatial resolution SAR imagery.

- PI Sletten and his team at the Naval Research Laboratory developed techniques to track ocean waves through a long sequence of sub-aperture images which allow for estimation of ocean surface currents and bathymetry
- PI Pritchard and his team at Cornell University leveraged the high-resolution Capella imagery to track the emplacement of volcanic products, like lava flows and lava dome growth, over time

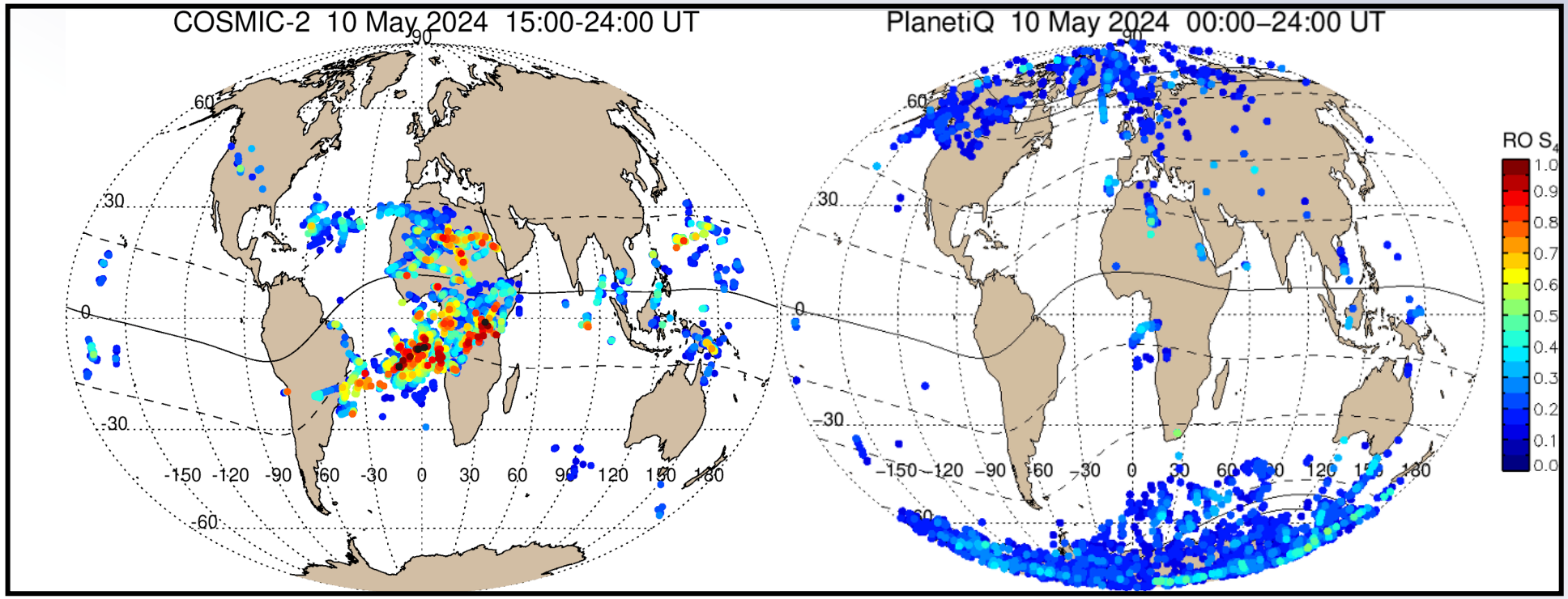
Capella spotlight data over Duck, NC collected on September 1, 2023.



Lewotobi, Indonesia lava flow from Feb-Mar, 2024 Capella Stripmap mode Geocoded Terrain Corrected Imagery

Tracking Magnetic Storm Impact with commercial GNSS-RO

In May 2024, the Earth experienced one of the strongest geomagnetic storms in decades. Irregularity geolocations derived from COSMIC-2 and PlanetiQ's with GNSS-RO data highlight how they complement each other.



The strong solar storm in May 2024 created scintillation noise data showing the locations of ionosphere disturbances:

- Important for DoD communications, GNSS accuracies, HF communications, whether aircraft can fly over the poles or not, and Space Force's and Intelligence communities' space environmental situational awareness
- PlanetiQ provides global data, with higher concentrations at higher latitudes and the poles, where COSMIC-2 has no coverage

Providing NASA Scientists and Broader US Researchers Access to Commercial Data

- Rapid temporal revisit by commercial data providers often provide initial imagery in urgent response activities.
- High temporal revisit and spatial resolution lends itself to novel methods that would not be possible before.
- Observations in different spectral bands enrich existing datasets.

- Specifically:
  - High resolution stereo imagery enables generation of high-resolution topographic maps, combined with targeted acquisitions that enable volumetric change analysis
  - Rapid revisit and high-resolution radar imagery enable mapping of sea-ice, flooding and volcanoes
  - Flexible acquisition geometries enabled by agile commercial platforms allow looking into hard to image environments like volcanic craters
  - Optical and SAR Video observations enable analysis of changes of ground conditions within a span of a few seconds
  - Commercial data can provide coverage where existing assets don’t, filling a data gap

Acronyms

3D	Three Dimensional
CSDA	Commercial Satellite Data Acquisition
DESIS	DLR Earth Sensing Imaging Spectrometer
GNSS	Global Navigation Satellite System (GNSS)
GNSS-RO	GNSS Radio Occultation
HF	High-Frequency
PI	Principal Investigator
SAR	Synthetic Aperture Radar

Learn more about CSDA

https://earthdata.nasa.gov/csda

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science.nasa.gov/earth

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