
SATY
Planet & Synspective satellite image
Mar 2024



Sustainable Navigation: Planet and SATY Workshop for Natural Resources and Environment, Agriculture, Construction and Transportation in Vietnam

January 17, 2024 | 09:00 am - 1:30 pm ICT

Hai Chau District, Da Nang, Vietnam • October 29, 2023

Meet the Speakers



So San Wong
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Planet



Rose Nguyen
Sales Development Representative, APJ
Planet



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General Director,
SATY

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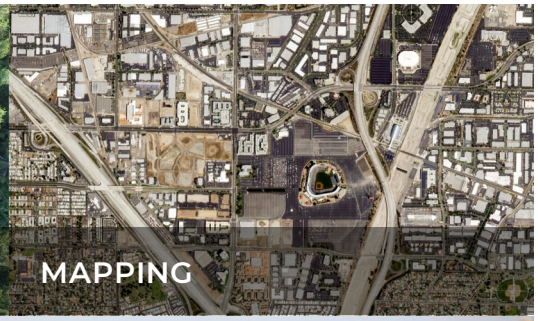
DEFENSE & INTELLIGENCE


EMERGENCY MANAGEMENT

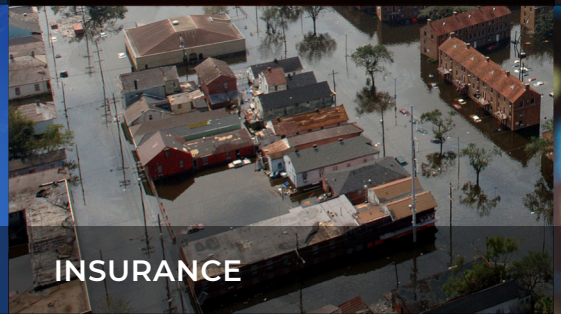

FORESTRY


MAPPING


ENERGY & INFRASTRUCTURE


AGRICULTURE


CIVIL GOVERNMENT


INSURANCE


FINANCE & BUSINESS INTELLIGENCE

Planet's Value Proposition

Planet's always-on monitoring capability, paired with high resolution tasking, deliver the freshest imagery available, anywhere on the globe. Planet analytic solutions extract insights at a cadence unmatched in the industry and government.



Global Coverage

Observe every location on Earth's landmass



High Revisit

Fresh insights from the most recent imagery



High Satellite Capacity

Greater predictability with tasking imagery



Analytics At Scale

Decrease manual labor, save time to get to insights

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TODAY'S CHALLENGES FOR GOVERNMENT

Governments are responsible for the economic, social, physical, and environmental health of their constituencies. However, lack of adequate data and insights make the design, implementation, and validation of successful policies an enormous challenge.



Lack of visibility

Lack of large area visibility leaves decision makers uninformed



Cost effectiveness

Governments must make the most efficient use of limited resources



Poor existing data

Existing data is outdated and has gaps, data collection is slow and not scalable



Limited access Geospatial data

There are barriers to using geospatial data due to technical complexity

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An Example of Lack of Visibility

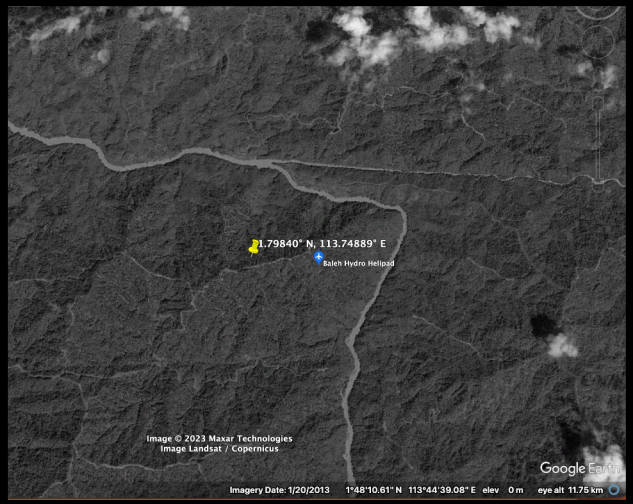
Baleh Power Plant in Kapit, Sarawak



Planet Basemap
Aug 2023



Planet Basemap
Sep 2023



Google Earth
January 2013

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CHALLENGES IN AGRICULTURE

Agriculture is a key sector, crucial for economic growth and the health of the population. However, there are many challenges in the efficient management of agricultural lands, which can cover large areas and are subject to risks threatening food security, the environment, and public budgets.



Infrequent data collection

Lack of updated information throughout the season



Low resolution

Field-level detail (including small parcels) is necessary for effective monitoring



Limited coverage

Need full country visibility, including remote fields which are difficult to access



Cost effectiveness

Limits to in-person monitoring and field deployment

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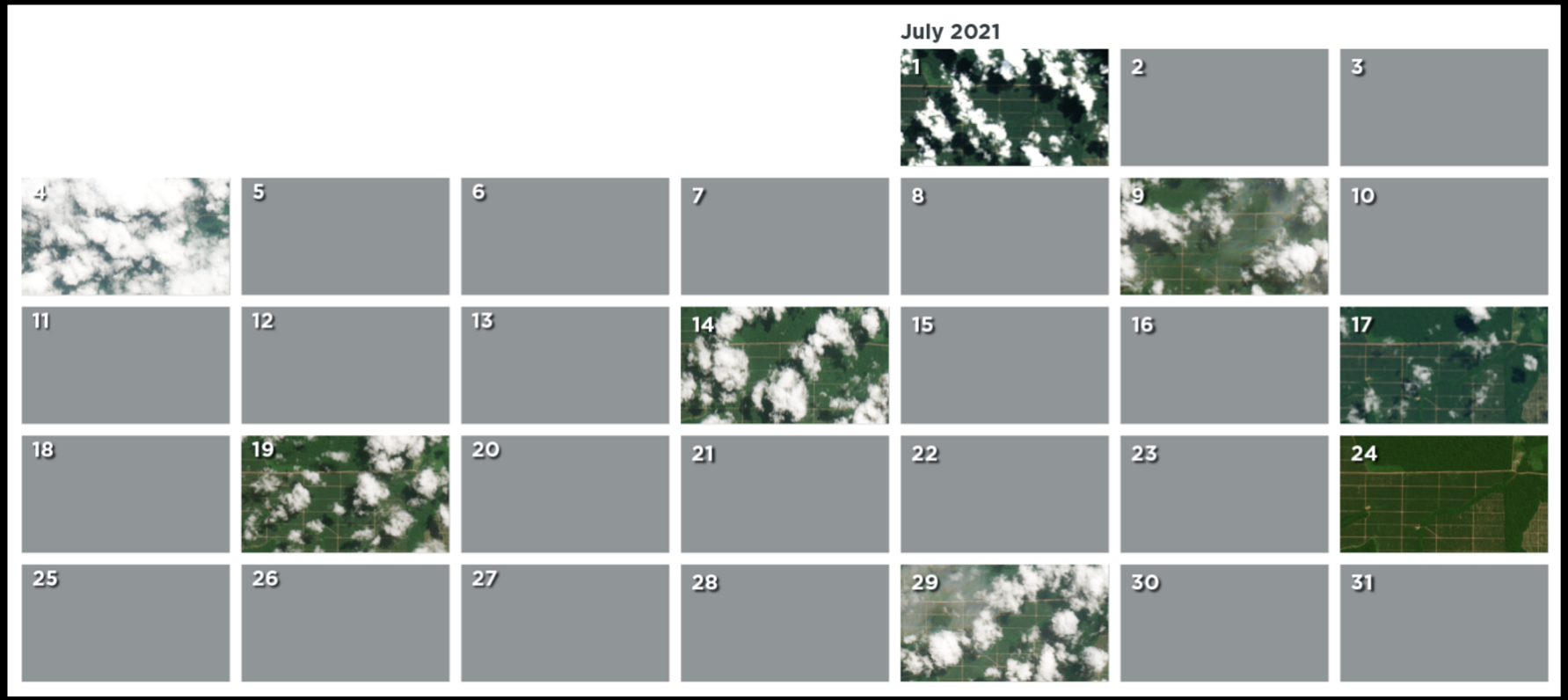
Infrequent Public Datasets

Landsat & Sentinel-2



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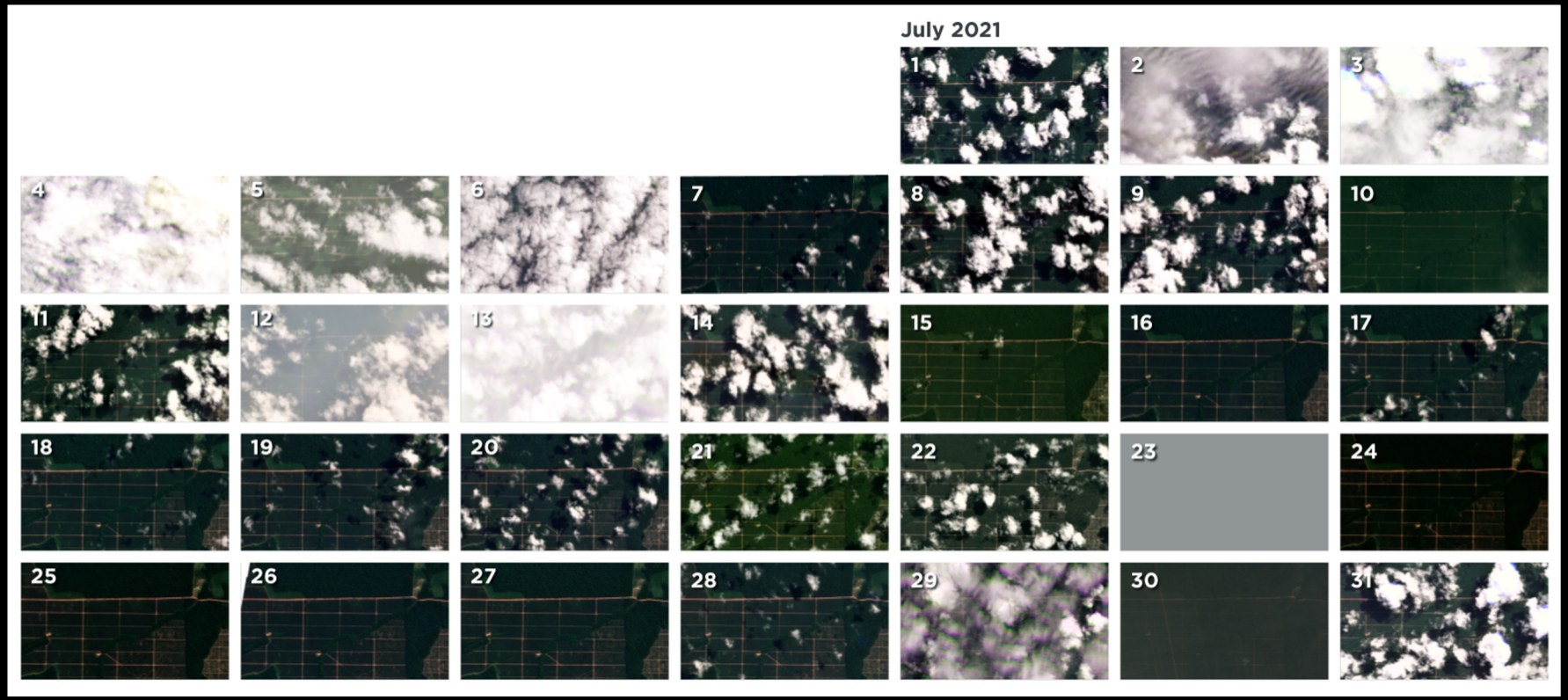
Frequency Matters

PlanetScope Near-Daily Imagery, no tasking required



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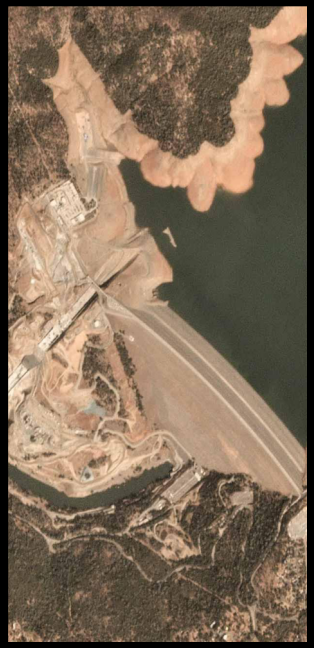
Planet Product Solutions

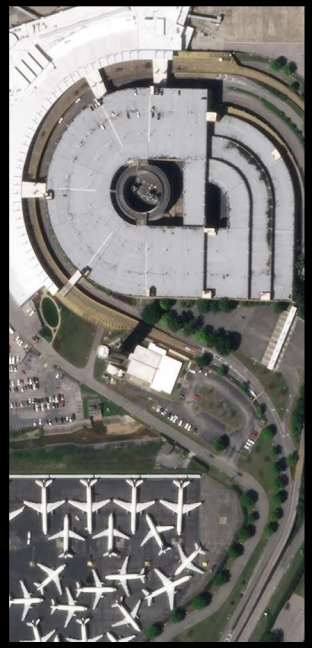
Monitoring

PlanetScope
3.7 m imagery updated on a near-daily basis



Tasking

SkySat imagery tasking with the highest intraday revisit capability commercially available



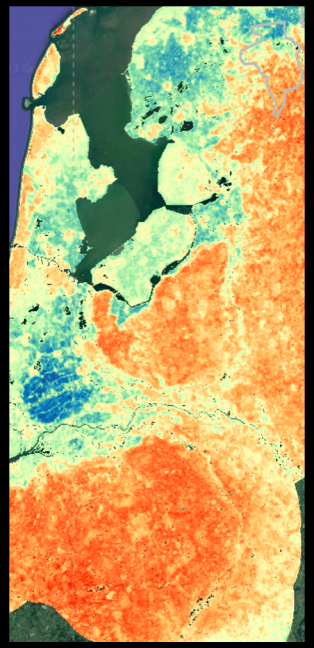
Basemaps

Visually consistent and scientifically accurate imagery over broad areas



Planetary Variables (PV)

Soil moisture, surface temperature, biomass proxy and forest carbon



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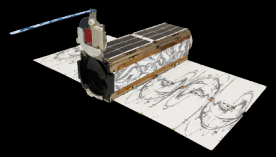
Agile Space Missions

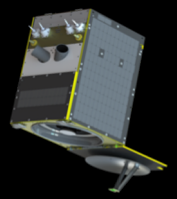
CURRENT CONSTELLATIONS



SuperDove

Always-on Monitoring

- ~180 satellites
- 3m resolution
- Up to 300 million km^2 / day
- 8-band: Blue, Coastal Blue, GreenI, GreenII, Red, Yellow. NIR, RedEdge

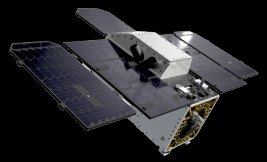


SkySat

High-Resolution Tasking

- ~20 satellites
- 50cm resolution
- RGB, NIR, and Pan bands
- Sub-daily tasking

PLANNED FUTURE CONSTELLATIONS



Tanager

Hyperspectral Tasking

- 400 - 2500 nm
- ~400 5nm bands
- Technical demo planned to launch late 2024



Pelican

Very High Resolution Tasking

- Initial fleet of up to 30 satellites[1]
- 30cm resolution
- Up to 30 revisits/day

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[1] Does not include initial 2 demonstration satellites planned for FY'24.

Near Daily Revisit of Planetscope and Sub-daily Revisit of SkySat

Planetscope
Near Daily Imagery:

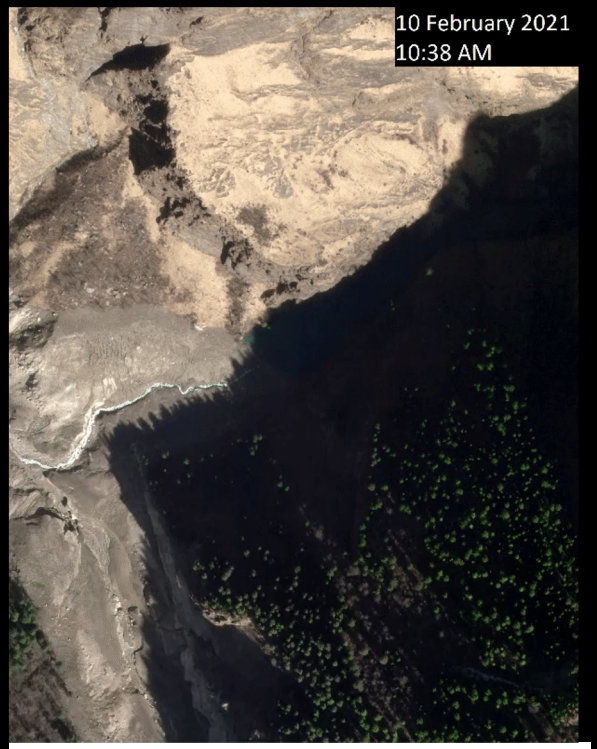
- Broad Area Mapping
- Regular Monitoring for Agriculture, Border, Forest, Urban etc

SkySat Daily/
Sub-daily Imagery:

- Very high resolution monitoring (50cm)
- Defence and homeland security
- Disaster/ Emergency



Nebraska growing season 2018
Planetscope Near Daily



Rishiganga Landslide Lake 2021
SkySat Sub-daily

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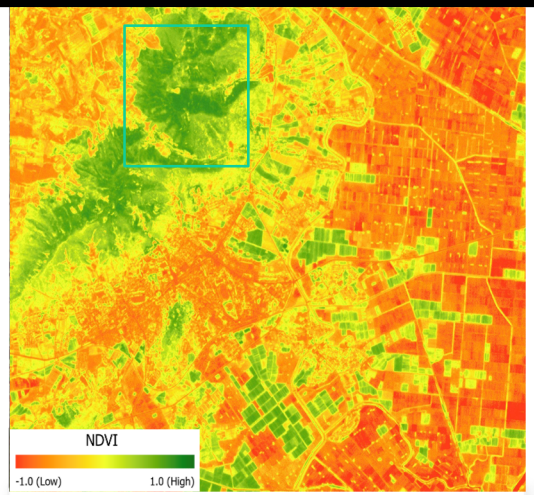
PlanetScope: NDVI, RENDVI, PRI

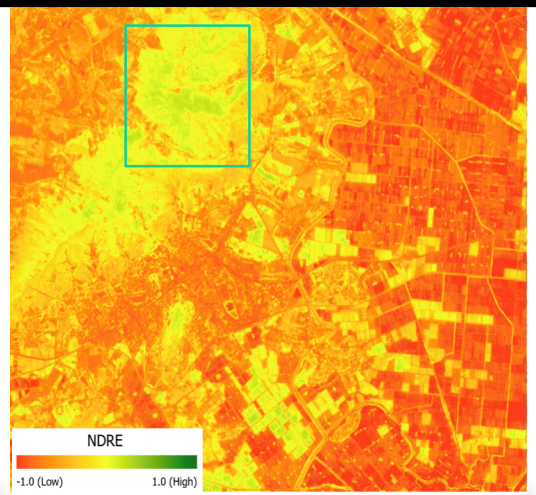


PlanetScope Visual image



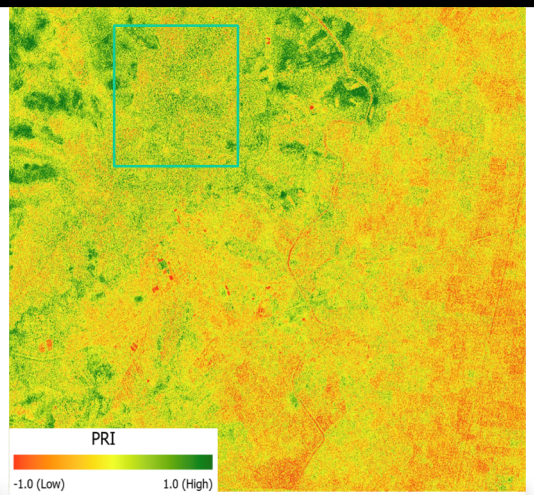
Normalised Difference Vegetation Index (NDVI)

$$NDVI = \frac{NIR - Red}{NIR + Red}$$



Red Edge NDVI (RENDVI)

$$Red\ Edge\ NDVI = \frac{NIR - Red\ Edge}{NIR + Red\ Edge}$$



Photochemical Reflectance Index (PRI)

$$PRI = \frac{Green\ I - Green\ II}{Green\ I + Green\ II}$$

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Planet Tip & Cue

Tip & Cue workflows combine a passive, high-frequency monitoring solution can generate the **“tip” of a new event** that **indicates where to task a high-resolution image**, or where to send on-the-ground field teams, for a closer look.

Tip & Cue leverages on Planet’s **enormous daily image capture** (~ 3m images each day) and **high-resolution intra-day SkySat tasking** capacity to find the most valuable insights.

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Paired with very high resolution imagery, provides strong and immediate compliance alerts



Evidence of current human activity in the Skysat imagery

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GLOBAL BASEMAP



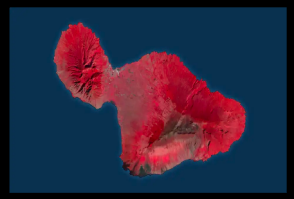
Global Basemaps

- 1.5+ million scenes incorporated daily to create a smooth contextual layer, updated annually, and ready for your workflow.
- Global AOI.
- Available via WMTS (streaming only)

PS SELECT BASEMAPS



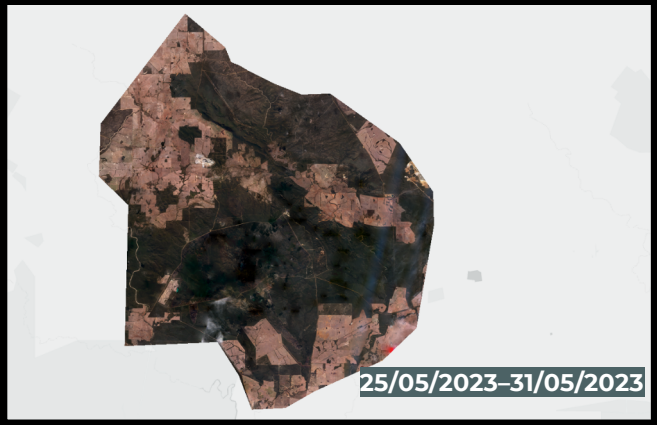
Visual Basemaps



Surface Reflectance Basemaps

- Customers define AOI.
- Spatial resolution of 4.77 meters.
- Available quarterly, monthly, biweekly, or weekly.
- Visual or surface reflectance formats. Access them via streaming or download.

SkySat CUSTOM BASEMAPS



Custom Basemaps

- Customer-defined AOI and TOI.
- Spatial resolution of .59 meters.
- These basemaps are provided in either visual or CIR (Color Infrared) format.
- Can be accessed via Web Map Tile Service (WTMS) or downloaded for use.
- The basemaps follow a specified tasked cadence

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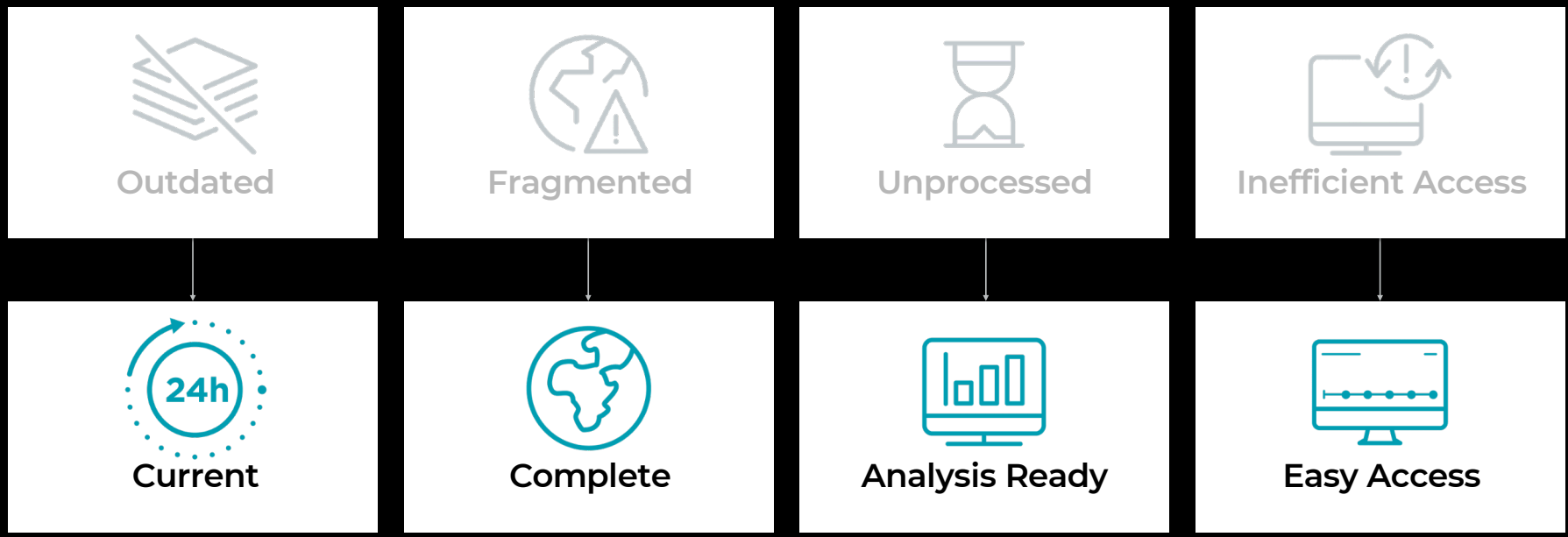
HOW PLANET BASEMAPS DIFFER

With daily, global imaging, Planet creates current, complete, and analysis-ready Basemaps, customizable by area and time of interest and easily accessible in your preferred environment.



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Monthly PS Basemaps of Hanoi:

January - December 2023 (Timelapse)



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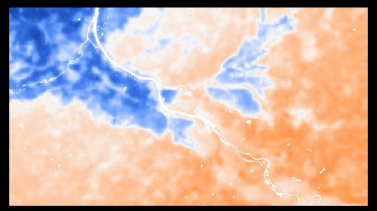
Measuring Key Phenomena on the Earth's Surface



SOIL WATER CONTENT



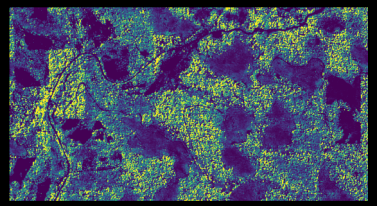
LAND SURFACE TEMPERATURE



BIOMASS PROXY

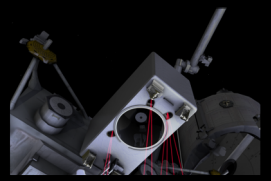


FOREST STRUCTURE



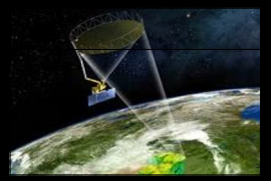
FOREST CARBON

A Virtual Constellation of Planet and Public Sensors

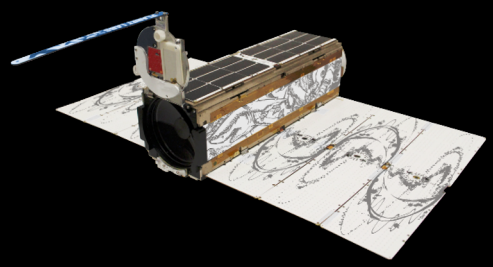












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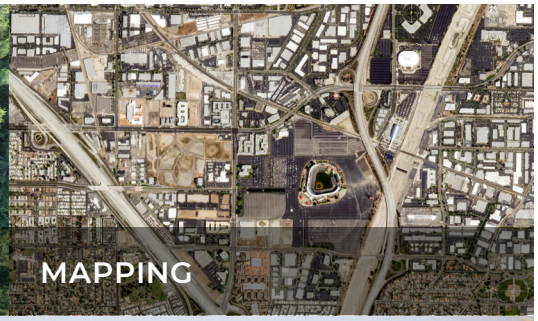
DEFENSE & INTELLIGENCE


EMERGENCY MANAGEMENT


FORESTRY


MAPPING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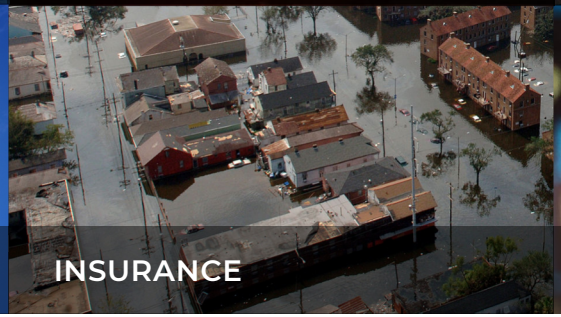
INSURANCE


FINANCE & BUSINESS INTELLIGENCE

Use Cases For Disaster/ Emergency Support

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Emergency Applications

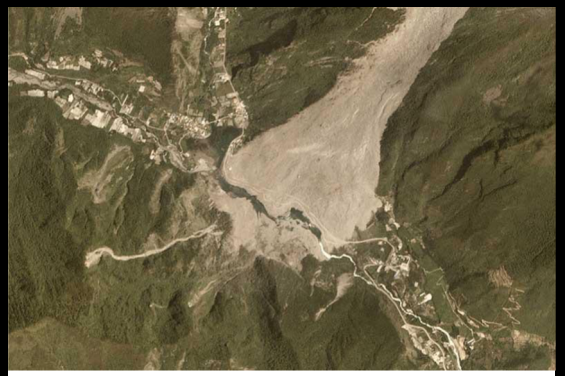
High frequency monitoring and archive ensure that customers always have ongoing coverage and access to the most recent pre- and post-event disaster imagery, enabling greater situational awareness and more informed action



RISK REDUCTION



RESPONSE



RECOVERY
AND RESILIENCE

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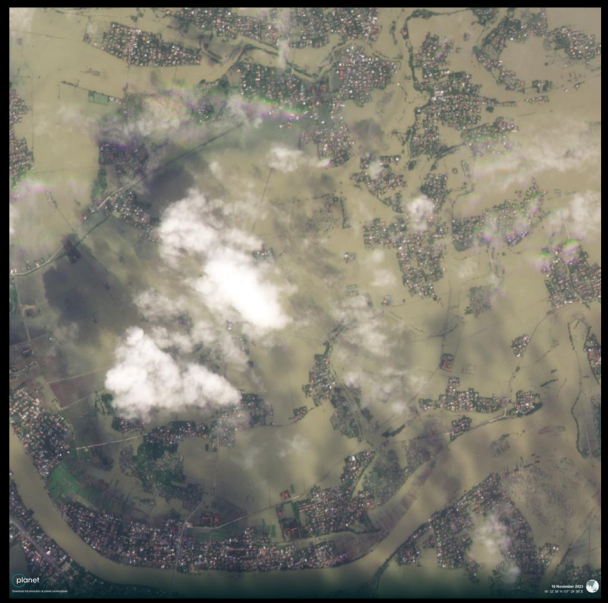
Flooding in Hue, Vietnam

High frequency monitoring and archive ensure that customers always have ongoing coverage and access to the most recent pre- and post-event disaster imagery, enabling greater situational awareness and more informed action



BEFORE
10 November 2023



FLOOD
16 November 2023



POST FLOOD
10 December 2023

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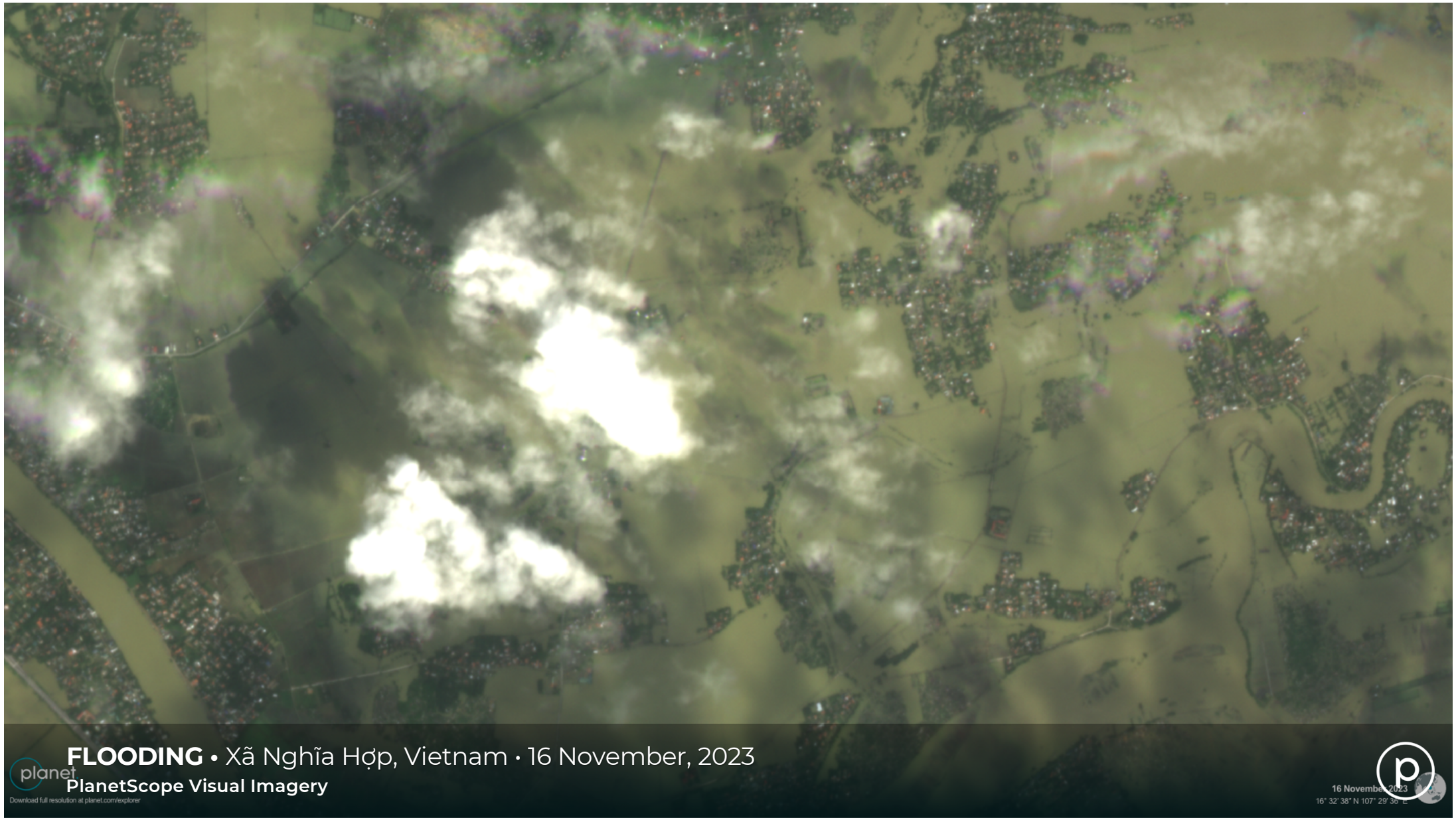
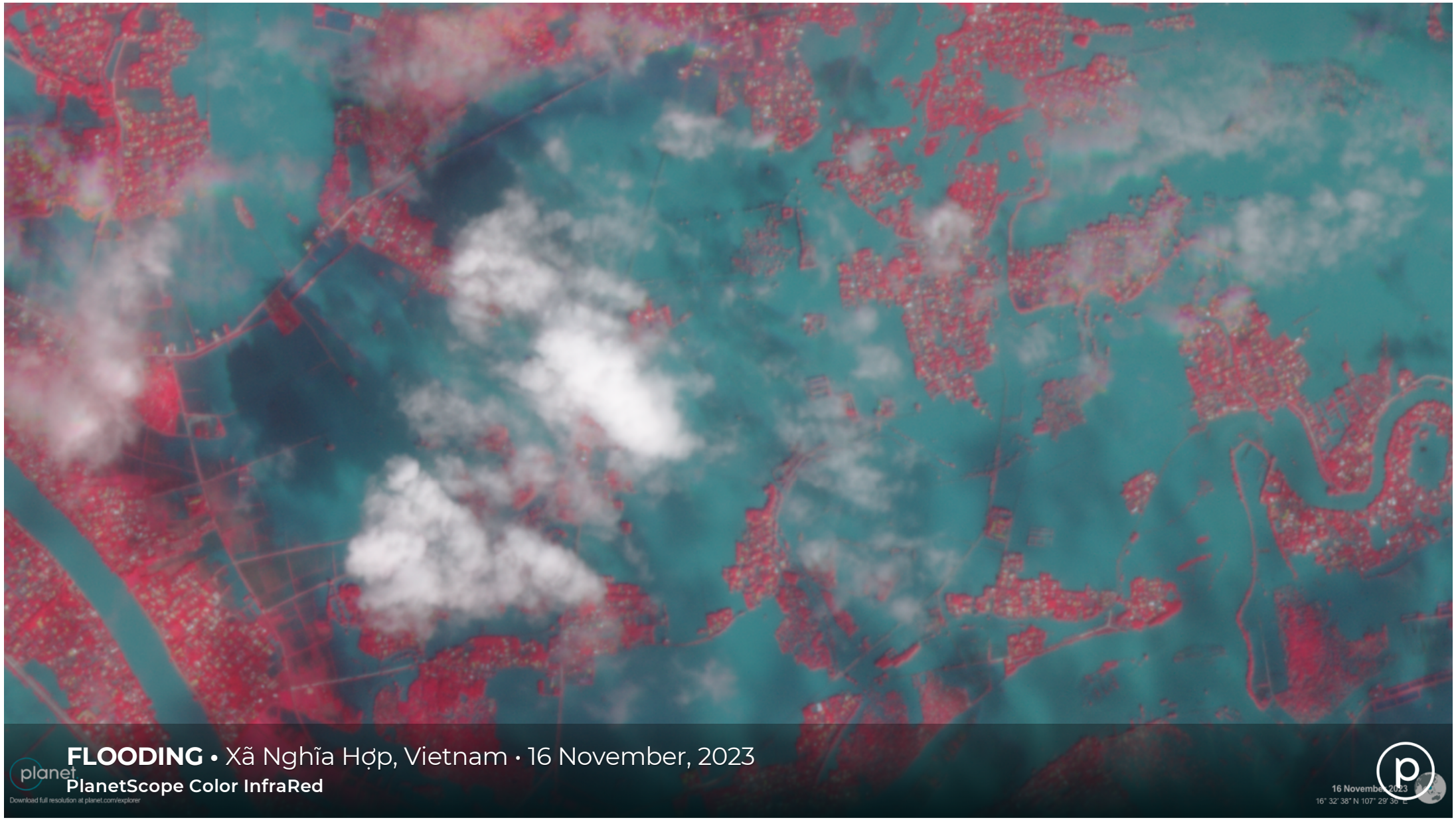
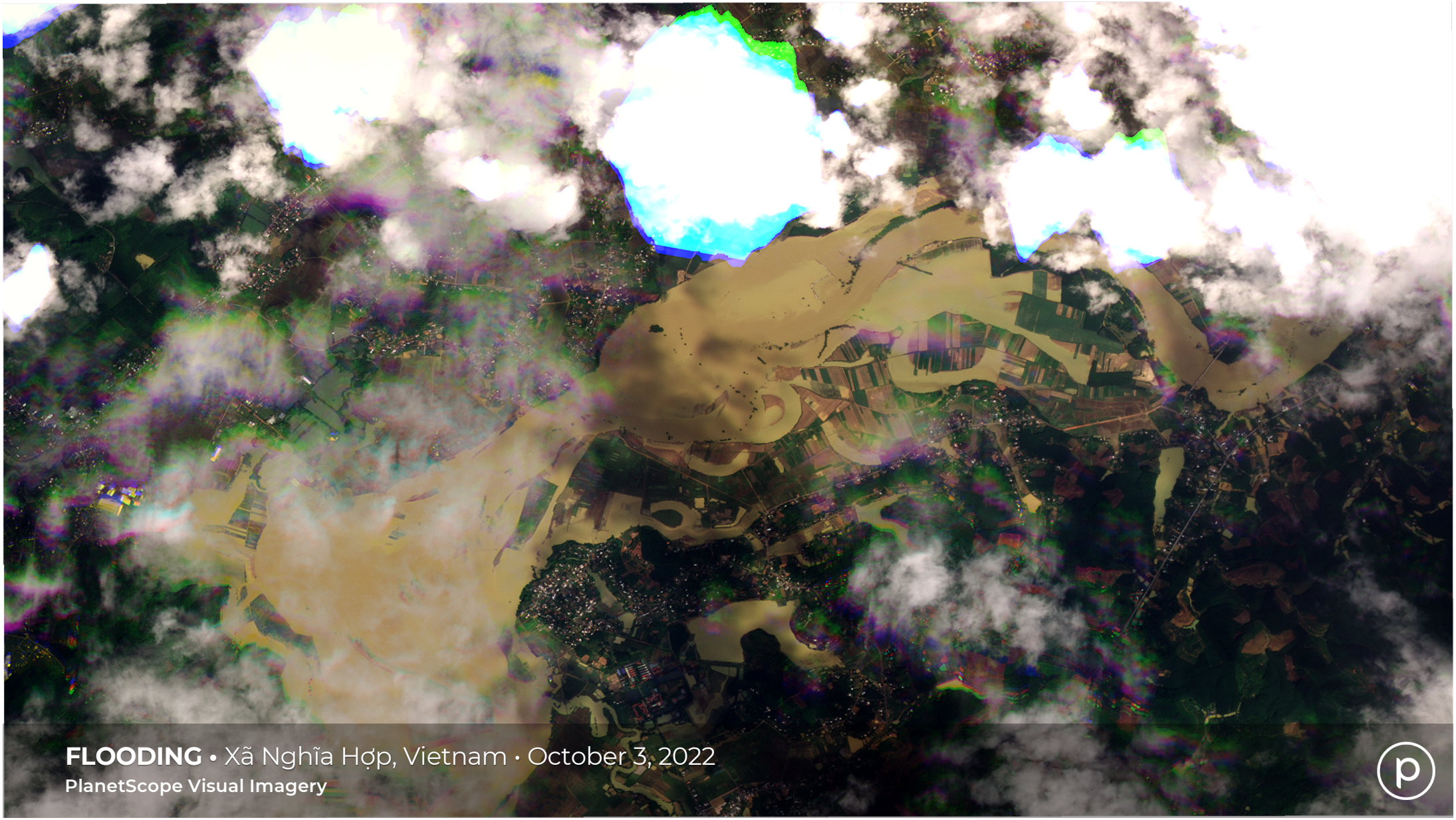
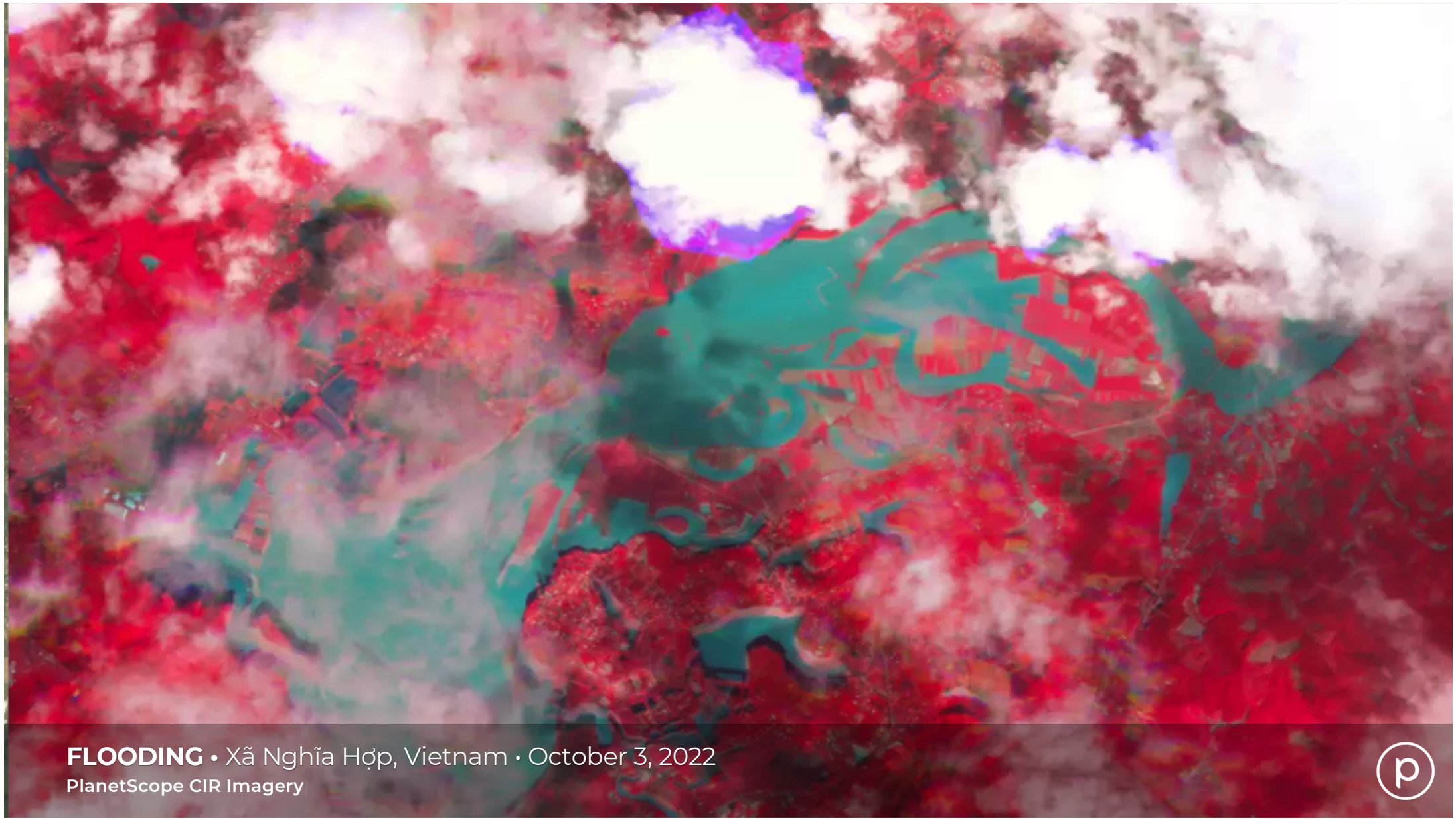

FLOODING • Xã Nghĩa Hợp, Vietnam • 16 November, 2023
PlanetScope Visual Imagery
Download full resolution at planet.com/explorer
16 November 2023
16° 32' 38" N 107° 29' 36" E


FLOODING • Xã Nghĩa Hợp, Vietnam • 16 November, 2023
PlanetScope Color InfraRed
Download full resolution at planet.com/explorer
16 November 2023
16° 32' 38" N 107° 29' 36" E


BEFORE FLOODING • Xã Nghĩa Hợp, Vietnam • September 19, 2022
PlanetScope Visual Imagery


FLOODING • Xã Nghĩa Hợp, Vietnam • October 3, 2022
PlanetScope Visual Imagery


FLOODING • Xã Nghĩa Hợp, Vietnam • October 3, 2022
PlanetScope CIR Imagery



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AFTER FLOODING • Ba Don Vietnam • October 22, 2020

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Forest Fire Monitoring

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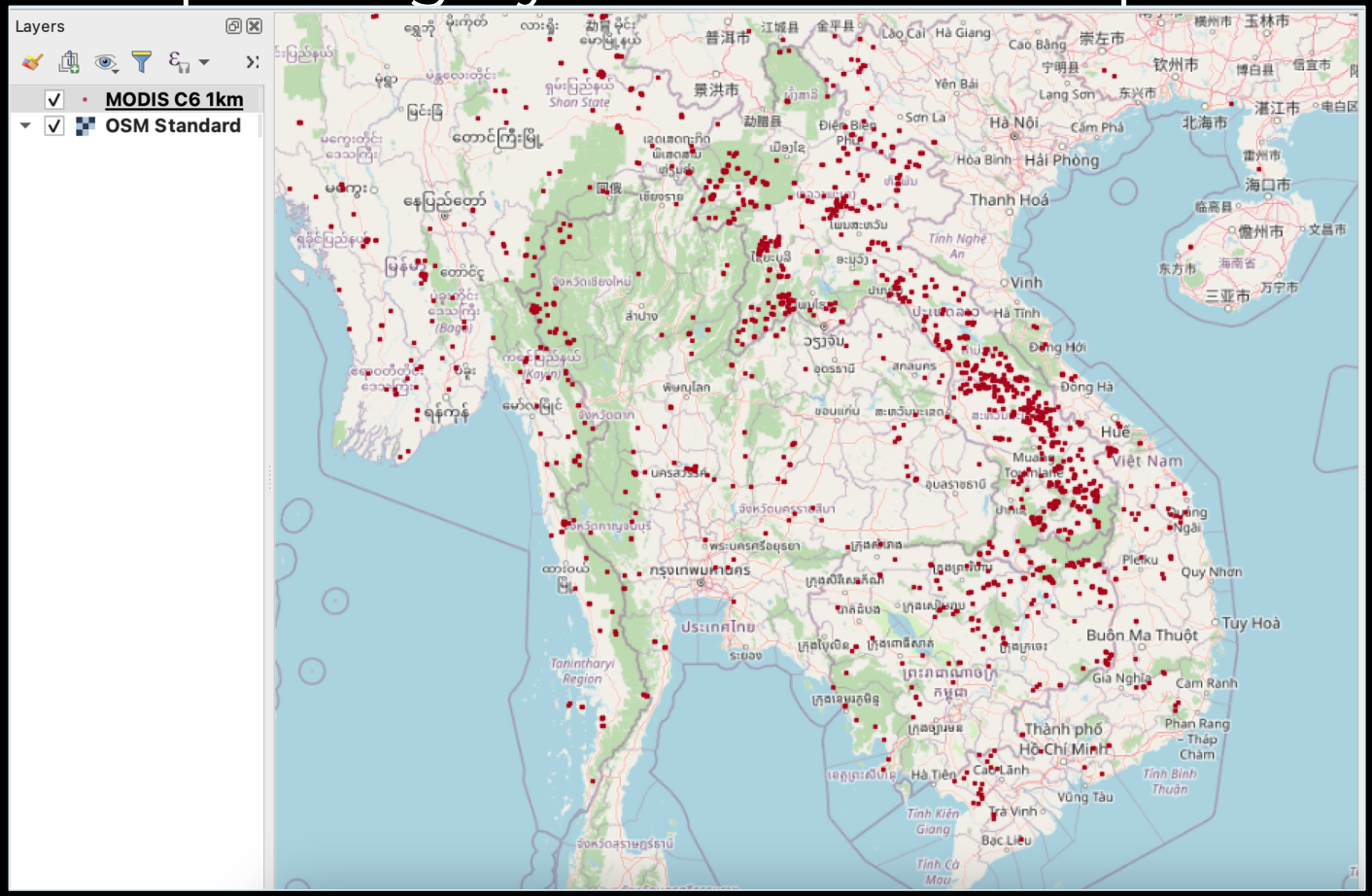
The location of the fire can be verified by using both PlanetScope imagery and MODIS hotspot data



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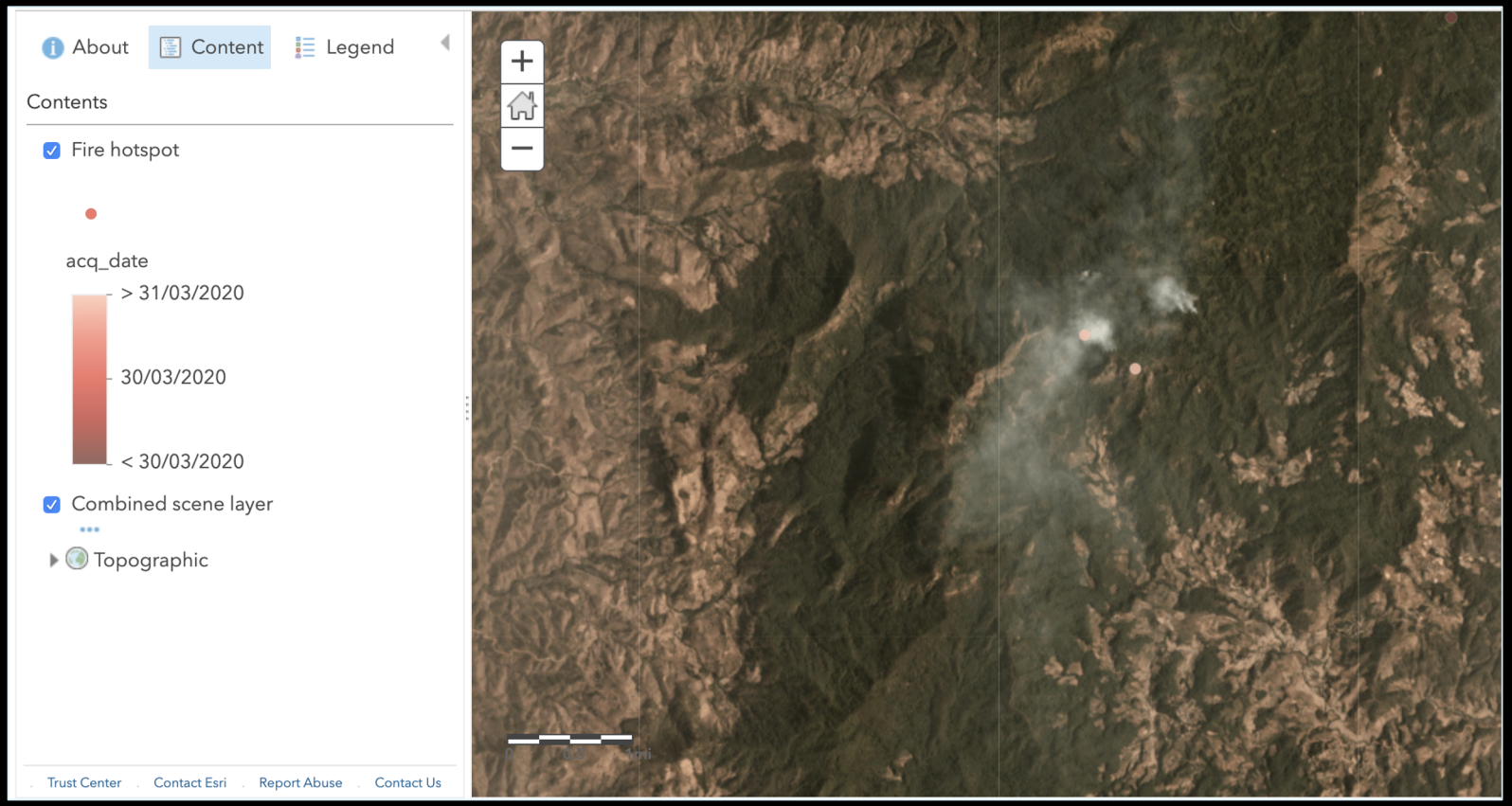
18 March 2020
Planetscope
4m Visual



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24 March 2020
Planetscope
4m Visual



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28 March 2020
Planetscope
4m Visual



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30 March 2020
Planetscope
4m Visual



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Burned area assessment by using PS multispectral data



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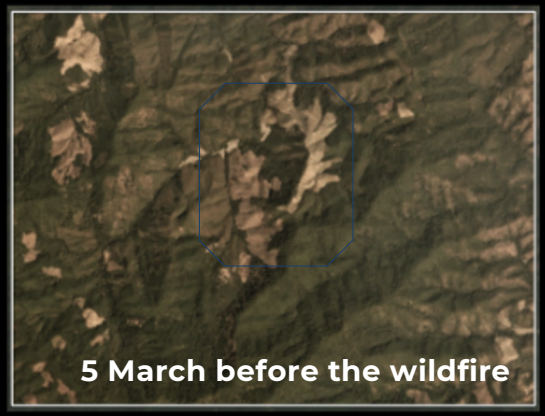
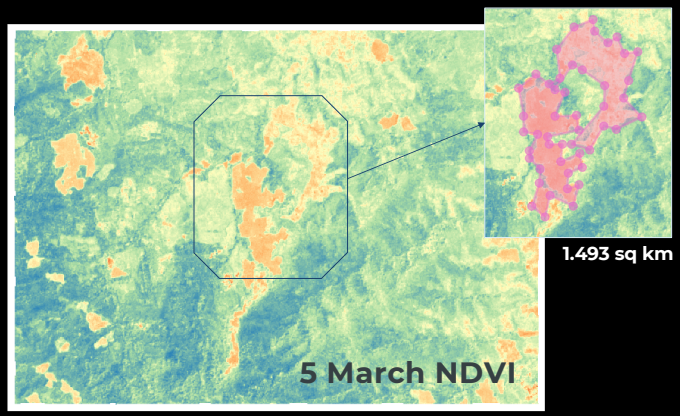
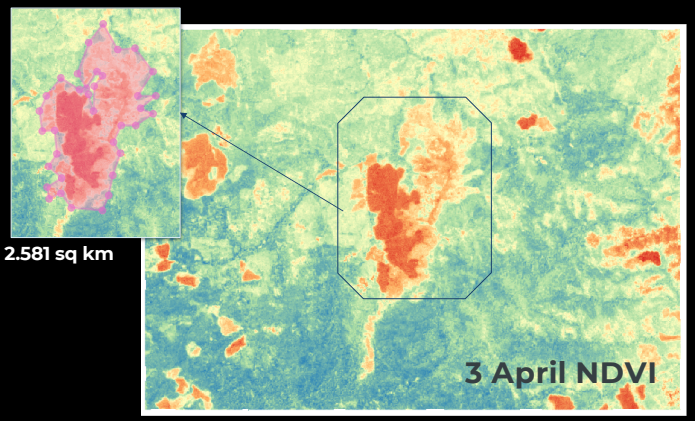
Burned area assessment by using PS multispectral data









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Forest fire monitoring - burned area estimation

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Forest Fire at Kapuas, Central Kalimantan

Coordinates: 2.43263° S, 114.39526° E



Before: May 4, 2019



During: September 14, 2019



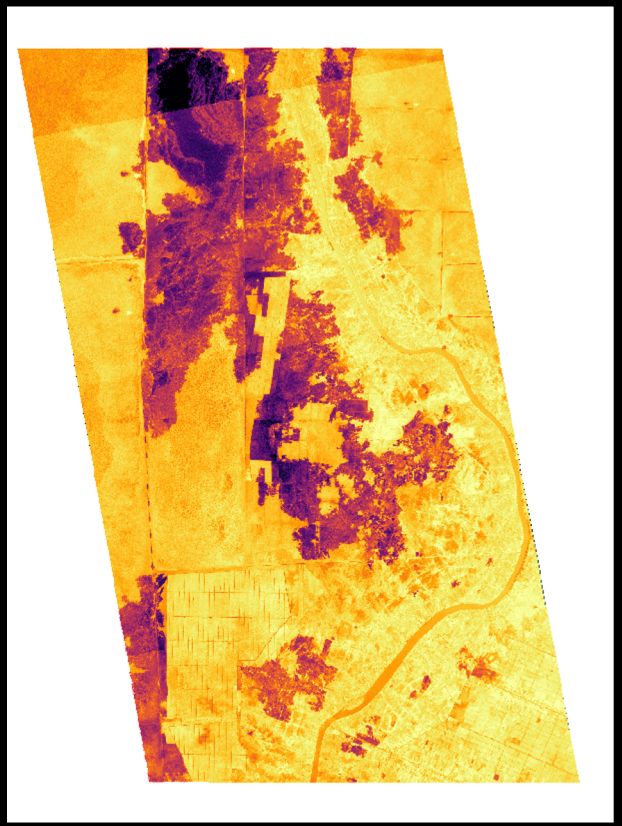
After: October 8, 2019

Forest Fire at Kapuas, Central Kalimantan

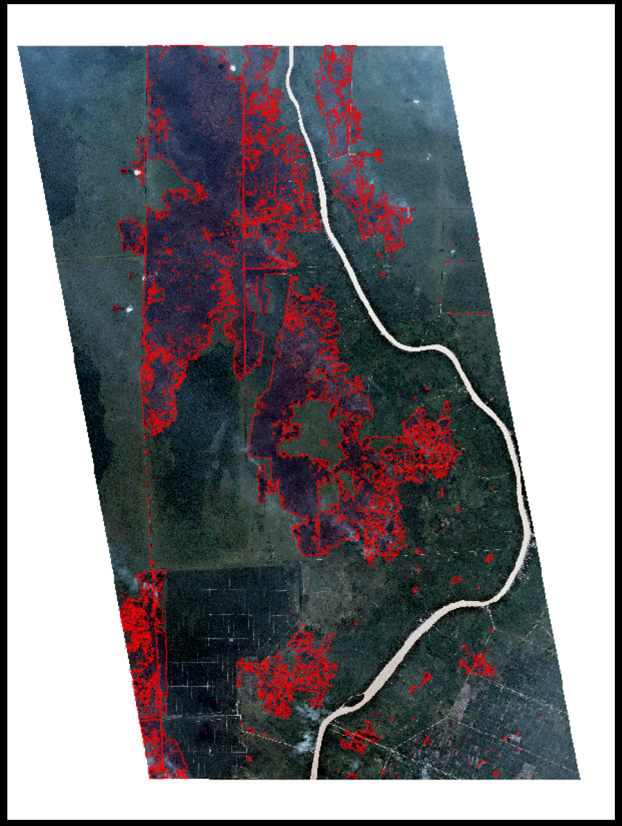
Coordinates: 2.43263° S, 114.39526° E



After: October 8, 2019



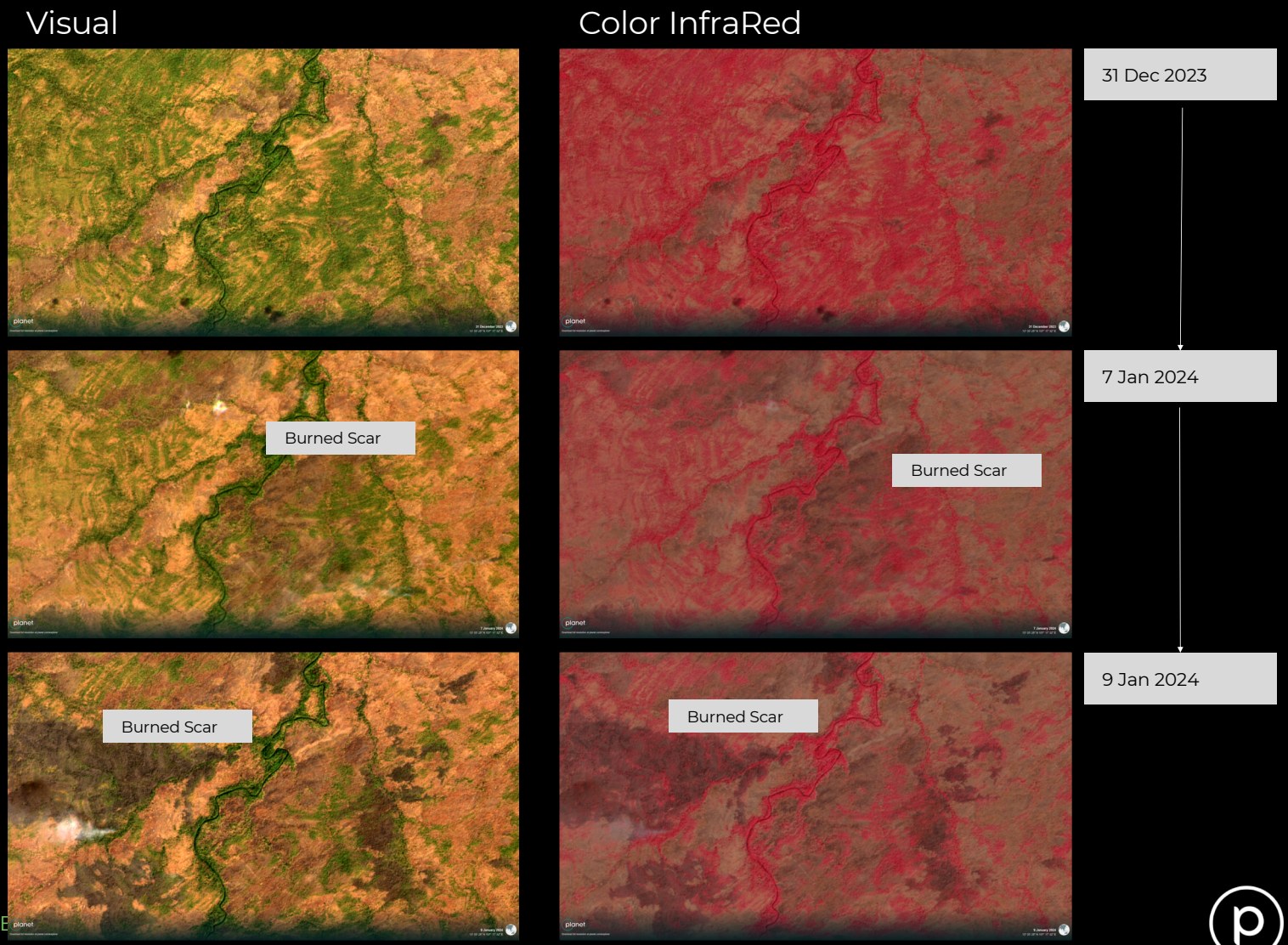
Burned Area Index (BAI)



Estimated burned area: 174.99 km^2

Burned Scar Assessment

Srae Huy, Cambodia



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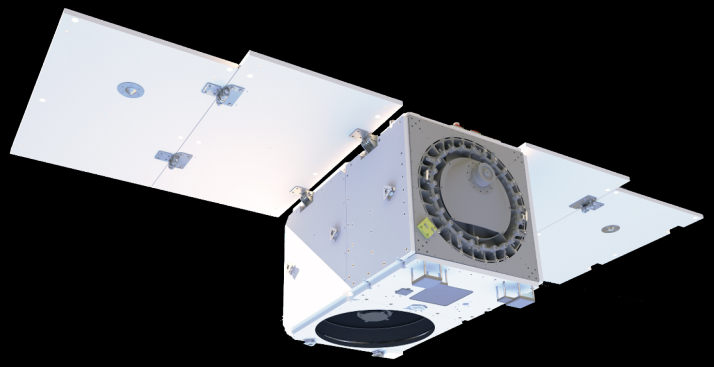
High Revisit, High Res Data

Meet Pelican



Planet's next-generation satellite constellation for delivering high-resolution, rapid revisit information – anywhere on the globe.

RESPONSIVE • RAPID REVISIT • HIGHLY PRECISE • INTEROPERABLE

EXPANSIVE COVERAGE

UP TO

30

satellites[1]

GREATER PRECISION

30

cm resolution

MORE CAPTURES

UP TO

30

captures per day

HIGHER DAILY REVISITS

Approximately

30

minute revisit time

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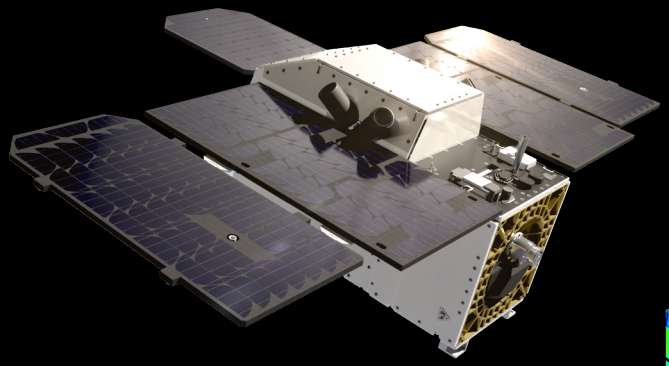
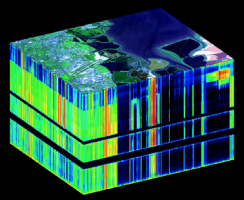
[1] Does not include initial 2 demonstration satellites planned for FY'24.

High Precision Hyperspectral Data

Brought to you by Tanager





Hyperspectral imaging captures the unseen, revealing valuable information that enables improved modeling, reduced uncertainty, and better, more efficient decision making.

- CROP DIFFERENTIATION • BIODIVERSITY TRACKING
- METHANE MONITORING • MATERIALS IDENTIFICATION
- ENVIRONMENTAL SITE ASSESSMENT
- SOIL CHARACTERISTICS • AND MANY MORE

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Synspective

Synspective's Use Cases



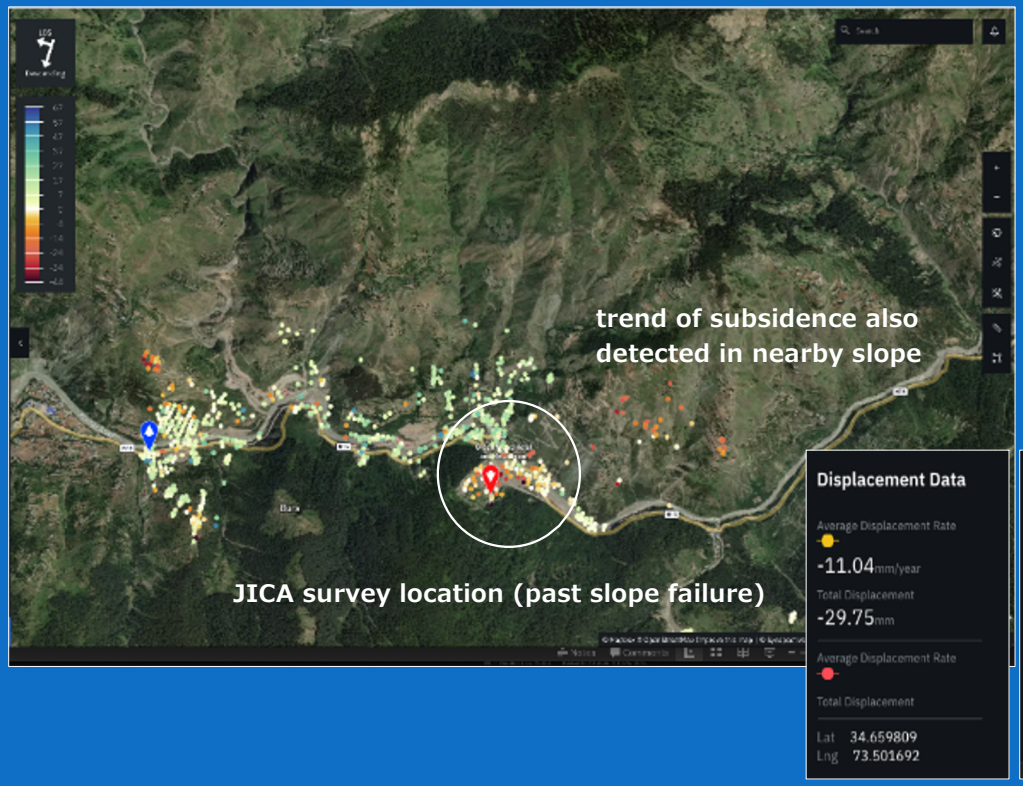
Nimas Anggarini
Regional Sales Manager
ASEAN

Highway, Building and Bridges Monitoring Using LDM

©Synspective Inc.

LDM – Monitoring landslide prone areas

Subsidence trends in the LDM Service are used to detect locations with risk of landslide occurrence in steep slope areas
Timely, wide, and inexpensive observations enable precautions to be taken to cover landslide risks in areas with steep slopes.



High Downward Subsidence + Steep Slope Area
=
High Risk Area for Landslide Occurrence



JICA – Japan International Corporation Agency
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Construction and Facility: Construction and maintenance monitoring of railways

Issue

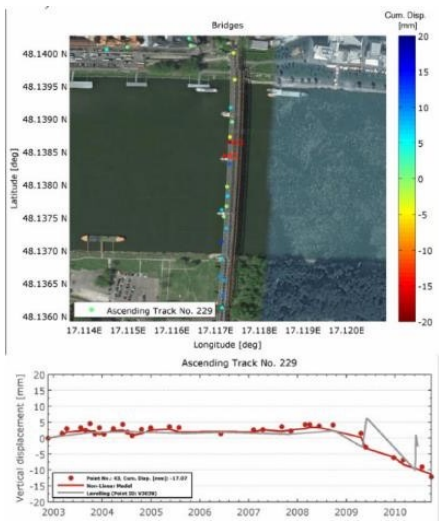
A wide-area and comprehensive impact assessment method is needed for launching shafts in shield construction and excavation lines in shield construction.

Prop

Time-series interferometric SAR analysis utilizing phase information from SAR satellites to obtain time-series information on ground deformation in millimeters.

Effect

It is possible to treat the collapse or damage of facilities such as houses as one of the reference information for the quantitative data of defect liability, whether or not the collapse or damage was caused by the relevant construction work.



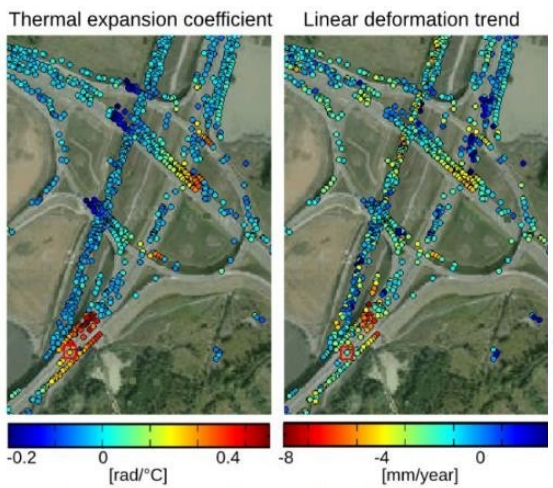
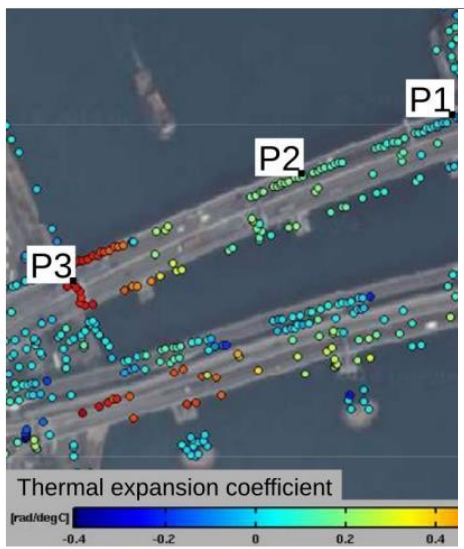
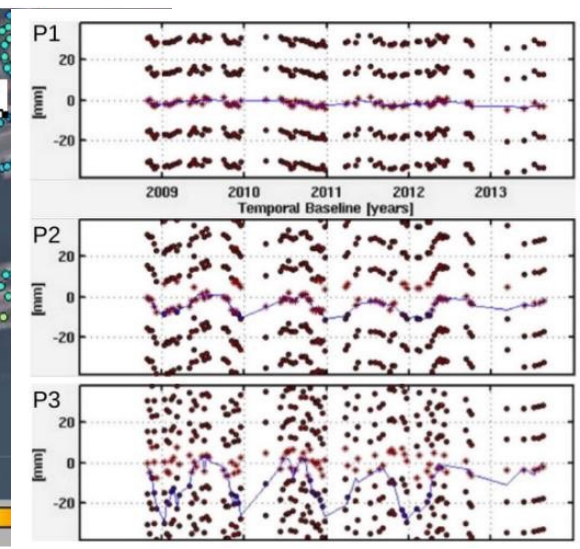


Fig. 2. Thermal expansion coefficient and linear deformation trend values Ostrava-Svinov roundabout estimated using 13 TerraSAR-X Stripmap imag (2013-2014). Red square depicts selected point 2274.





Potential of Satellite InSAR Techniques for Monitoring Bridge Deformations
https://www.researchgate.net/publication/282017806_Potential_of_Satellite_InSAR_Techniques_for_Monitoring_Bridge_Deformations

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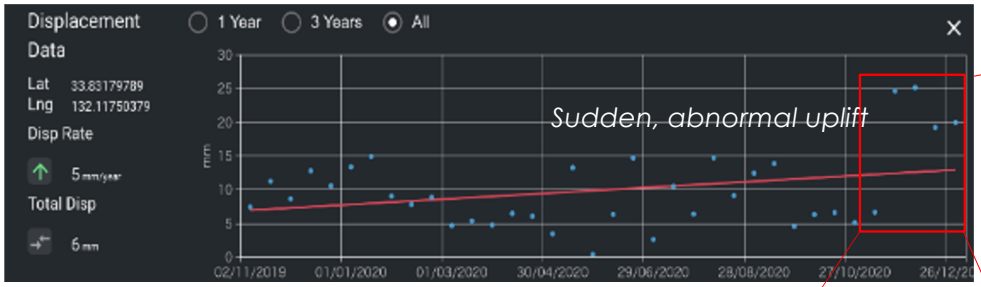
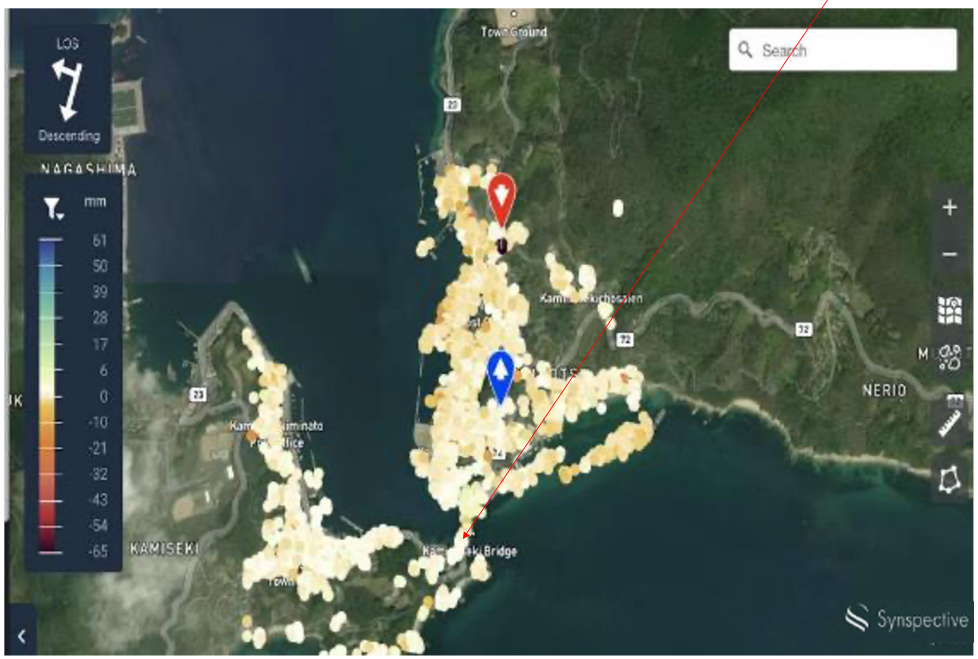
Infrastructure Monitoring

Synspective

Case: transportation asset monitoring in areas with little possibility of direct/ground monitoring





Lifetime cost reduction | **Risk aversion** | **Better project evaluation**

Synspective LDMS detected the temporal surface movement dynamics of the bridge and indicated an anomaly. Ground confirmation confirmed that during this period, the anchor connecting the girder and its seating was damaged (the girder was lifted by several centimetres)



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Case: risk of ground hole around underground project areas

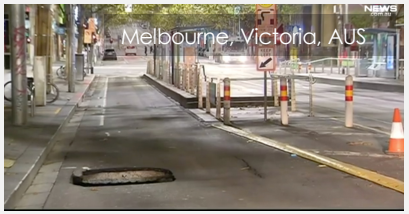


Synspective proprietary AI technology enables automated spotting of sinkhole-risk hotspot

Risk aversion | **Safety assertion** | **Lifetime cost reduction**

- ✓ Before the hole emergence (approx. 300m from underground parking lot construction project in Surabaya), data in LDM Service shows displacement pattern that is peculiar to emergence of hole (later identified as soil failure phenomenon)
- ✓ Regular displacement observation (intensity + pattern) in LDM Service enables pre-event warnings to detect hole-risk hotspots

Other examples of sinkhole emergence around the world detectable through displacement observation using satellite data





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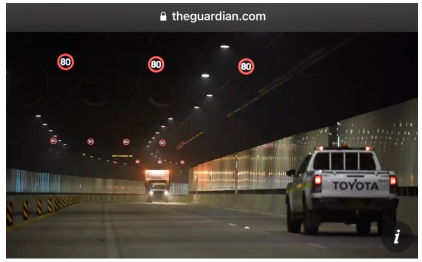
Case: monitoring building deformation/damage risk around ongoing tunneling project area

Synspective LDMS indicates sudden change of displacement pattern around road tunnel construction project. The pattern change started happening some period before the actual building damage occurred.

Risk aversion | **Safety assertion** | **Better evaluation** | **Lifetime cost reduction**







Sydney

This article is more than **5 months old**

Sydney building above Westconnex tunnel evacuated after cracking

Fire and Rescue says there is no fear of collapse but Ashfield residents told to leave amid reports of 'growling' noises

Australian Associated Press

Fri 24 Jul 2020 01.39 BST

121

A building in Sydney's inner west above the Westconnex tunnel has begun to crack, forcing the evacuation of residents.

Fire and Rescue NSW were called to the three-level premises in Green Trees Estate at 18-20 Knocklayde Street in Ashfield at 3.30am on Friday.

Source: The Guardian, news link here

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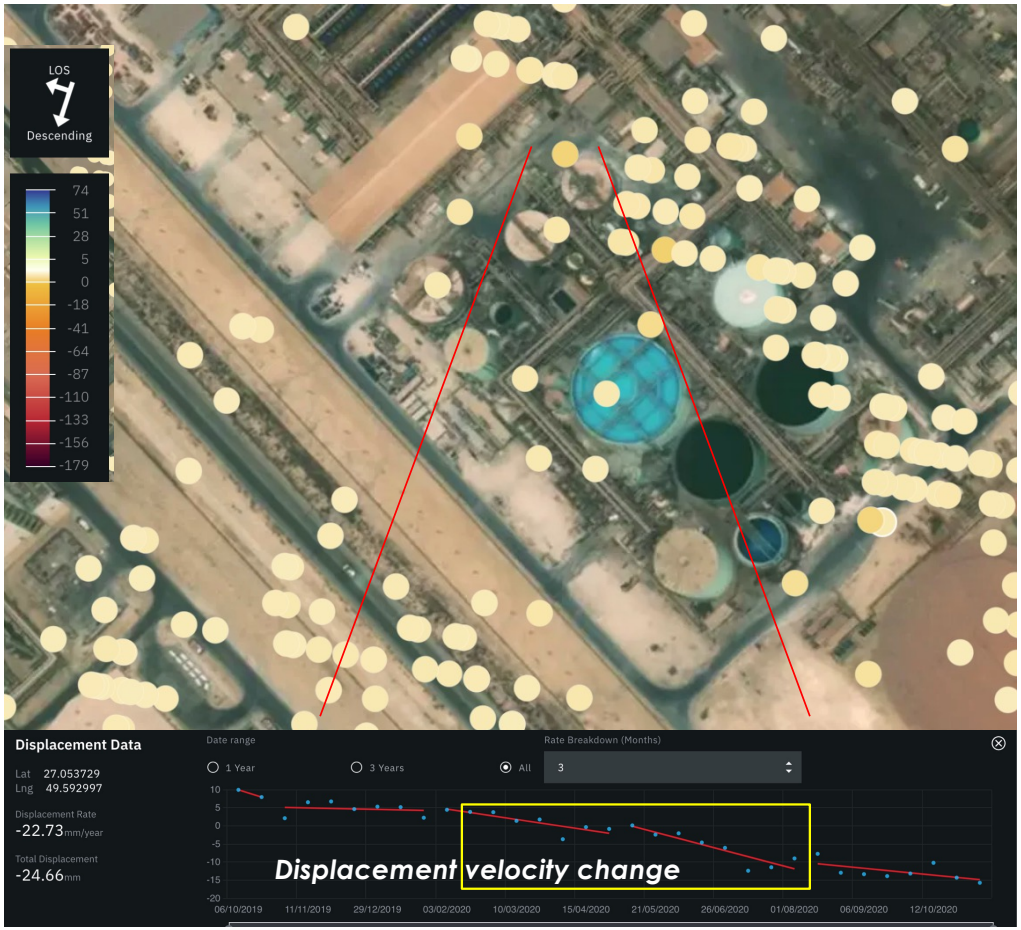
Case: pipeline external environment stability monitoring

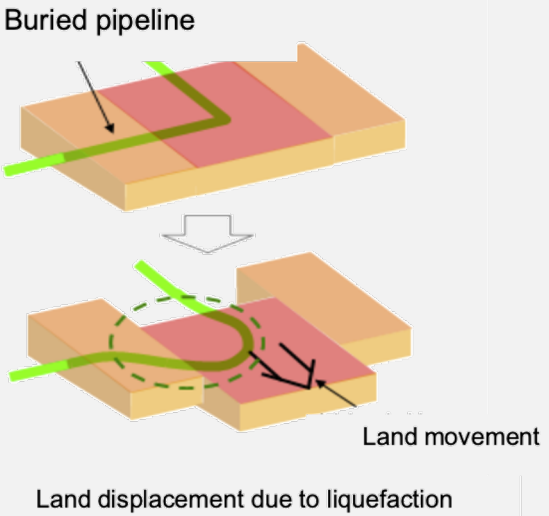


Risk aversion | **Safety assertion** | **Lifetime cost reduction**

Synspective LDMS regularly monitors external environment of critical facilities and helps heighten alertness on any changes that may lead to safety risk or disturb normal operation

Risk of disturbance to pipeline due to external factors of land deformation

Picture credit: TOKYO GAS (translated from Japanese)



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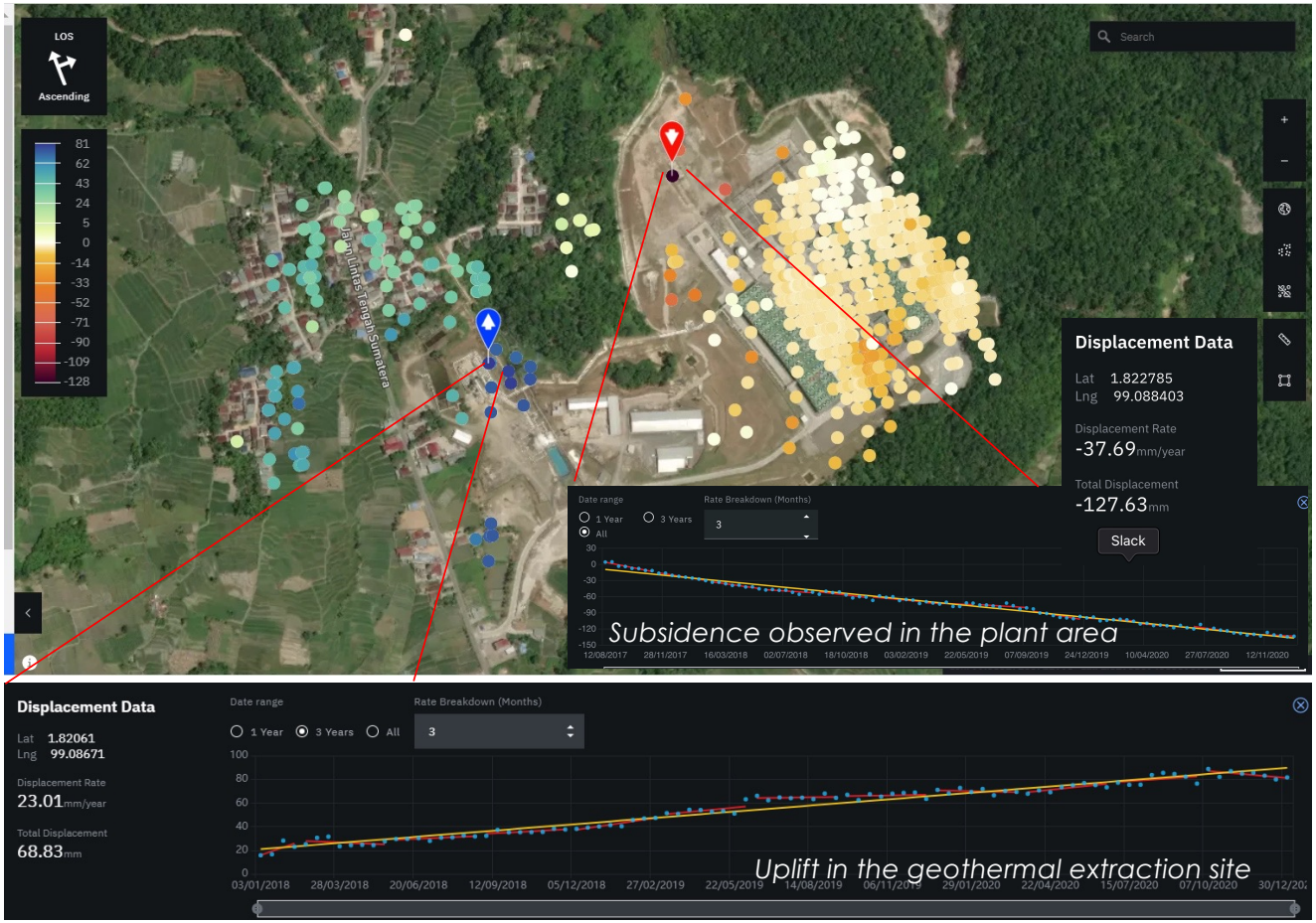
Case: uplift & subsidence regular monitoring in energy development project sites



Risk aversion **Safety assertion** **Better evaluation**

- ✓ Synspective LDMS regularly monitors uplift (triggered by water injection) and subsidence in the geothermal, natural gas projects
- ✓ This helps asset managers avoid risks & build safety portfolio



Sample of national regulation on allowable displacement velocity threshold in energy projects:
20mm/year
Japan Oil, Gas, and Metal National Corp.

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Dam Monitoring Using LDM

Monitoring of Dam Structures and Surrounding Areas

Threats to Dam Failures

- Climate change
- Increased water runoff into reservoirs
- Seismic movements
- Landslides
- Subsidence
- Strain to dam structures

High Risk Areas

- High mountain dams
- Old dams
- Dams near human activity (e.g. communities, industrial, farmland)
- Areas of active seismic activity



https://unsplash.com/photos/IBYdRegAZDA

©Synspective Inc.

Benefits of using Synspective's LDM solution

- Historical analysis
- Extremely large area, lower than sensor costs
- Proactive monitoring to reduce potential dam maintenance costs.
- Early detection from frequent monitoring
- Detect and understand large-scale millimeter level ground changes not seen by optical sensors
- Efficient resource prioritization to site surveys and maintenance targets
- Understanding of land stability for pre-assessment and during construction of the dam



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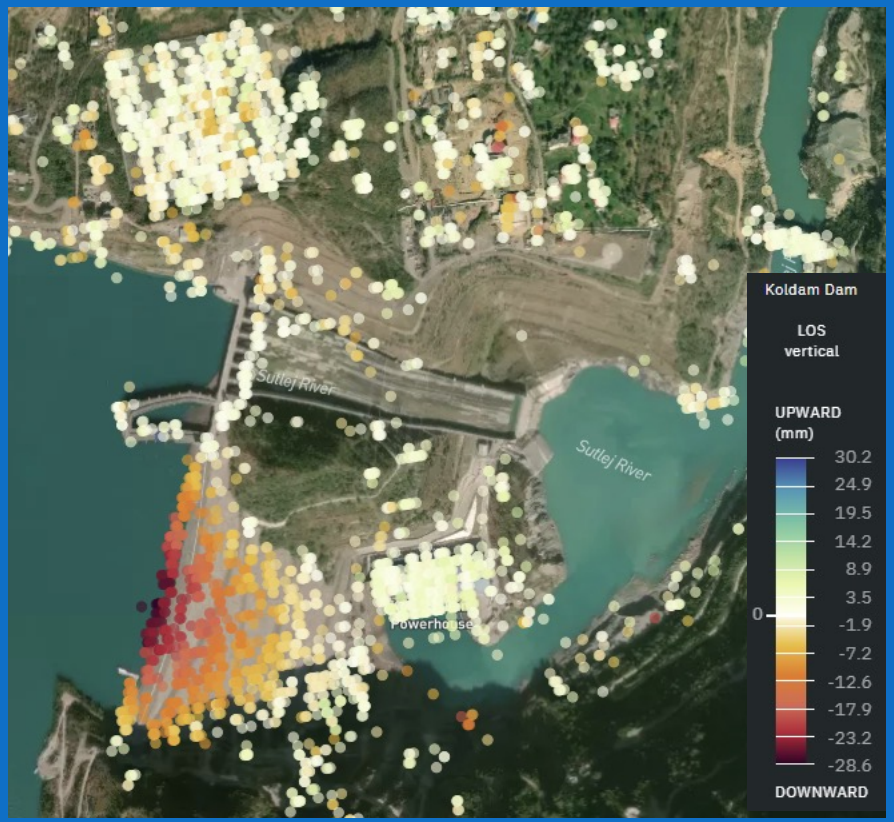
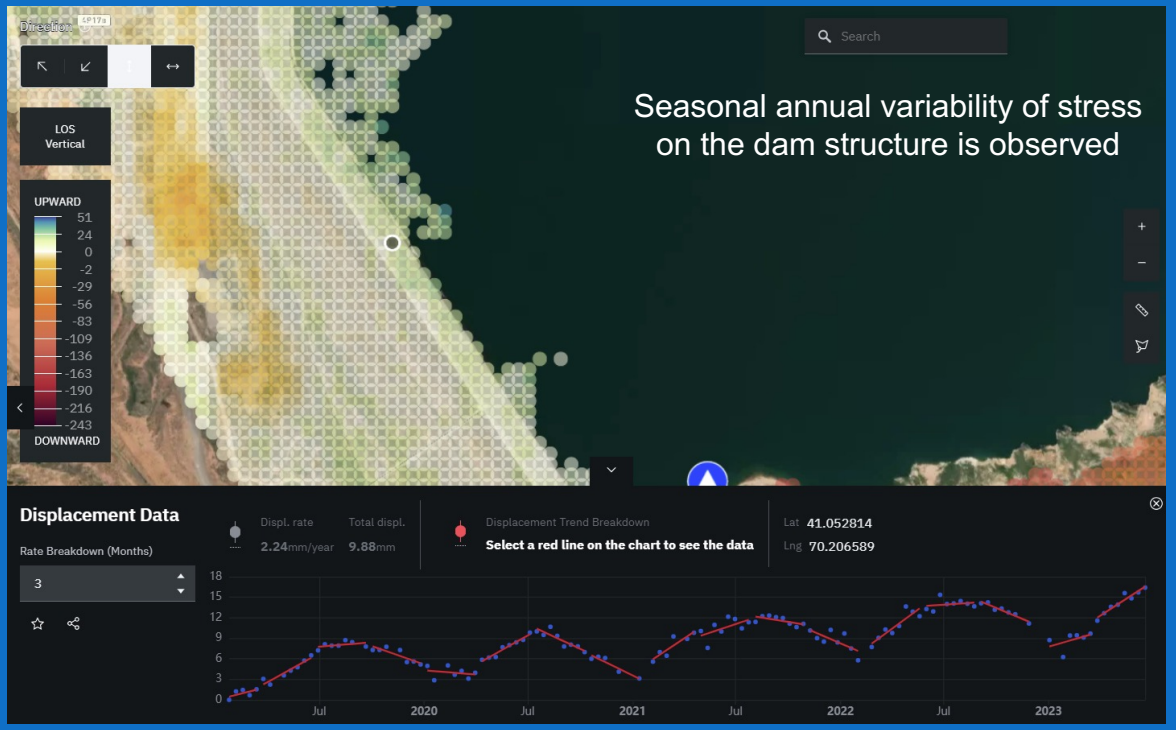
Dam Infrastructure Monitoring

- Monitoring of dam structure
- Identification of the stresses on the dam structure spatially and temporally
- Monitoring of other structures such as the powerhouses.





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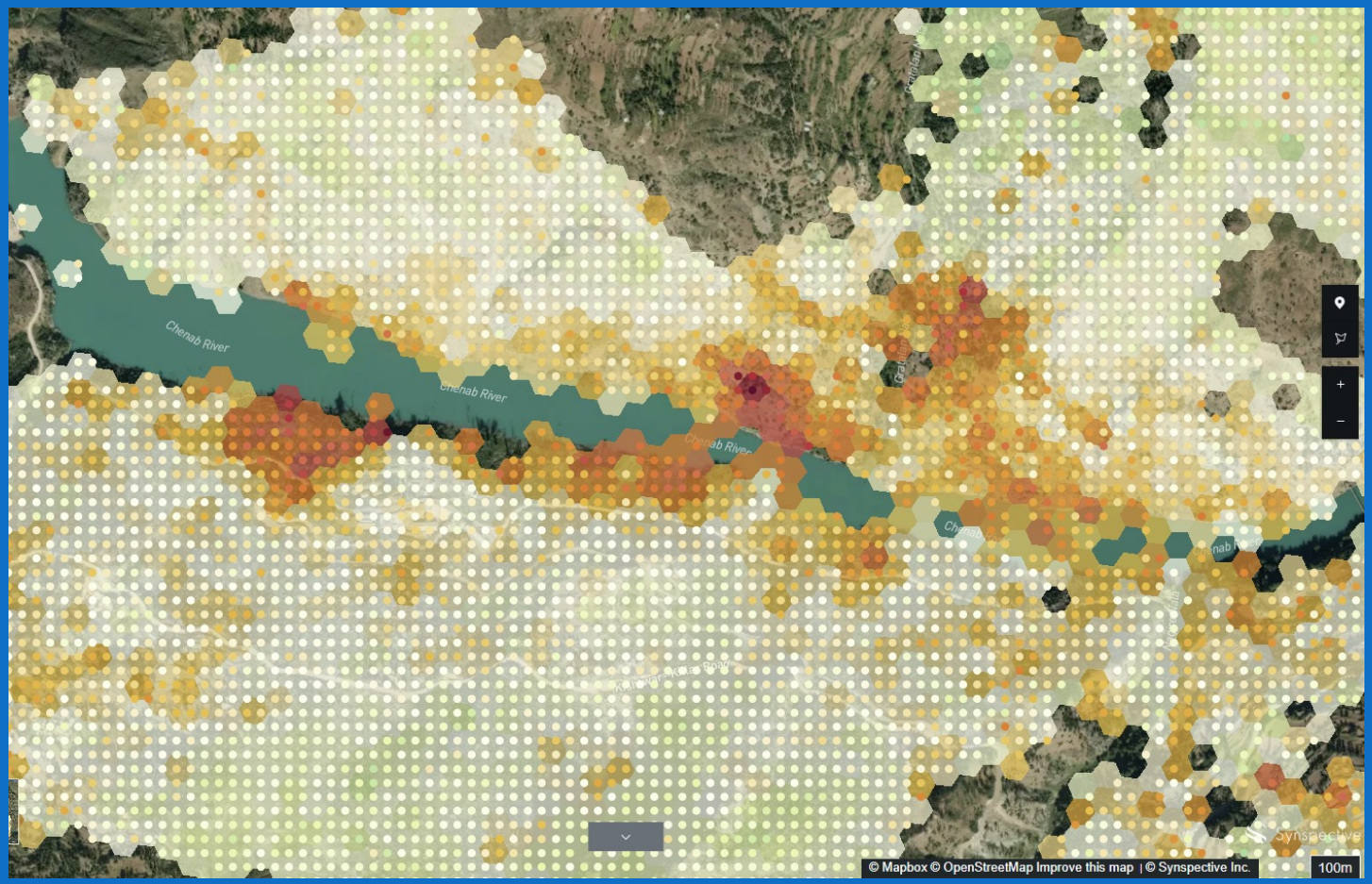
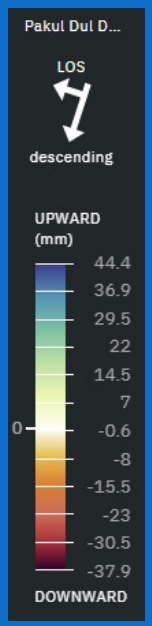
Dam's Surrounding Areas Monitoring: India





Monitoring of the surrounding areas of the reservoir for subsidence which is an indicator for landslide occurrences. Thus, affecting the reservoir's capacity.

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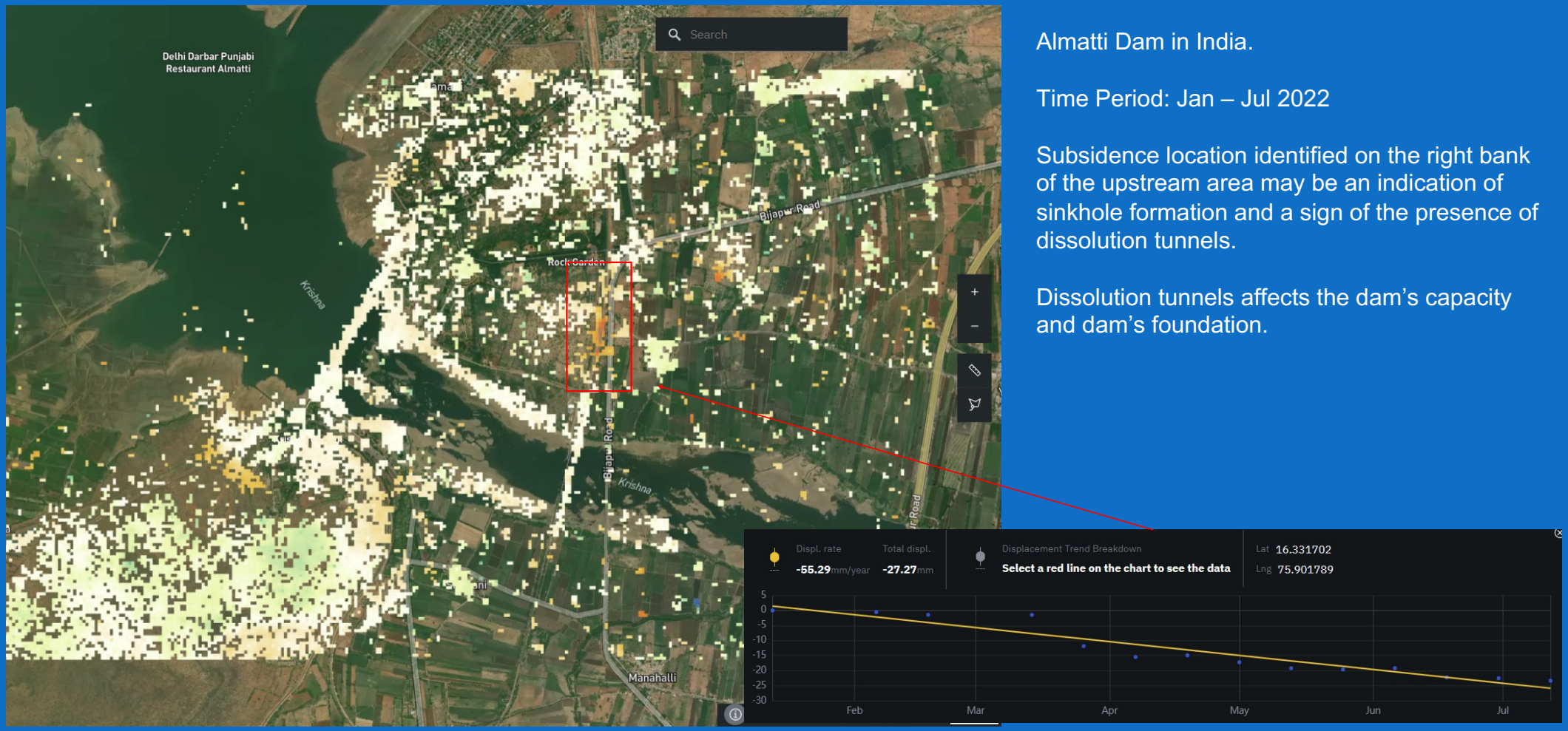
Dam monitoring: India



Almatti Dam in India.

Time Period: Jan – Jul 2022

Subsidence location identified on the right bank of the upstream area may be an indication of sinkhole formation and a sign of the presence of dissolution tunnels.

Dissolution tunnels affects the dam's capacity and dam's foundation.

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Synspective Land Displacement Monitoring
© Mapbox, © OpenStreetMap and Improve this map, © Copernicus Sentinel data [2020-2022], © Synspective Inc.
EW-South Surkha...
Time period
Jan 5, 2020 - Dec 25, 2021 (Entire Range)
Max upward (mm)
53.72
Max downward (mm)
-37.31
Average displ. rate (mm/year)
1.38
Area size (km²)
73.10
Total PS points
14198
Export Data
Direction
LOS Vertical
UPWARD
54
46
37
29
21
13
4
0
-4
-12
-20
-29
-37
DOWNWARD
Search
Dam monitoring: Uzbekistan
Dam Monitoring is particularly important if there are communities around the dam site
Sunxondaryo
Golden Fish
4R101a
Synspective

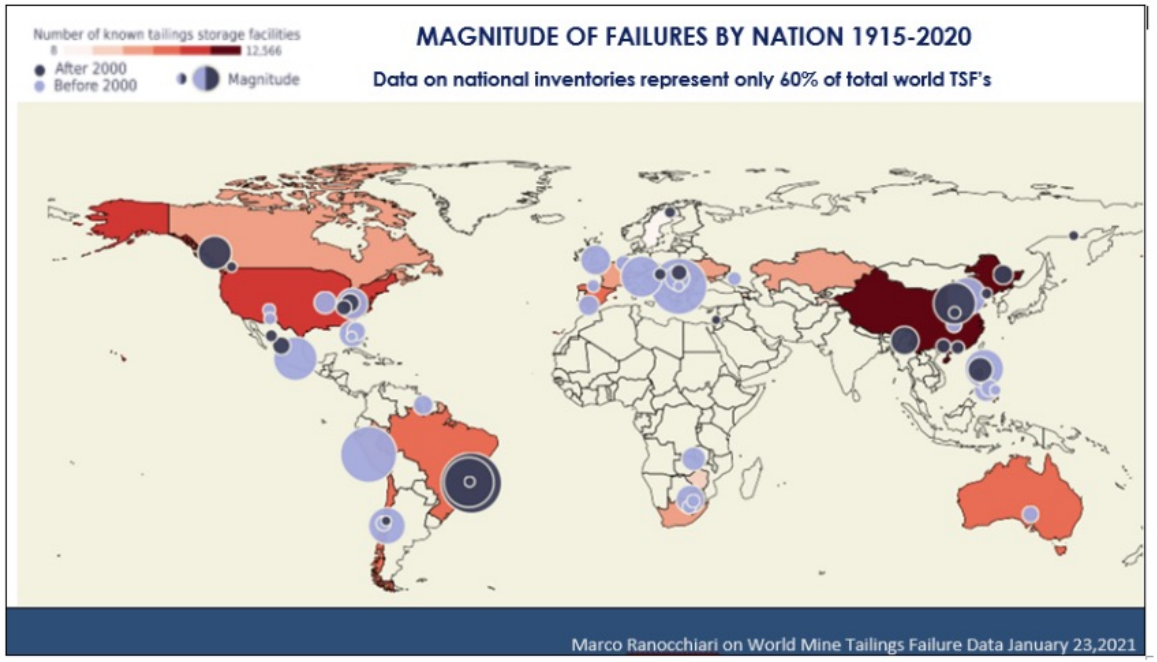
Monitoring Tailing Dams

Summary of world tailing mine failures

Synspective

SUMMARY OF DETAIL NATION COUNTS IN TABLE BELOW	
TOTAL BY OFFICIAL /AUTHORITATIVE DISCLOSURE	19,214
ESTIMATED % OF TOTAL MINERAL PRODCTION OF ABOVE	60%
ADJUSTED ESTIMATE (19,214/.6)	32,023
With 10% limits	29,000-35,000

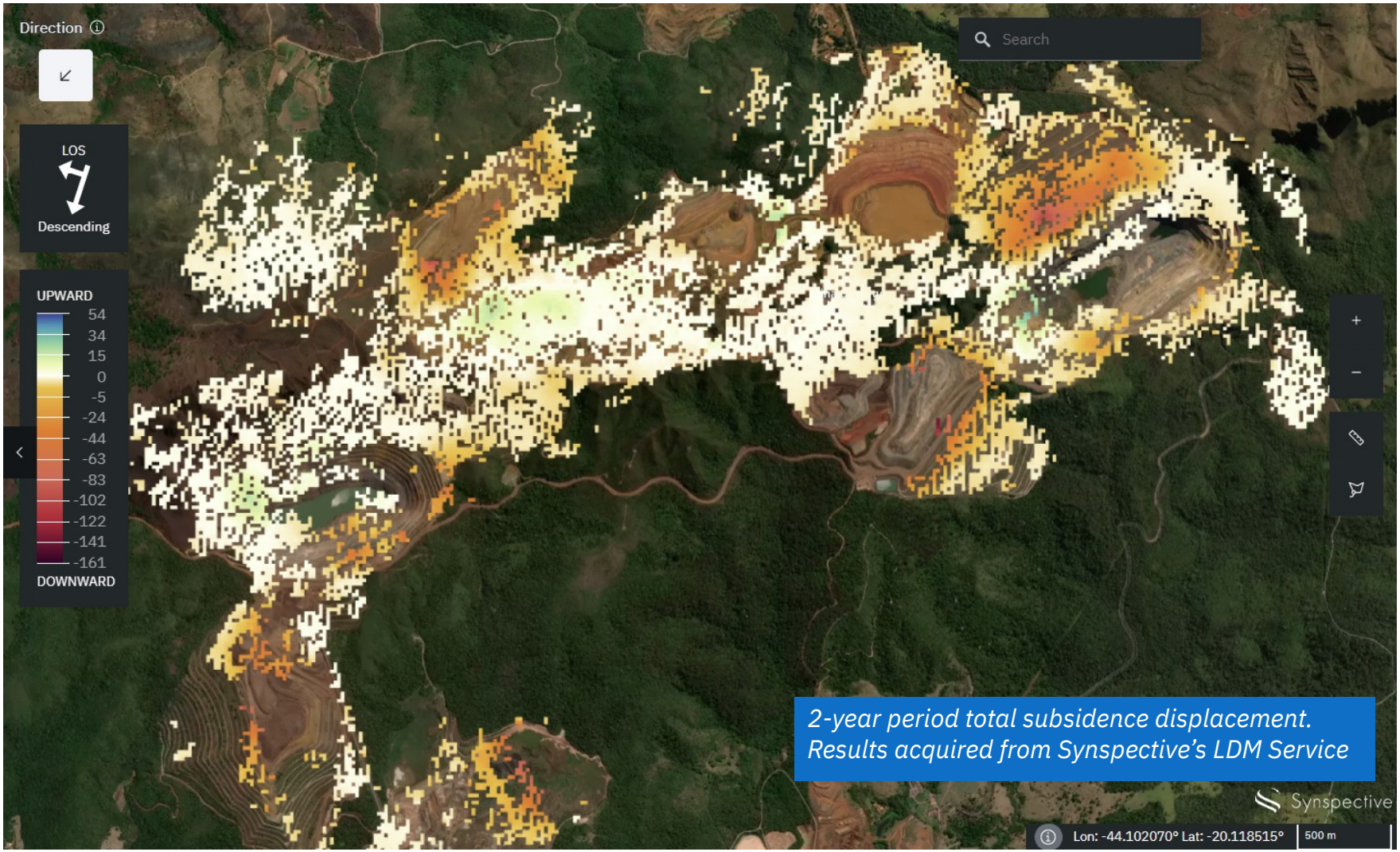
World Mine Tailings Failures as of January 23,2021



Extracted from: https://worldminetailingsfailures.org/

Case Study: Brumadinho Tailing Dam Collapse

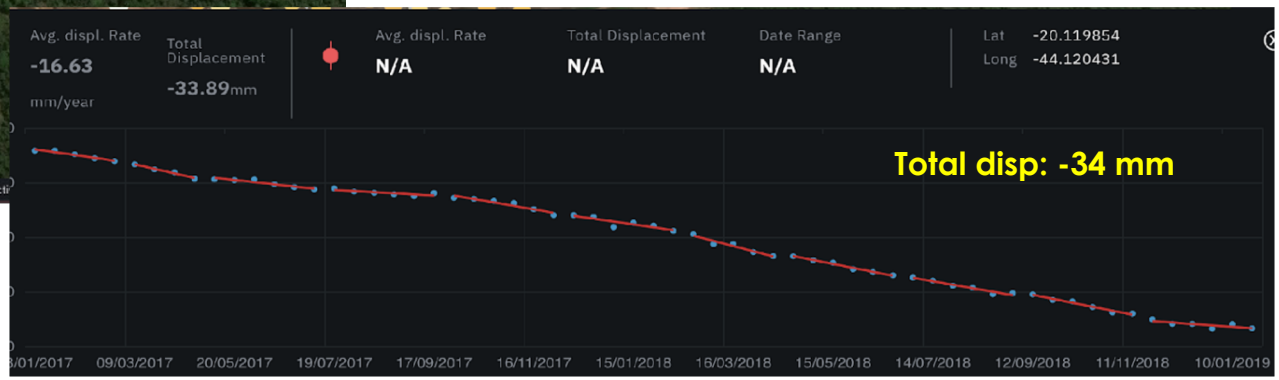
Synspective



Case Study: Brumadinho Tailing Dam Collapse

Synspective



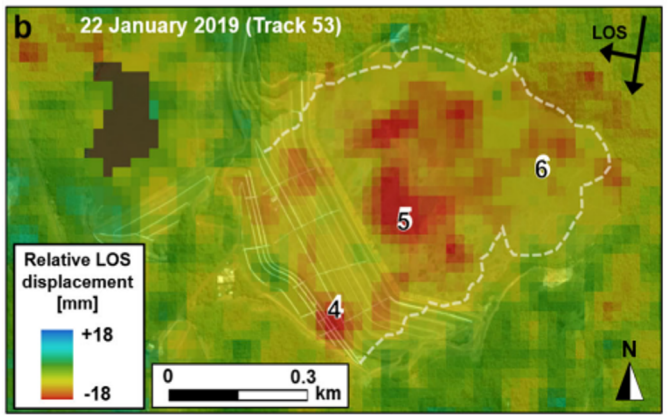


2-year period total subsidence displacement.
Results acquired from Synspective's LDM Service

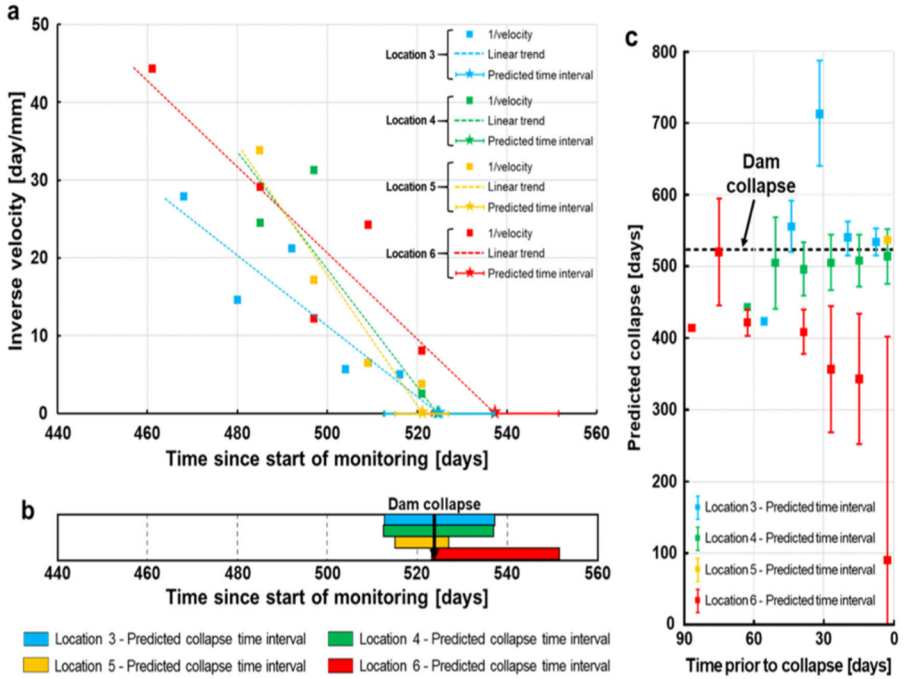
Identifying precursory deformation information

Synspective

Precursory deformation information such as Inverse Velocity Analysis may be used as an early warning alert and indicator to a potential tailing dam failure



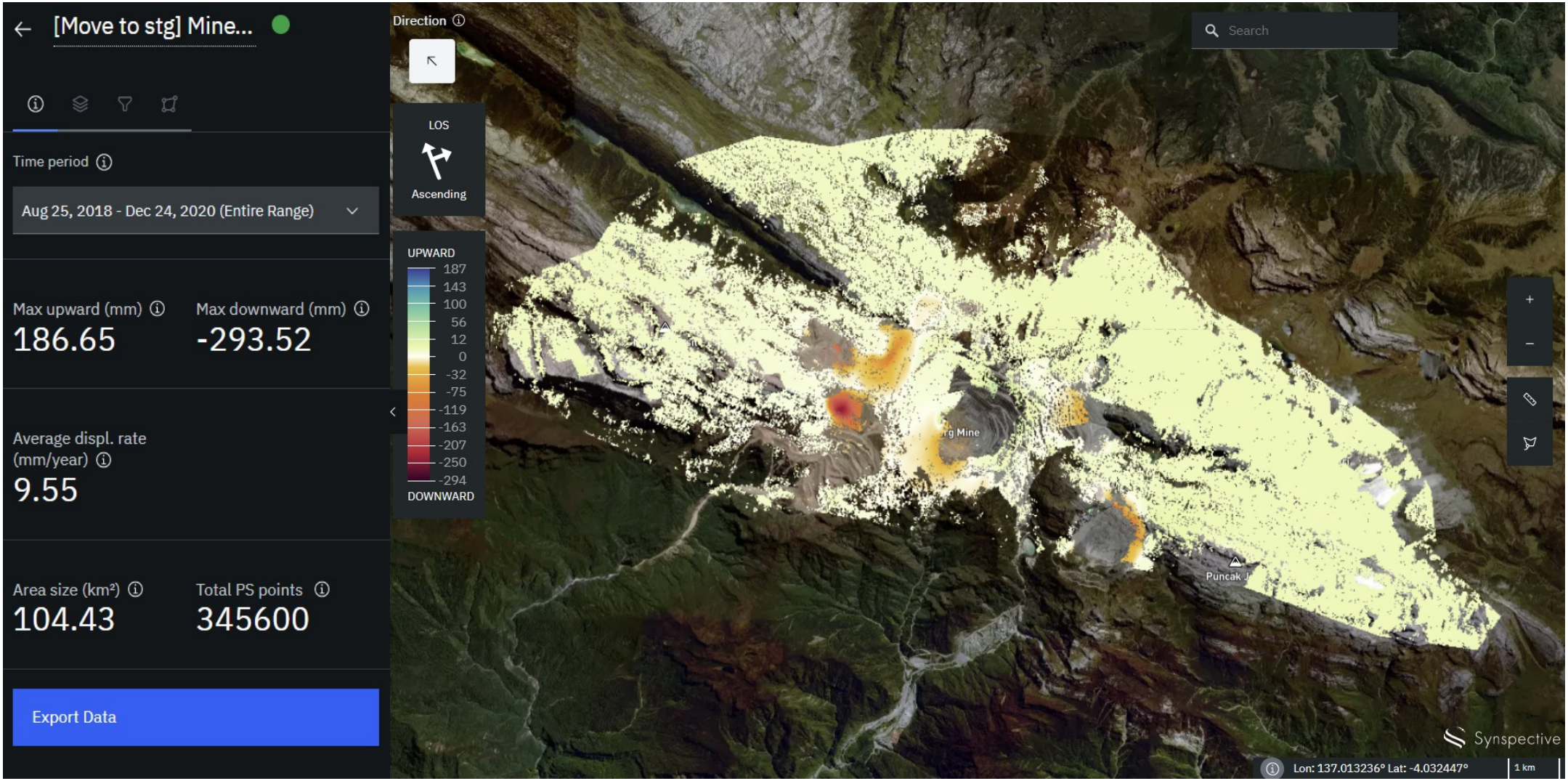
Location 4 offers the most conclusive evidence of precursory deformation indicative of the occurrence of a collapse, with correct failure date predictions that could have been reliable made as early as 51 days prior (from 5 Dec 2018).



Grebby, S., et.al. 2021. Advanced analysis of satellite data reveals ground deformation precursors to the Brumadinho Tailings Dam collapse. Communications Earth & Environment. https://doi.org/10.1038/s43247-020-00079-2

Grasberg Mine, Indonesia

Synspective



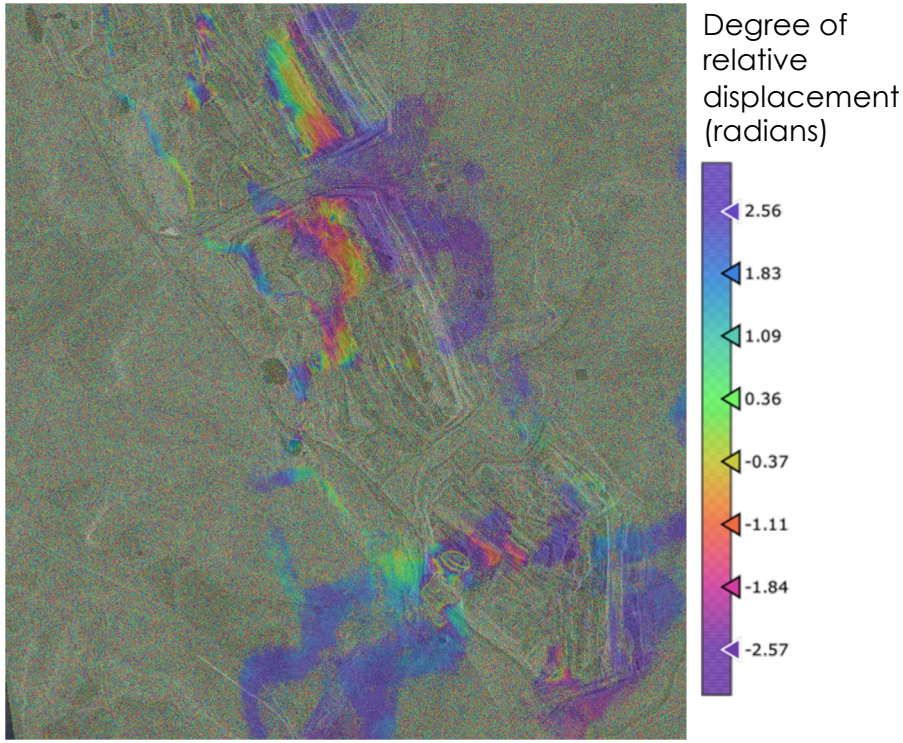
Monitoring Tailing Dams

Synspective

Small displacements/deformations of the tailing dam structure may be detected by the use of interferometric SAR.



Mount Polley tailing dam failure (4th Aug 2014). The slurry of tailings and process water affected the ecosystem and impacted human health



Displacement between 2 SAR acquired images at different periods

Thank you!

- GIS solution
- Bản đồ
- CSDL GIS
- SDI
- SmartWard
- Ảnh vệ tinh
- Mô hình số độ cao