EARTH SCIENCE
APPLIED SCIENCES

BOOSTING DISASTER READINESS

EARTH SCIENCE APPLICATIONS WEEK 2021

EARTH SCIENCE
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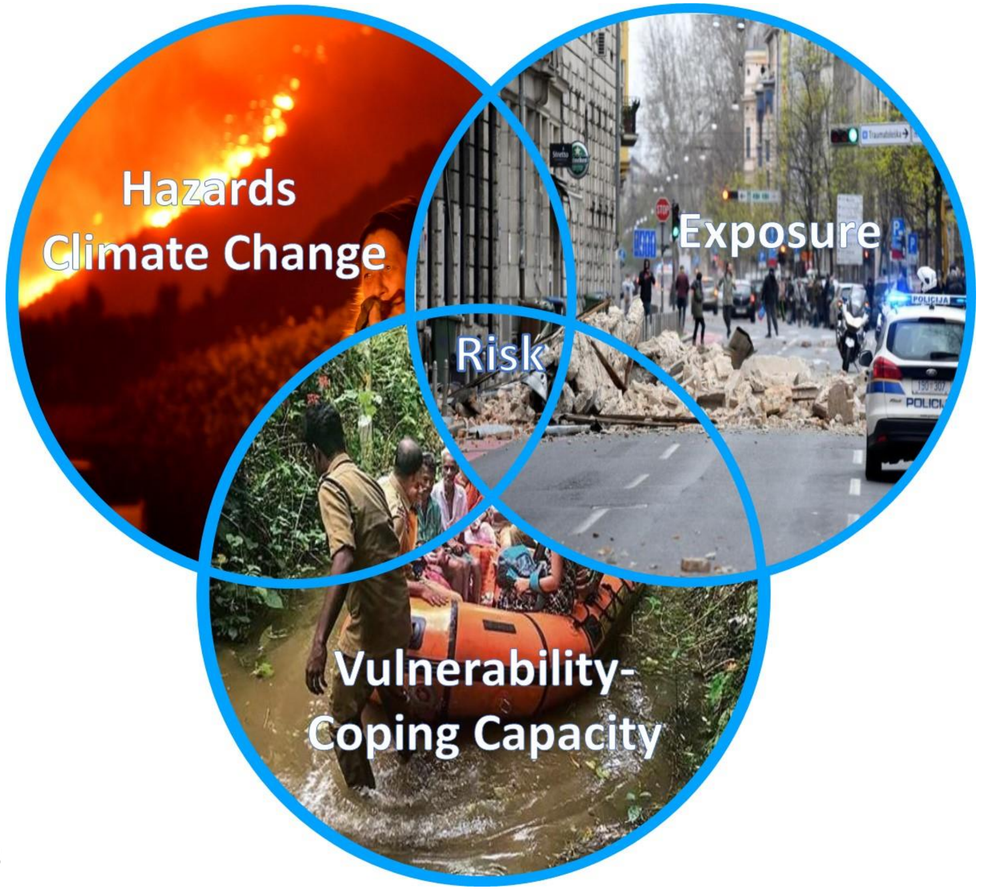
NASA Disasters Program Overview

Dr. David Green
Program Manager

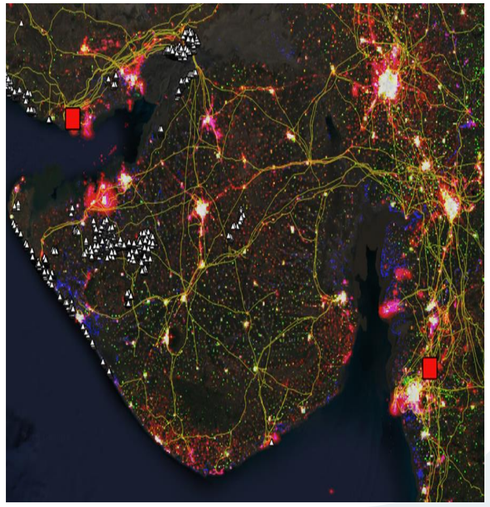
EARTH SCIENCE APPLICATIONS WEEK 2021

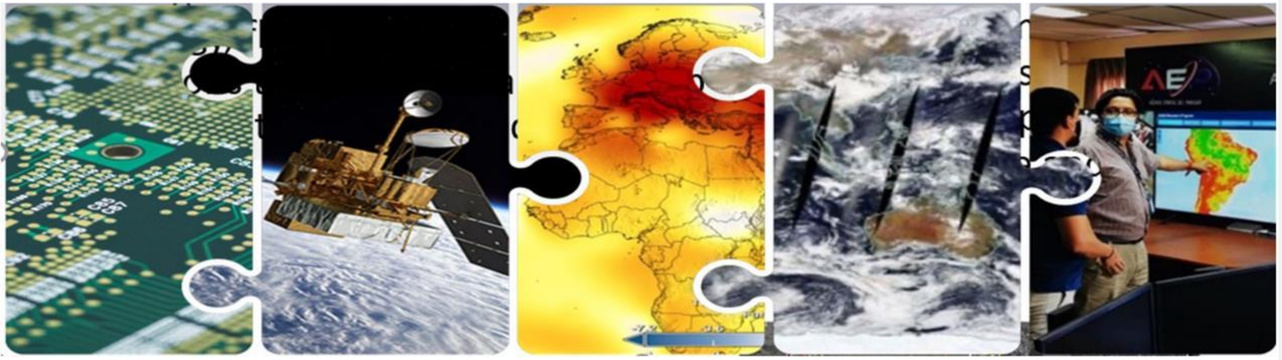
Disasters

- Natural **hazards and climate change** are projected to increase the perils that disrupt lifelines and threaten infrastructure.



- Practices that incorporate **vulnerability**, **exposure** and **coping capacity** help provide anticipatory knowledge to understand risk.

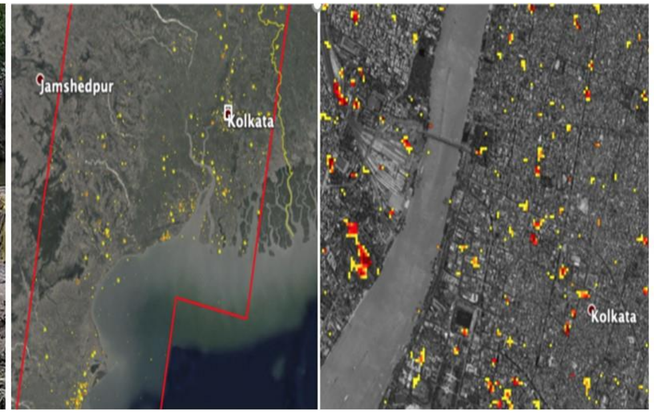




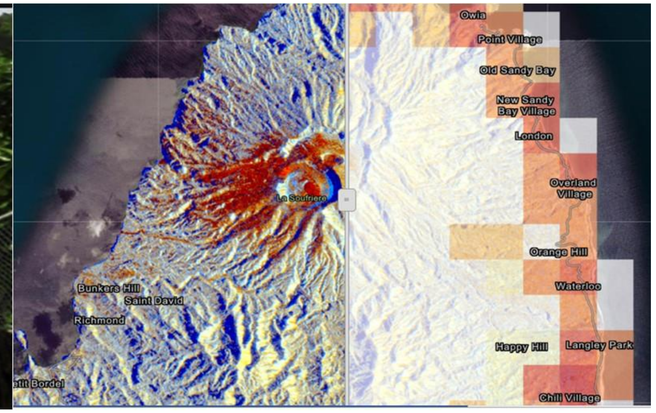
NASA Disasters Program

Promotes the interconnected nature of technology, flight, research, data and applications to reduce risk and develop resilience

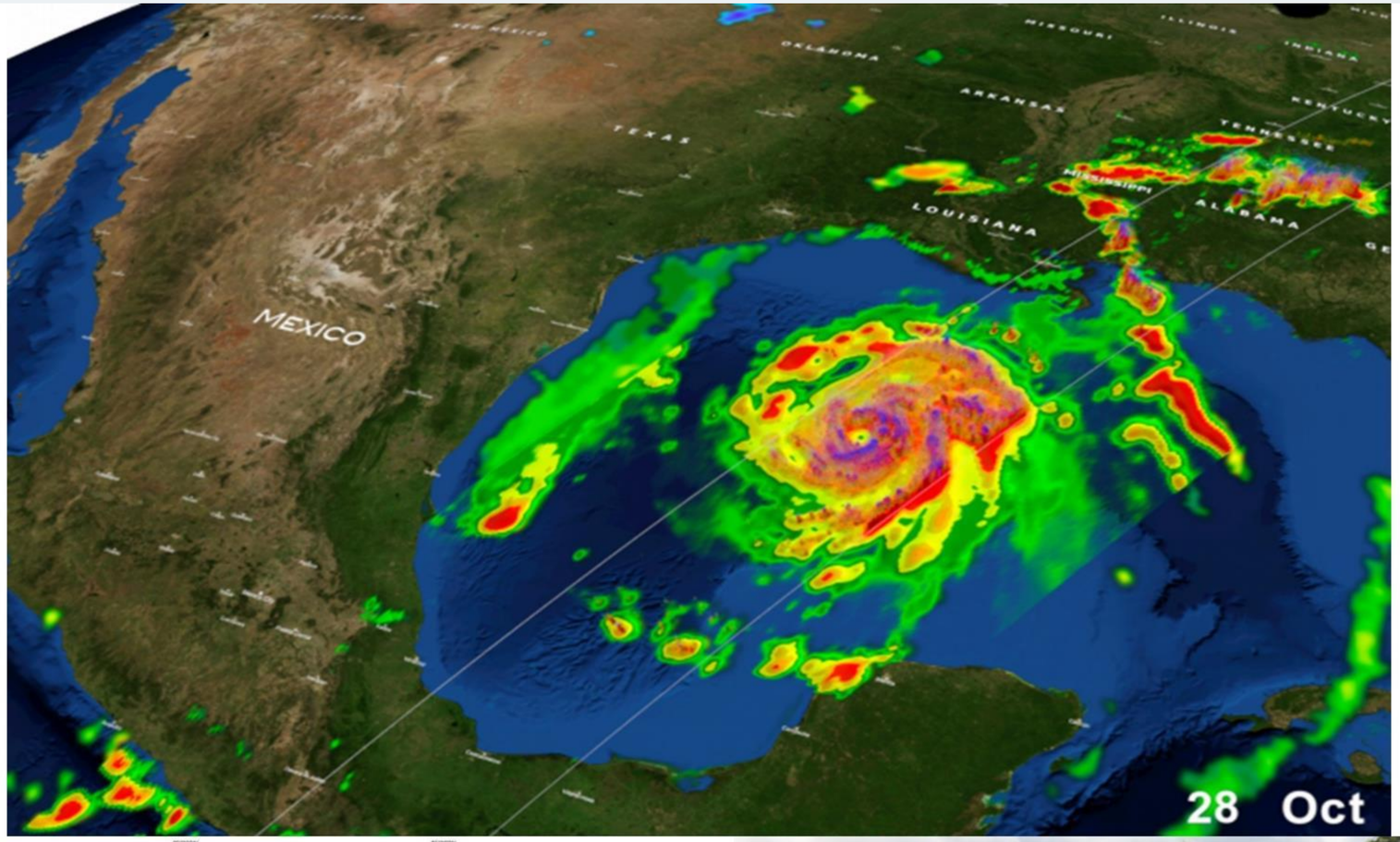
https://disasters-nasa.hub.arcgis.com/



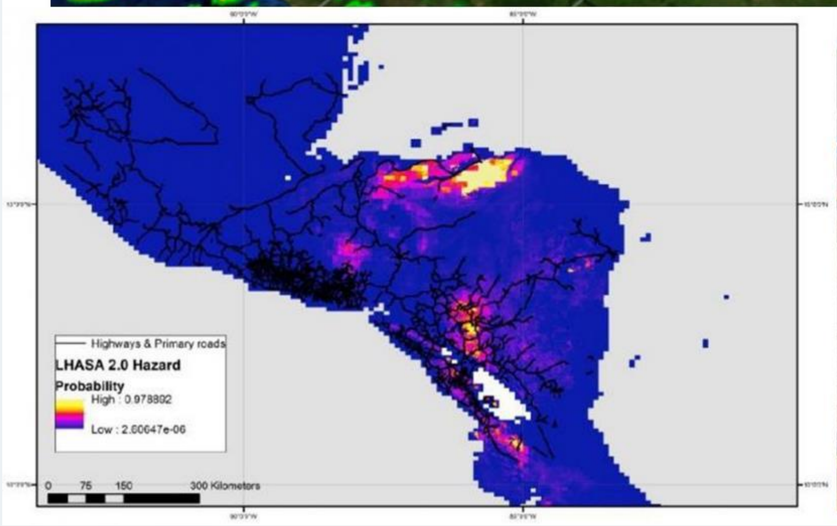
Satellite-based flood extent and damage maps guiding evacuations and humanitarian relief for Super Cyclone Amphan, protecting waterways and ports and securing power recovery

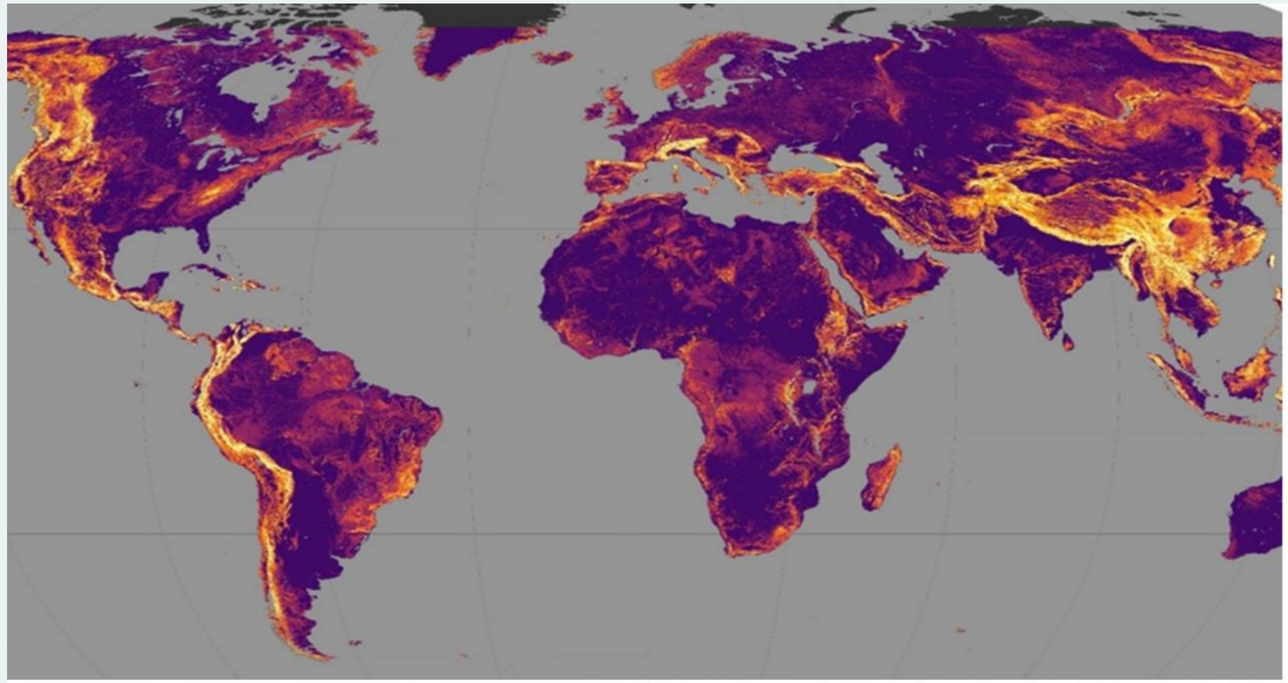


Assessing peril of La Soufiere volcanic eruption both in the air and on the ground by tracking emissions and volcano activity for nearby communities, transportation and lifelines.



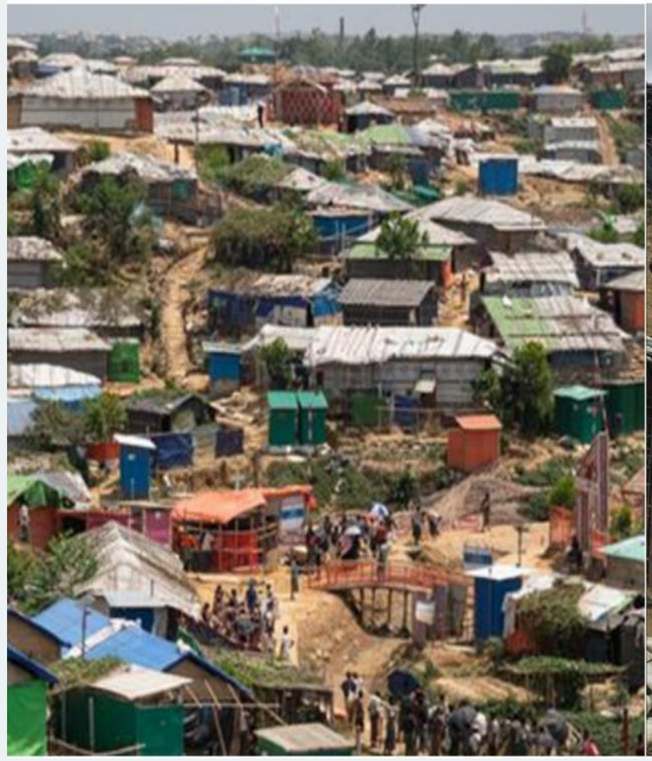
Monitoring Earth for the most vulnerable and exposed from the unique perspective of space

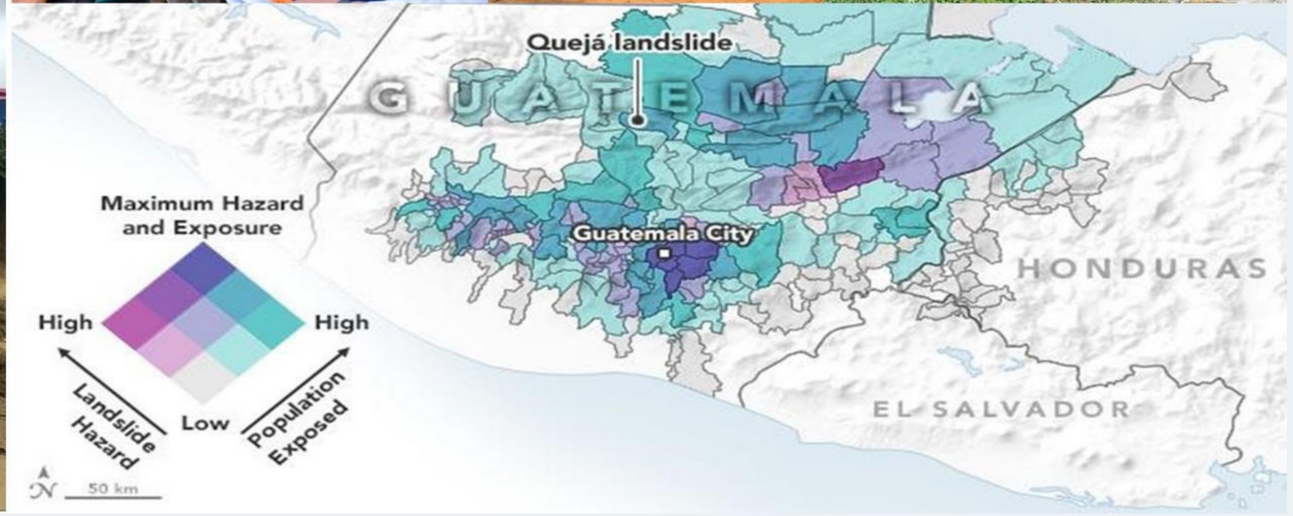


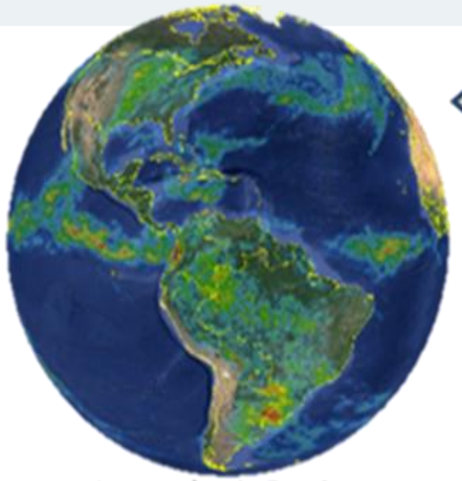


Scaling Value

Integrating local data and NASA data to provide scalable value by assessing and conveying the understanding of risks relative to local communities, cultures and their impacts

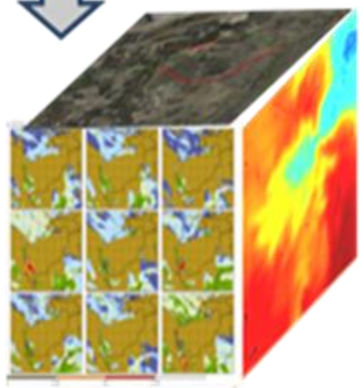






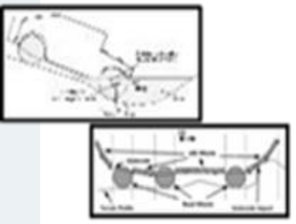
Atmospheric Forcing

Global models run persistently

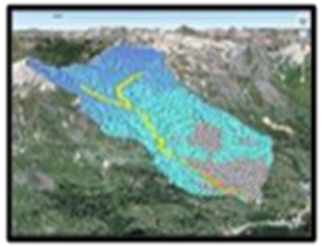


Terrestrial Modeling (e.g. LIS)

Stream Routing (e.g. RAPID)



Mobility Analyses



Snow Assessments

Humanitarian Assistance

Drought Vulnerability

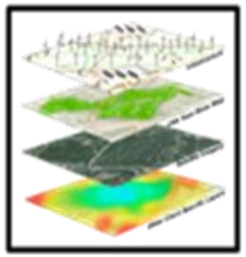
Navigation

Social Issues

Economic Issues

Chemical/Biological/Radiation Hazards

Transportation Networks



Other Layers

The Vision

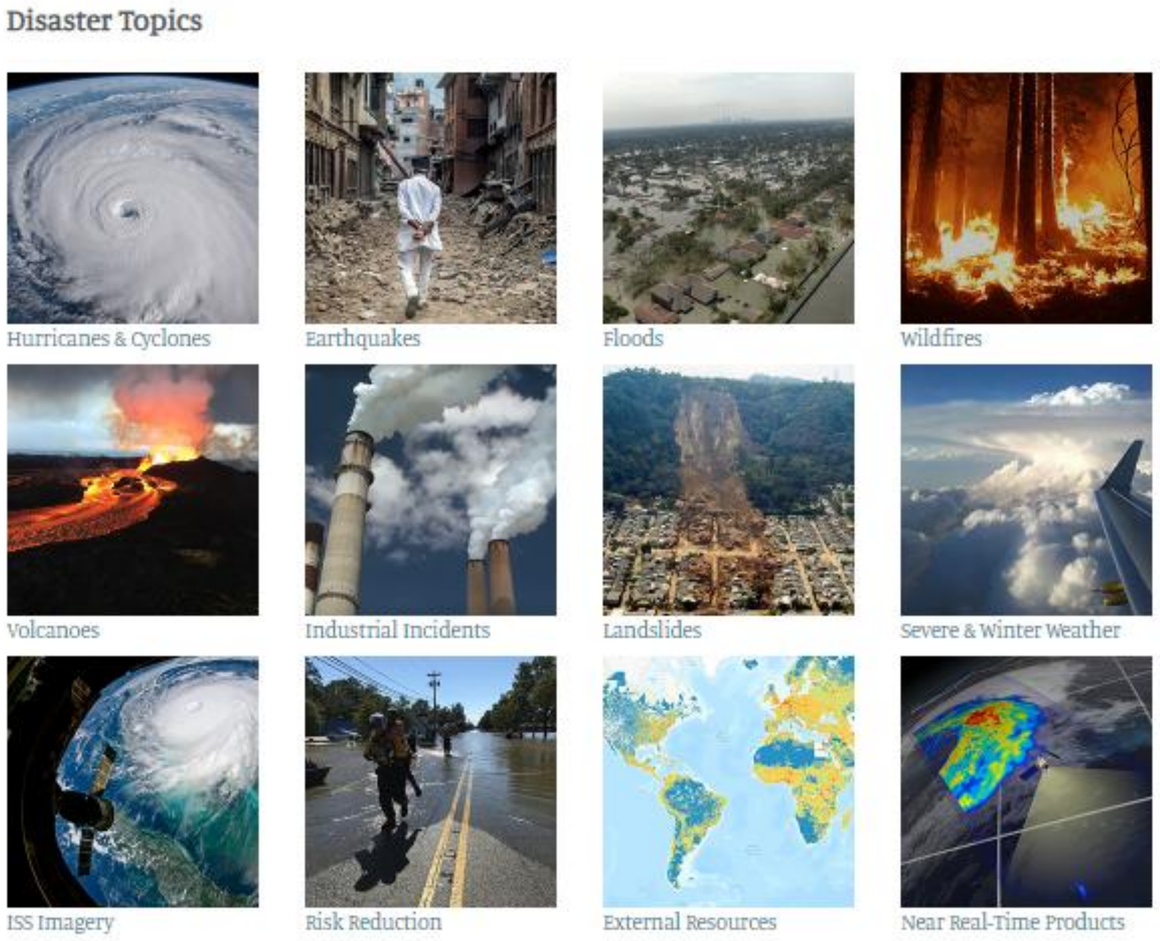
To increase access to earth observations and open science that …

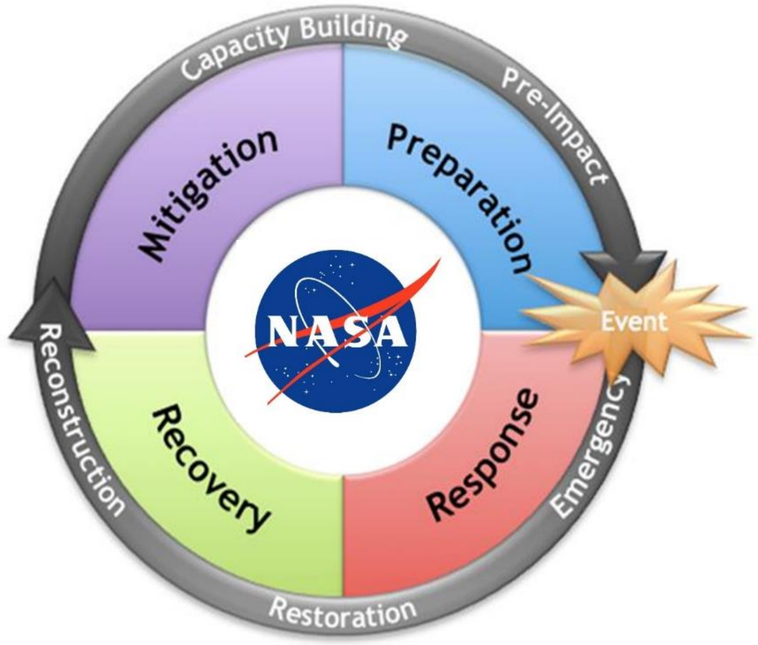
inform choice,
support decisions*, and*
guide actions,

which prevent disasters, reduce risk and strengthen resilience

Systemic Disaster Risk Reduction

- Enables a multihazard approach across the disaster management cycle



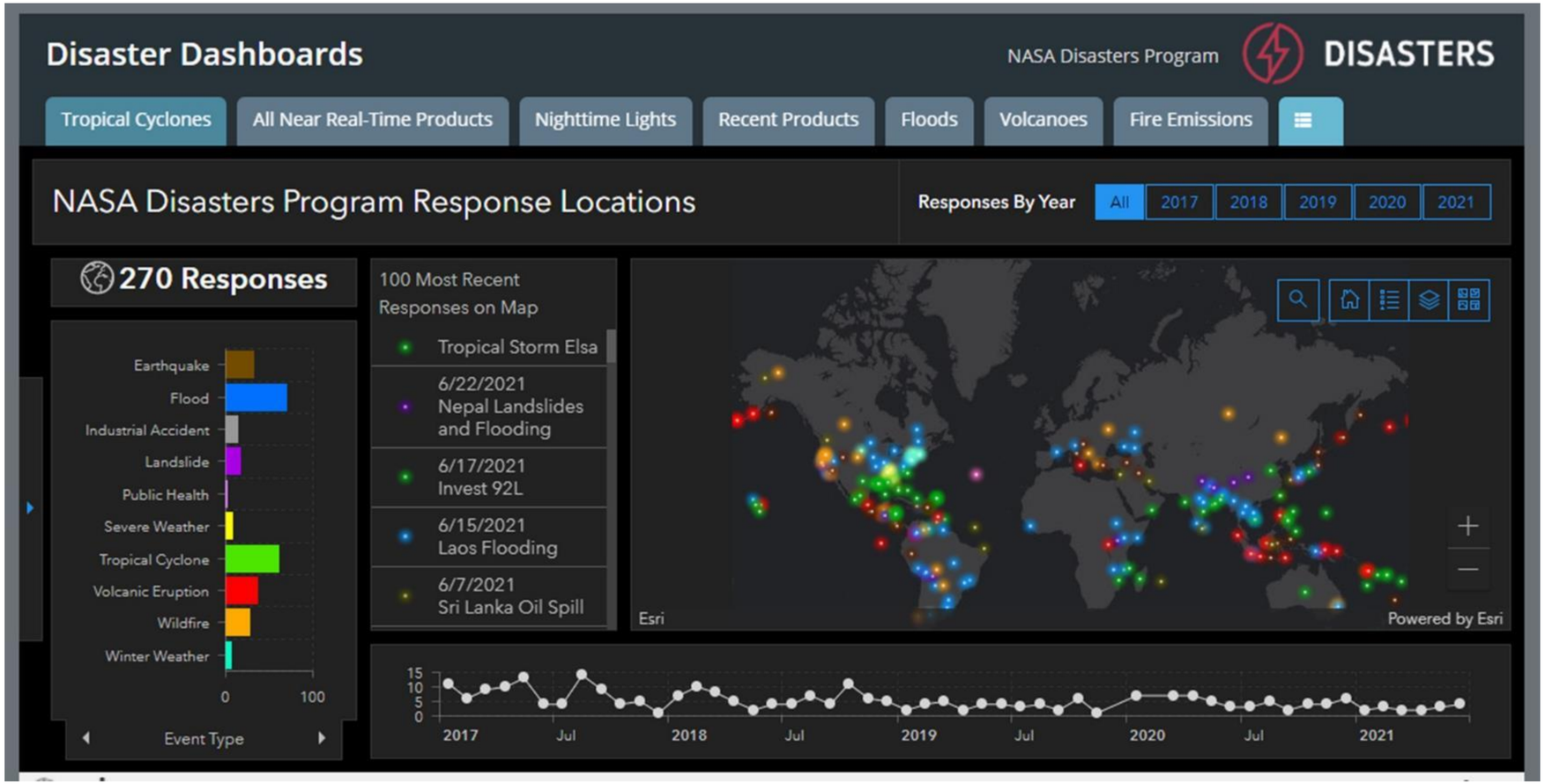


- NASA Disasters supports coordination and collaboration, which improves availability, accessibility and timeliness of geospatial information and accelerates translation to readiness by demonstrating applicability for real-world impacts

NASA Disasters Mapping Portal

Risk dashboards and scalable impact

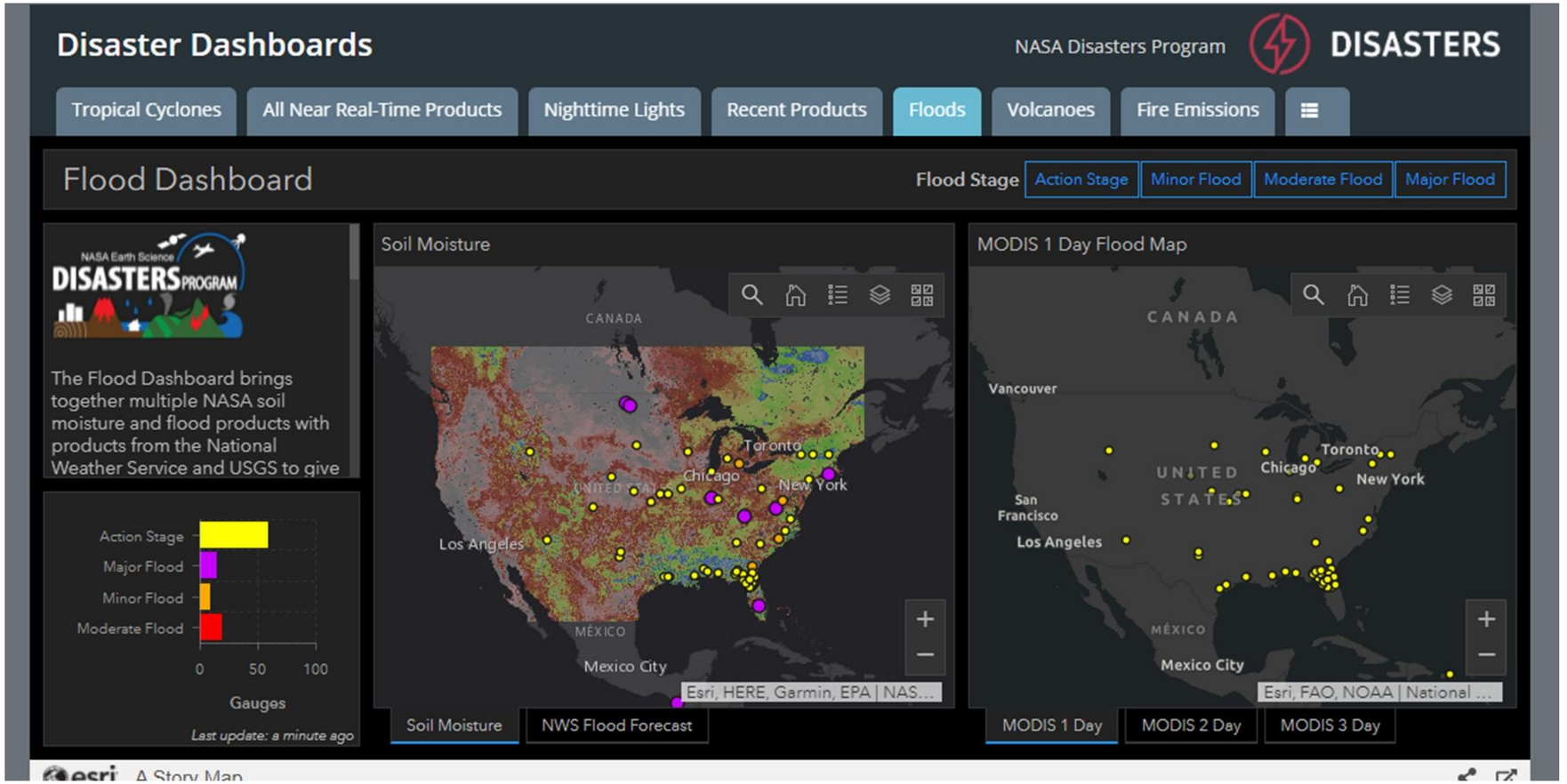
https://disasters-nasa.hub.arcgis.com/



NASA Disasters Mapping Portal

User-centric dashboards and hazard impact

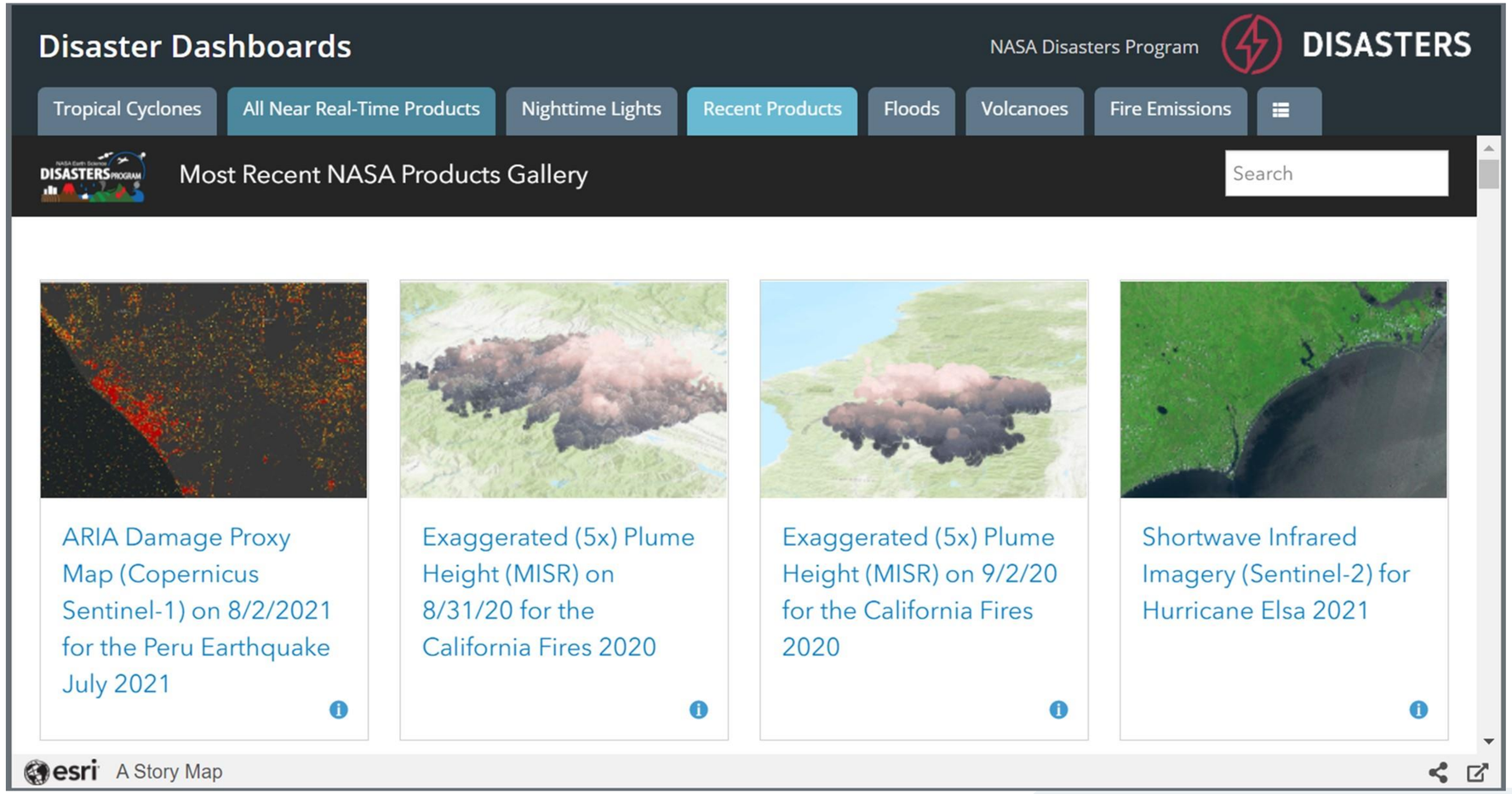
https://disasters-nasa.hub.arcgis.com/



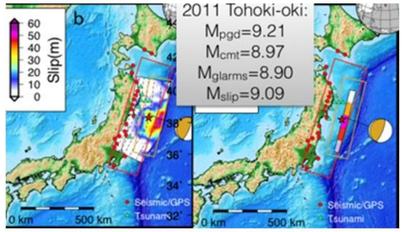
NASA Disasters Mapping Portal

https://disasters-nasa.hub.arcgis.com/

Creating a collaborative community of practice



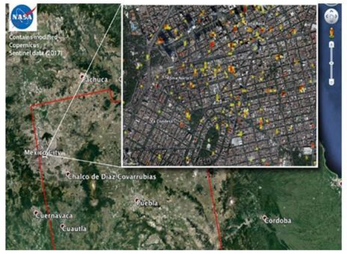
Observational and Collection Systems

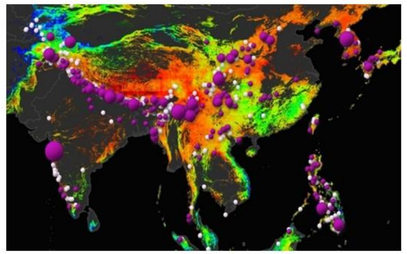


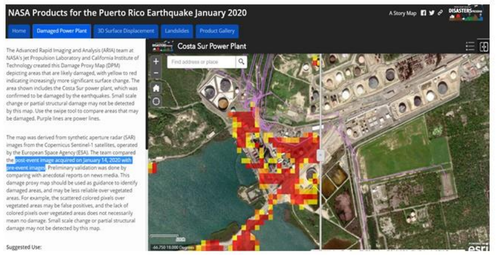
How We Work

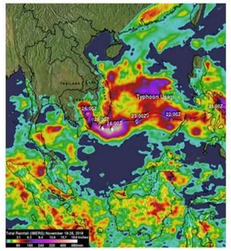
End-to-End Innovation and Integration

Advanced Modeling and Risk Analysis

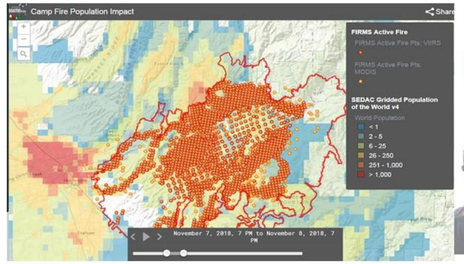


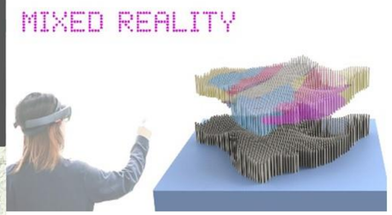


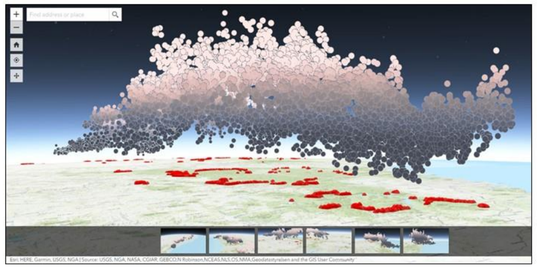




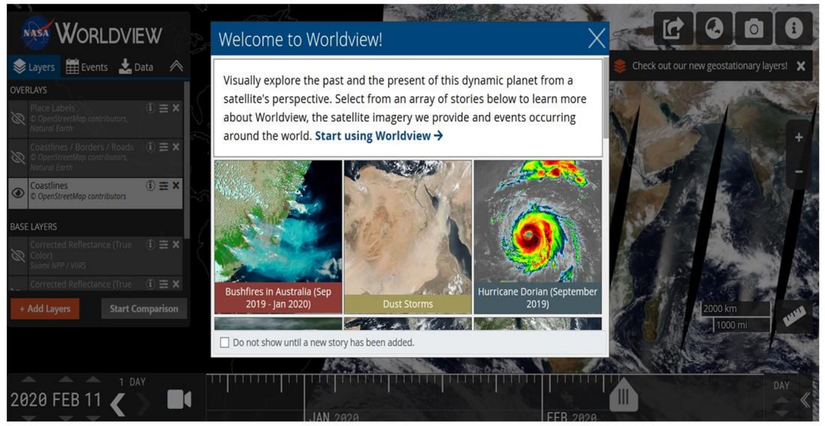
GIS and visualization systems







Computing and Communication Technologies

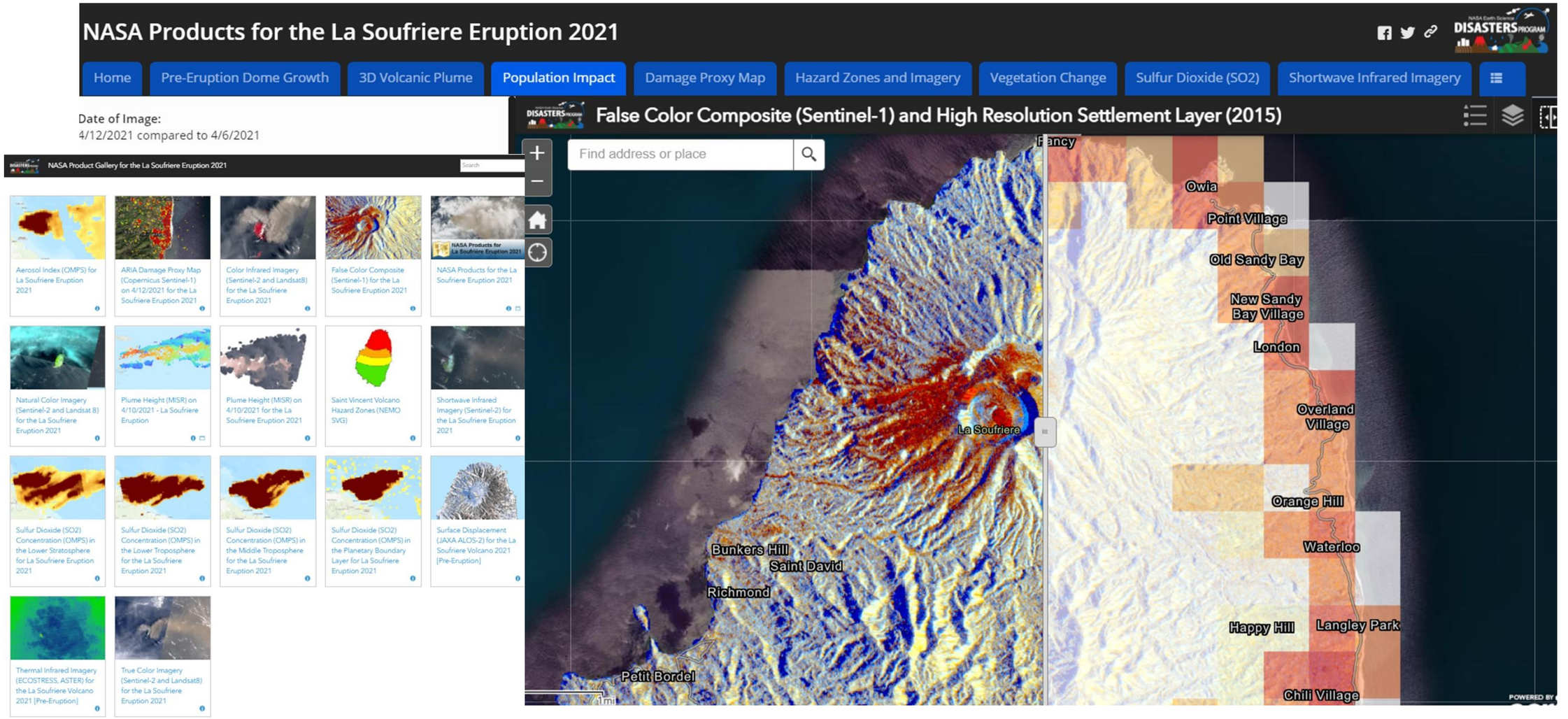


NASA Disaster Risk Research

- Global Flood Modeling for Decision Making
- Critical Infrastructure Exposure for Disaster Mitigation
- Landslide Risk Reduction
- Oil Spill Monitoring and Storm Damage Assessment
- Forecasting of Fire Behavior and Smoke Impact
- SAR Data for Weather-related Disasters
- Volcanic Ash Monitoring
- Hail Storm Risk Assessment
- SAR Rapid Damage Assessments
- Tsunami Warning through Earthquake Products

ROSES A.37 Portfolio

Anticipating Impacts with Partners

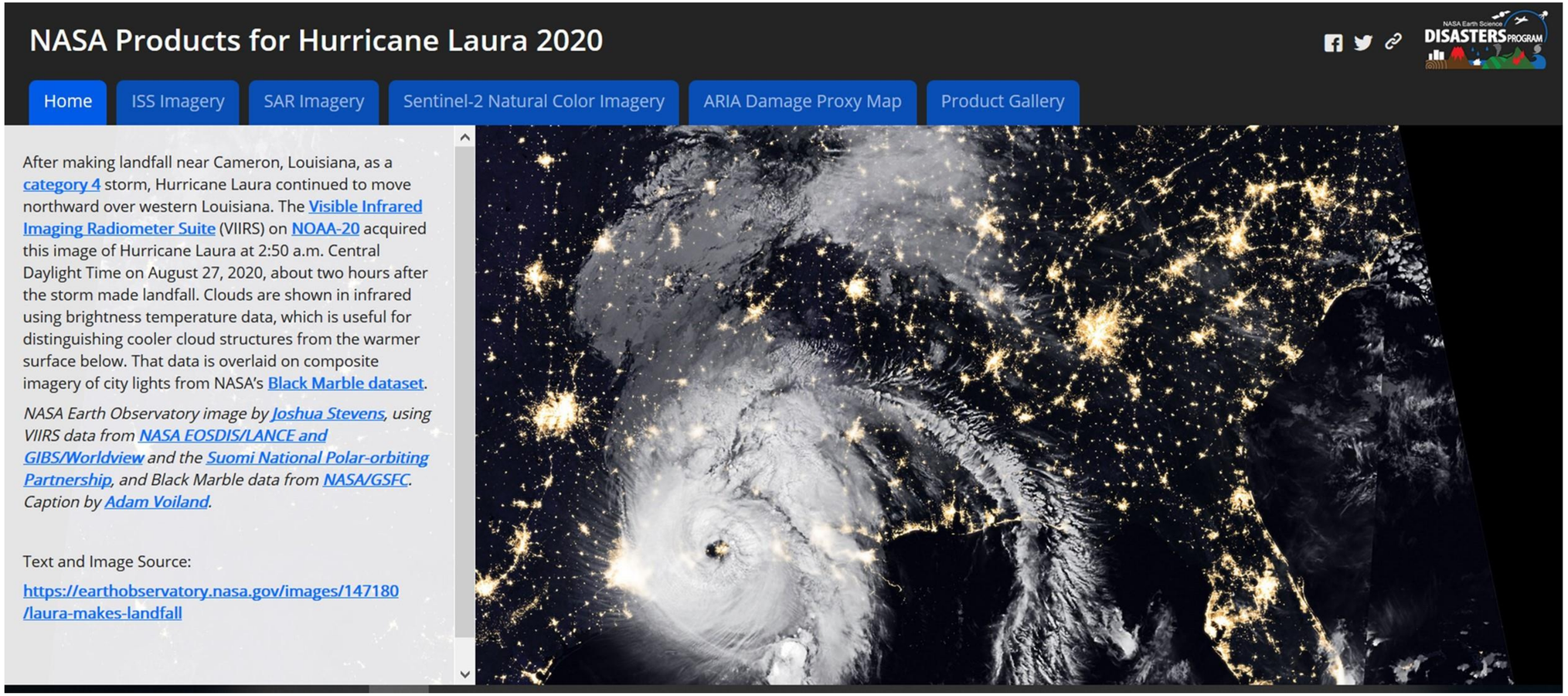


https://maps.disasters.nasa.gov/arcgis/apps/MapSeries/index.html?appid=483b9f632f6c4dadbb73fa60e8b30b4f

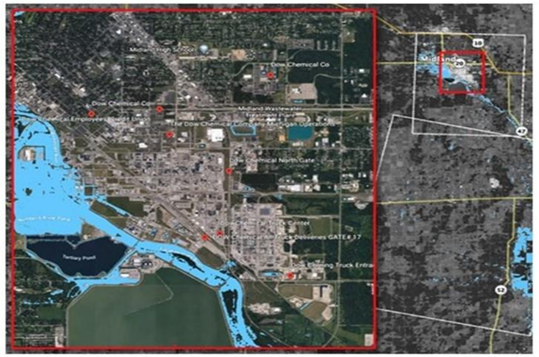
From Earth System Science to Humanitarian Relief

Super Cyclone Amphan, flood extent and damage maps for ports and power plants
Supporting World Food Program

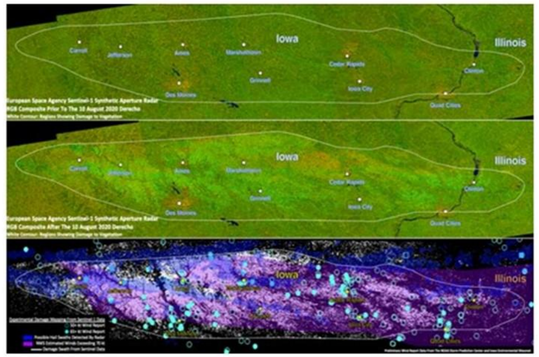
Sharing observations strengthens resilience and builds back smarter



From Earth System Science to Sustainable Recovery



As water overruns a neighborhood dam and threatens air fields and chemical contamination, NASA Disasters supplies people and businesses in the community with flood Proxy Maps



As a severe derecho swept across the Midwest threatening lives and livelihoods, NASA's satellite-based damage products supported people impacted

Helping communities stay connected

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Hail Storm Risk Assessments

Dr. Kris Bedka
Principal Investigator

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Hail Storm Risk Assessment Using Space-Borne Remote Sensing Observations and Reanalyses

Principal Investigator: Kristopher Bedka, NASA Langley Research Center (LaRC), kristopher.m.bedka@nasa.gov

Example Societal Impacts of Hailstorms

Hail is the costliest severe weather hazard for the insurance industry, generating $10's of billions in losses across the world due to damage to homes, businesses, agriculture, and infrastructure

Hail catastrophe models (CatModels) estimate risk to an insurer's portfolio. CatModels are developed with climatologies defining hailstorm frequency/severity

Hail climatologies are difficult to derive over developing nations without hail reporting or climate-quality weather radar observations

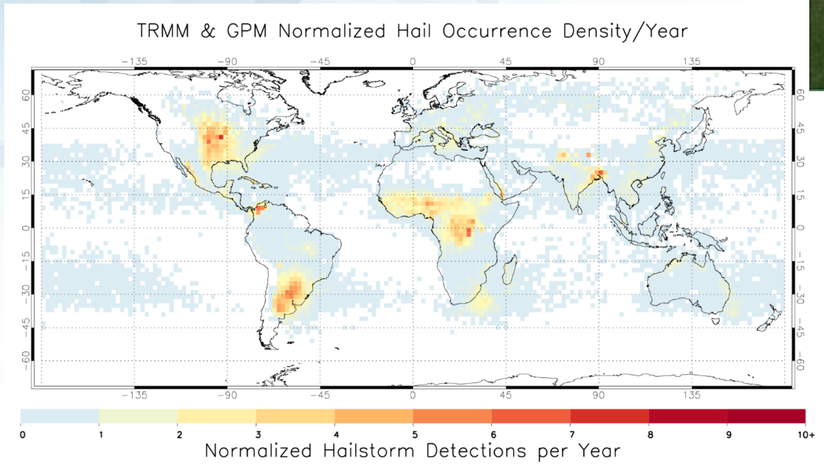
Hailstorms generate unique patterns in satellite imagery that has been collected for the last 25-30+ years, offering a new opportunity to identify hail-prone regions

This project is using satellite observations and reanalyses to:

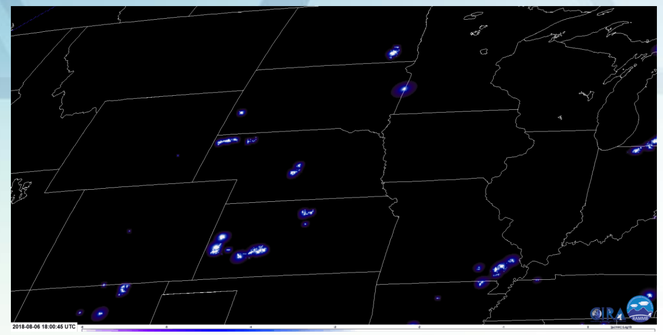
1) Perform climatological hailstorm analysis to enable CatModel development and hailstorm resilience across the globe
2) Improve severe storm understanding and warning in regions without adequate weather radar coverage
3) Analyze hailstorm damage signatures in high spatial resolution optical imager and synthetic aperature radar data to assess opportunities for post-disaster mapping and response

Hail Storm Risk Assessment Using Space-Borne Remote Sensing Observations and Reanalyses

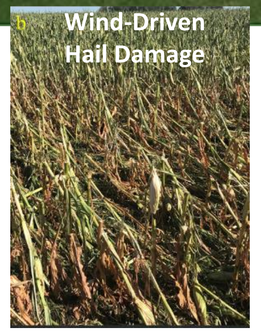
Up to 30-Year Duration Global Passive Microwave Hailstorm Database

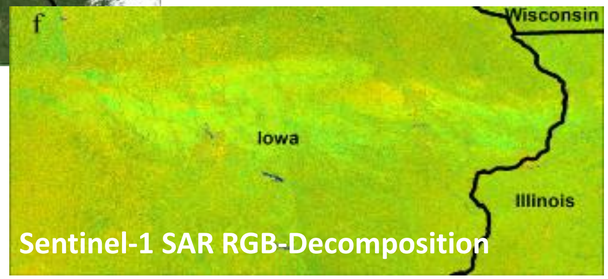


Geostationary Lightning Flash Rates and Flash Characteristics Consistent With Hailstorms



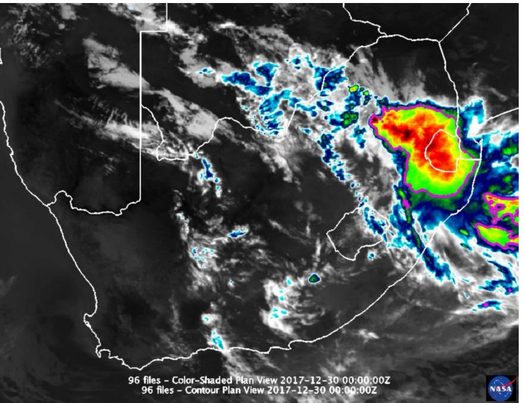
Catastrophic 10 August 2020 Iowa Derecho





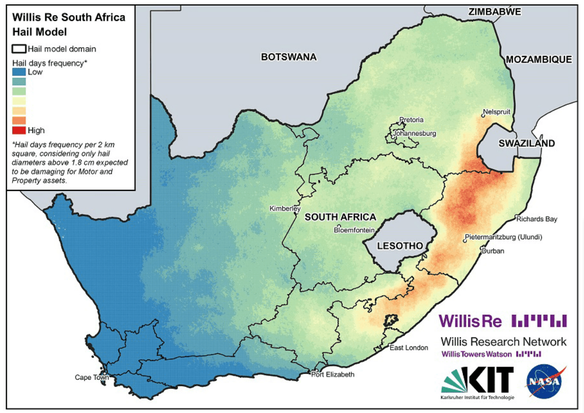
Develop the Highest Possible Resolution and Longest Duration Satellite and Reanalysis-Based Hail and Severe Storm Climatologies, Tested and Validated With Spotter Reports, Doppler Radar Hail Detection, and Insured Losses

Demonstrate Use of High Resolution Optical Imager and SAR Data To Identify Hail Damage Swaths For Post-Event Response and Insurance Claim Analysis



Up to 25 Year Duration, ~4 km and 10-30 min Resolution Geostationary Infrared Detections of Hailstorm Clouds

Reinsurance Hailstorm Catastrophe Models Derived From Satellite and Reanalysis Data



Use Climatologies To Develop Reinsurance Hail Catastrophe Models, Improve Understanding of Hailstorm Distributions at High Spatio-Temporal Resolution

Provide Near-Real Time Geostationary Products To Aid Severe and Aviation Weather Forecasting

Visualize and Provide Data to The International Community With GIS-Based Tools

Project Partners

NASA LaRC and MSFC, U. Alabama in Huntsville, Willis Towers Watson, Karlsruhe Institute of Technology, University of Buenos Aires, Brazil National Institute for Space Research CPTEC, National Meteorological Service of Argentina, South African Weather Service

Co-Investigators and Collaborators

Role	Name	Affiliation
Co-PIs	**Christopher Schultz, Daniel Cecil, Sarah Bang, and Jordan Bell**	**NASA Marshall Space Flight Center**
Co-Is	Heinz Jurgen-Punge and Michael Kunz	Karlsruhe Institute of Technology
Co-I	Geoffrey Saville	Willis Towers Watson
Co-Is	Konstantin Khlopenkov, Benjamin Scarino, Kyle Itterly, and Doug Spangenberg	Science Systems and Applications, Inc.
Collaborator	Luciano Vidal	National Meteorological Service of Argentina
Collaborator	Paola Salio	University of Buenos Aires
Collaborators	Luiz Machado	INPE/CPTEC, Brazil
Collaborators	Cameron Homeyer and Elisa Murillo	University of Oklahoma
Collaborator	John Allen	Central Michigan University
Collaborators	Steve Nesbitt and Jeff Trapp	University of Illinois – Urbana Champaign
Collaborator	John Cooney	NASA Postdoctoral Program at NASA LaRC
Collaborator	Morne Gijben	South African Weather Service (SAWS)
Collaborator	Julian Brimelow	Environment and Climate Change Canada
Collaborator	Franz Meyer	University of Alaska-Fairbanks
Collaborators	GIS Specialists at the Atmospheric Science Data Center	NASA Langley Research Center

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Landslide Science to Decisionmaking

NASA GSFC Landslide Research Team

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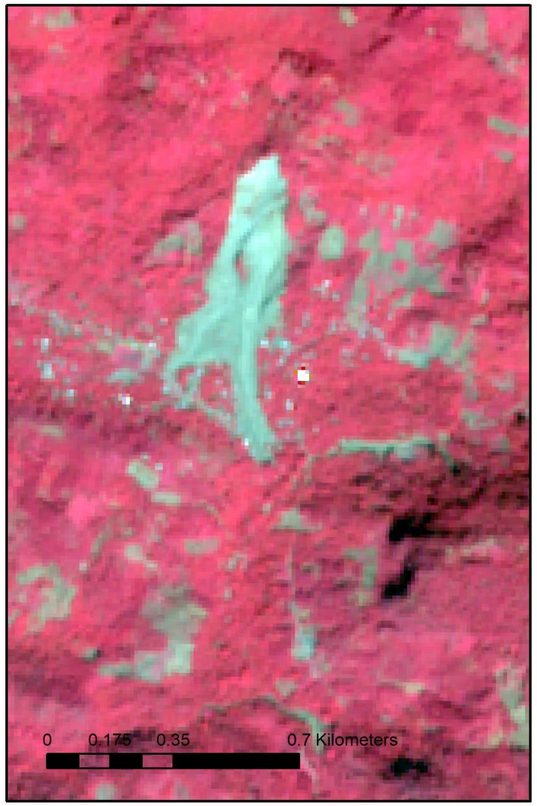
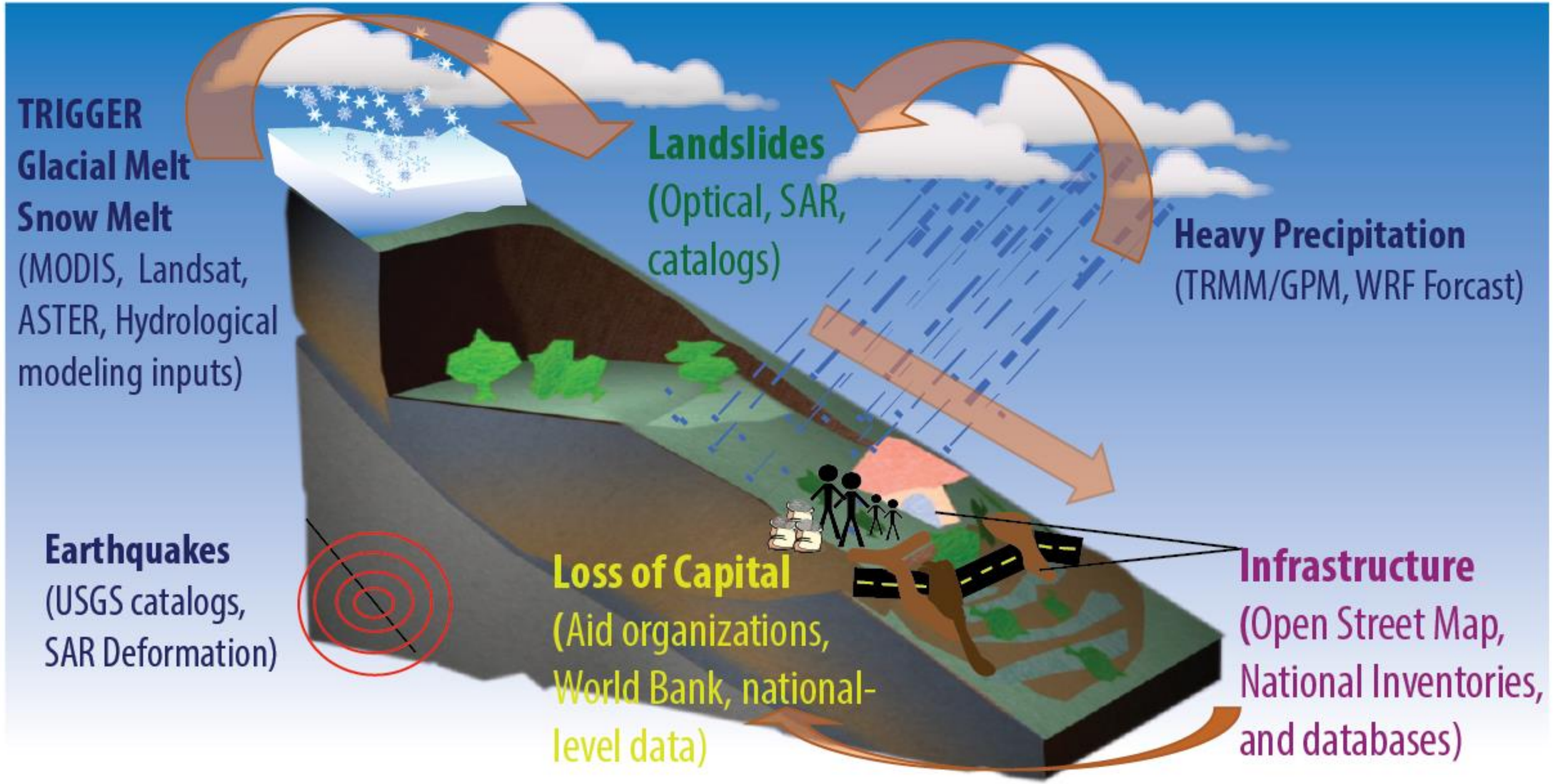
Devastating local events, seen from space

Landslides cause devastating impacts to communities in mountainous areas. How can we support response and mitigation activities with satellite data?

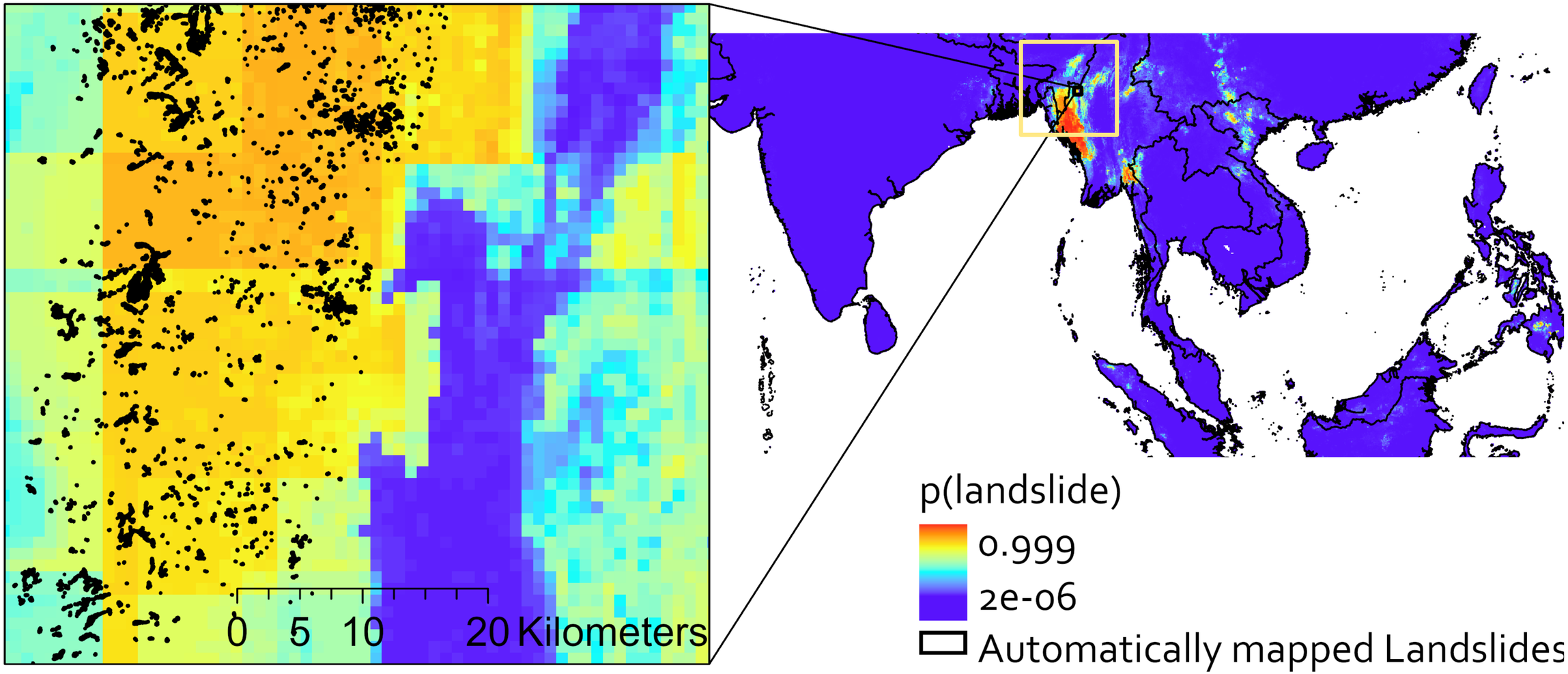
High Resolution Landslide Mapping





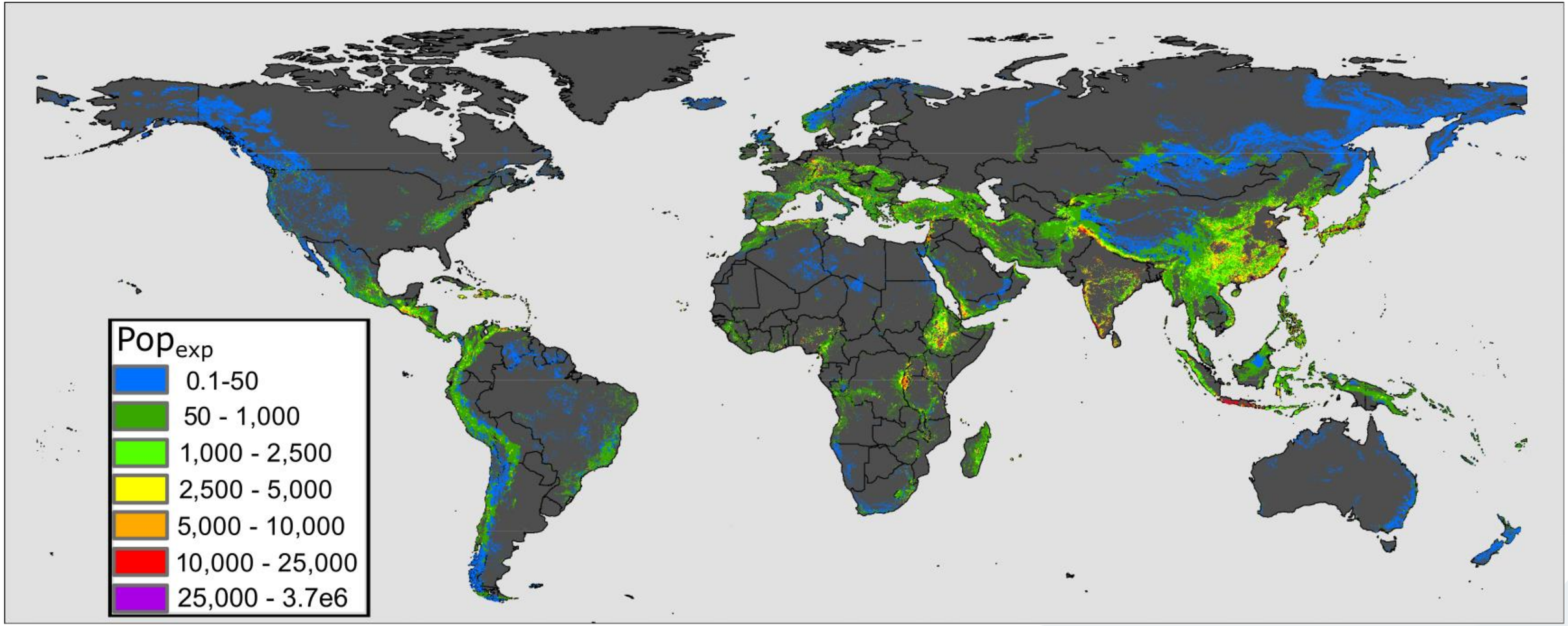
What data can we use?

Nowcasting – and forecasting - landslides

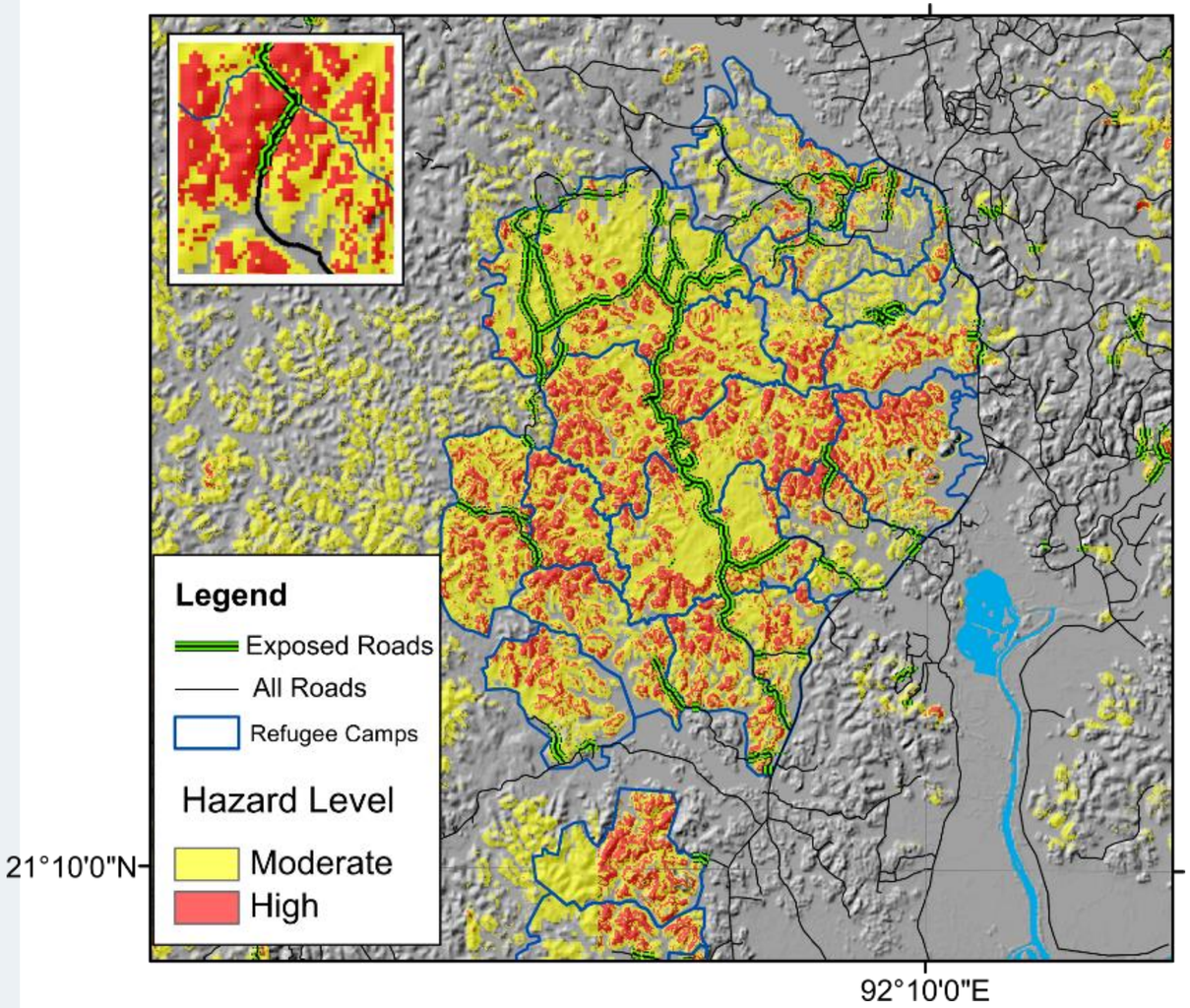


Using newly developed models, we can estimate the probability of landslides around the world in near-real time

A global perspective of exposure

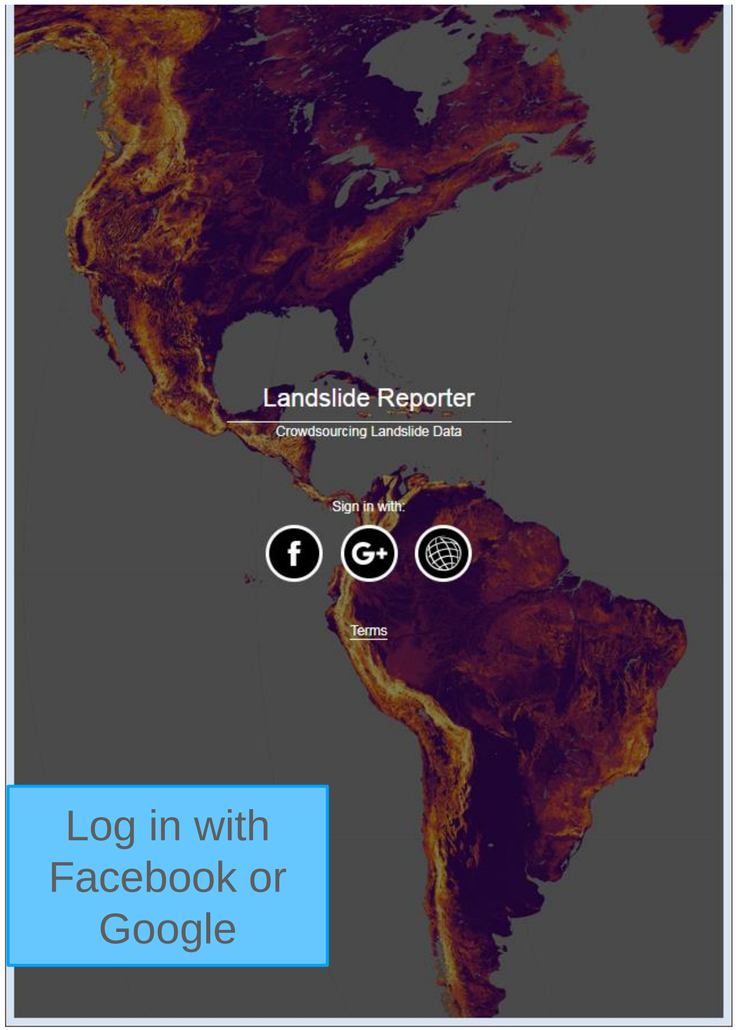


Local projects with refugees

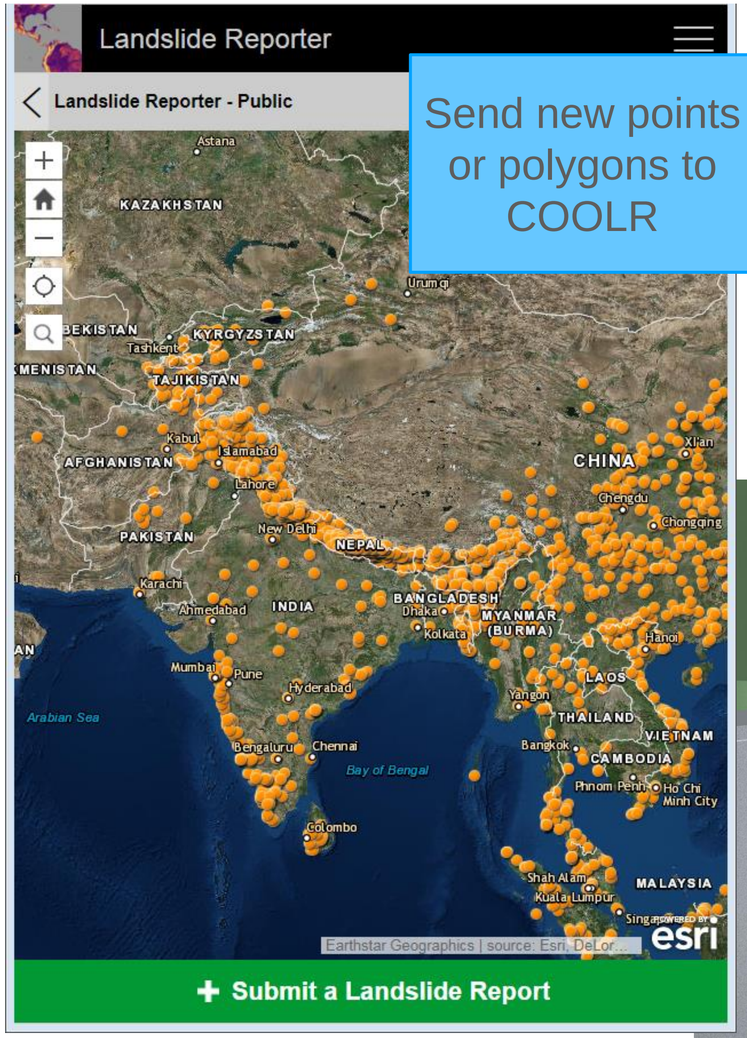


NASA data is used to model the exposure of vulnerable refugees to landslides in the Rohingya refugee camps

Improving our models with citizen science



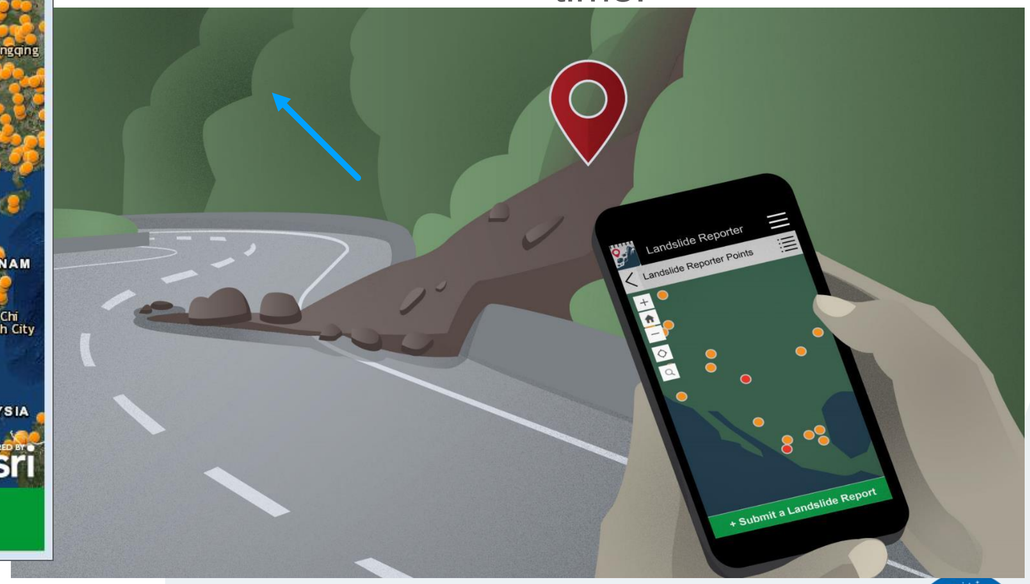
Log in with Facebook or Google



Send new points or polygons to COOLR

https://landslides.nasa.gov

Citizen scientists are helping NASA expand the global landslide map, one landslide at a time!



Report landslides you see

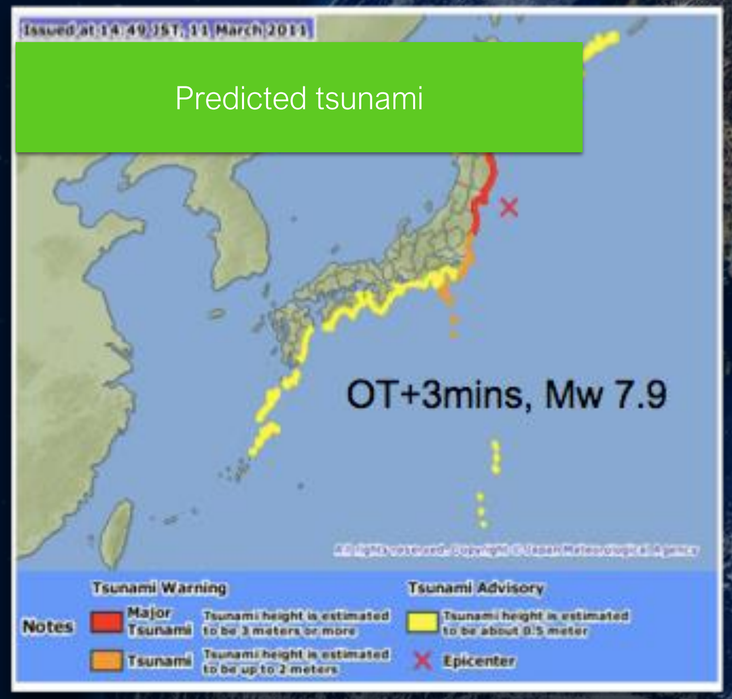
EARTH SCIENCE
APPLIED SCIENCES

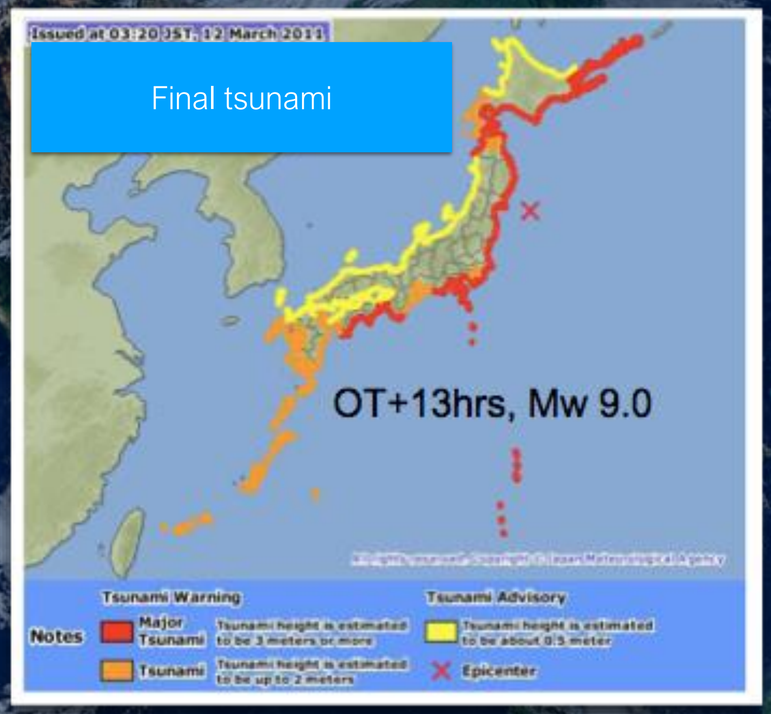
Tsunami Early Warning with GNSS

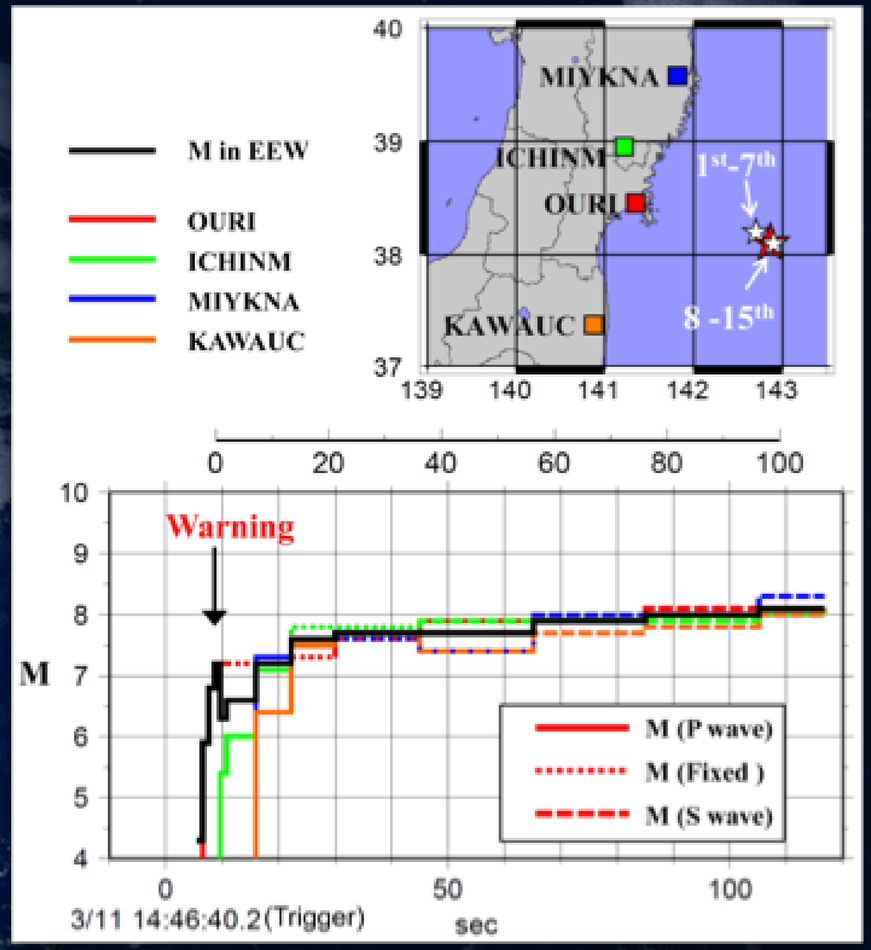
Brendan Crowell, UW
Diego Melgar, UO
Tim Melbourne, CWU
Diego Arcas, NOAA

EARTH SCIENCE APPLICATIONS WEEK 2021

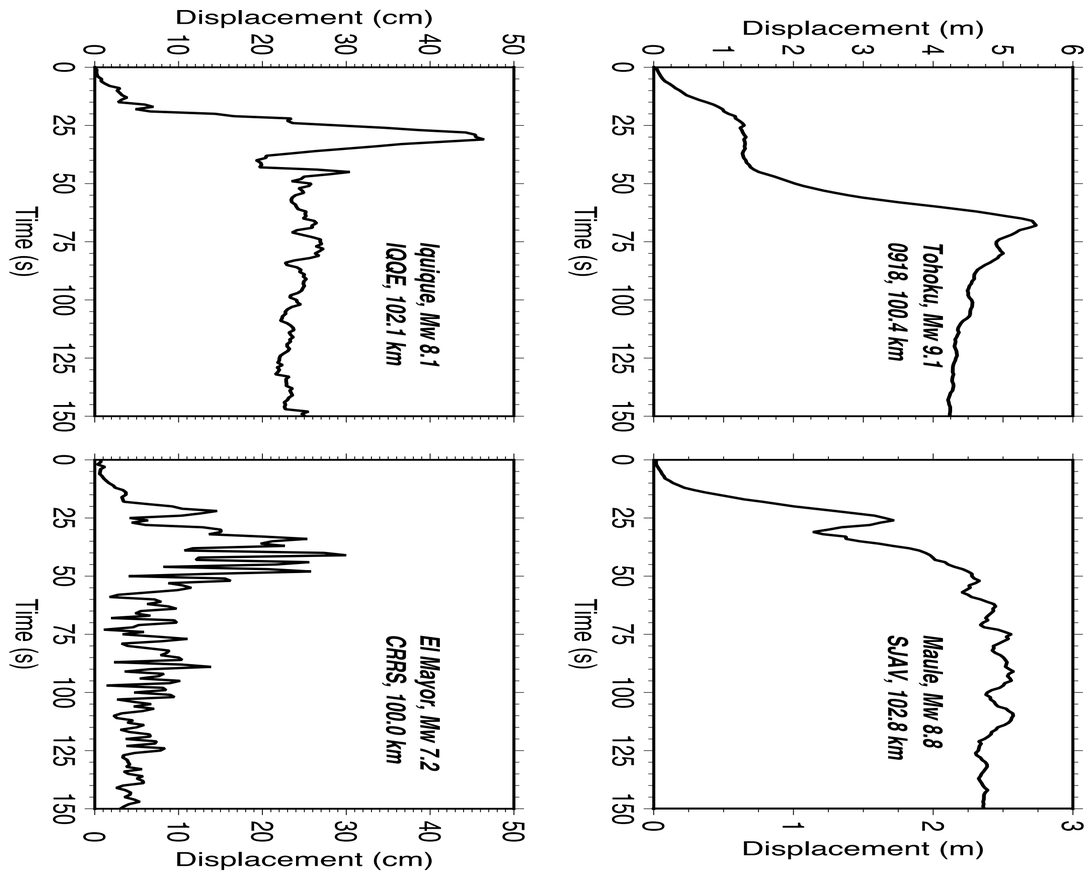
Local Tsunami Warning is Difficult with Seismic Data

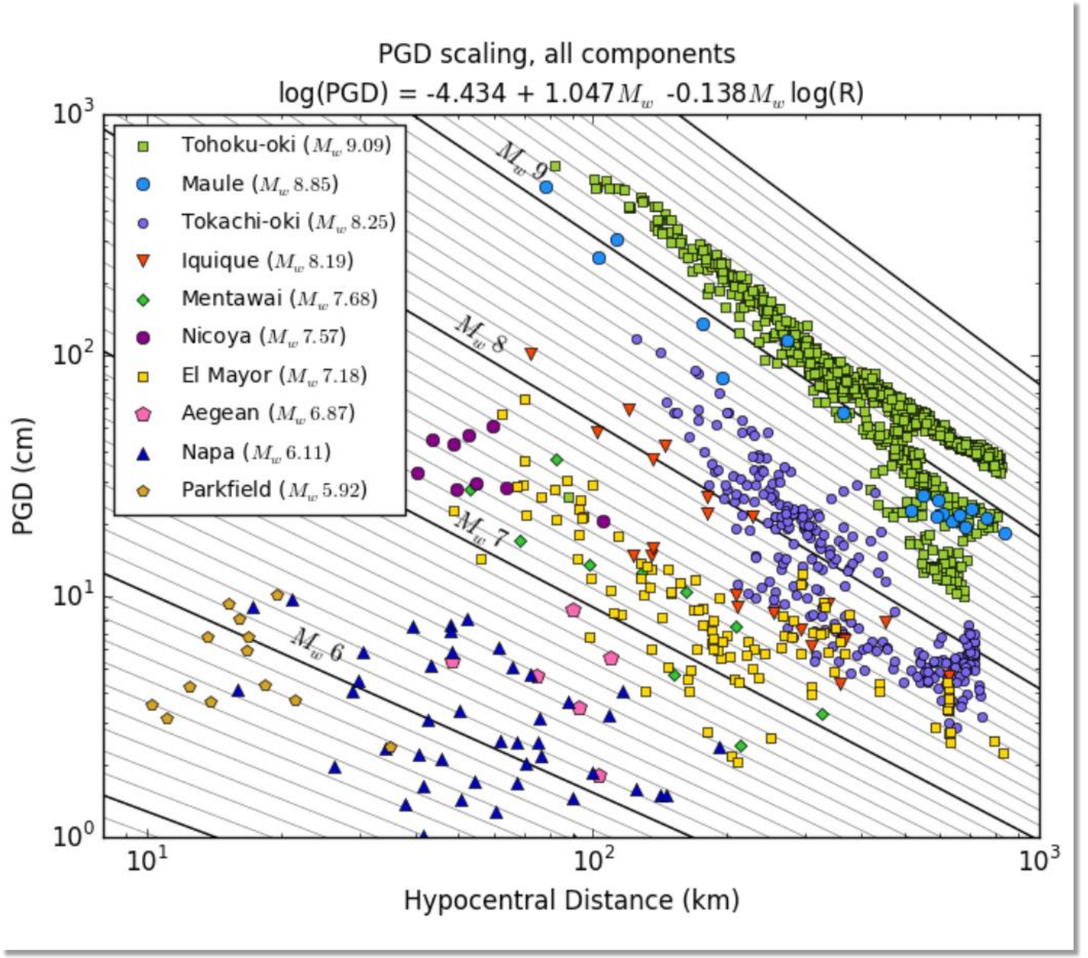






GNSS/GPS Does Not Saturate for Large Earthquakes

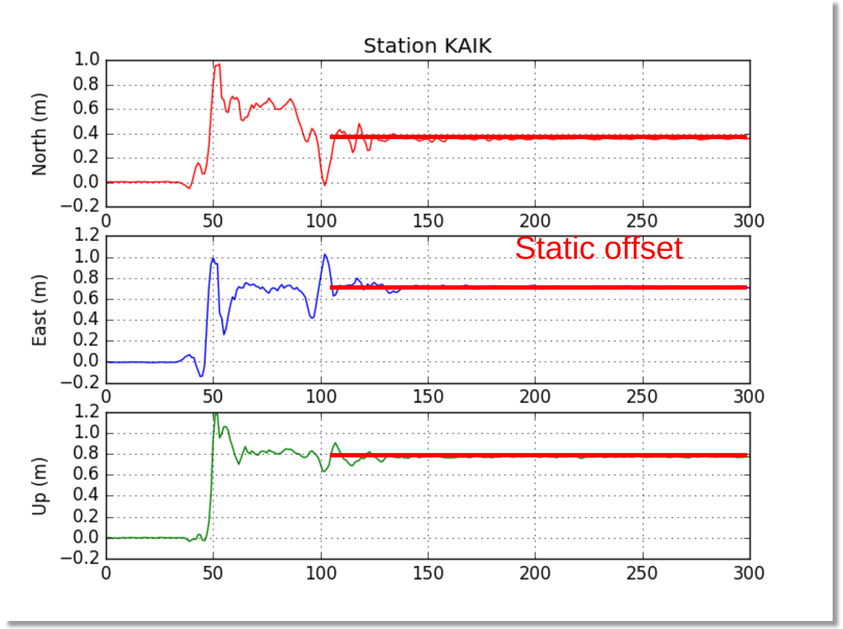


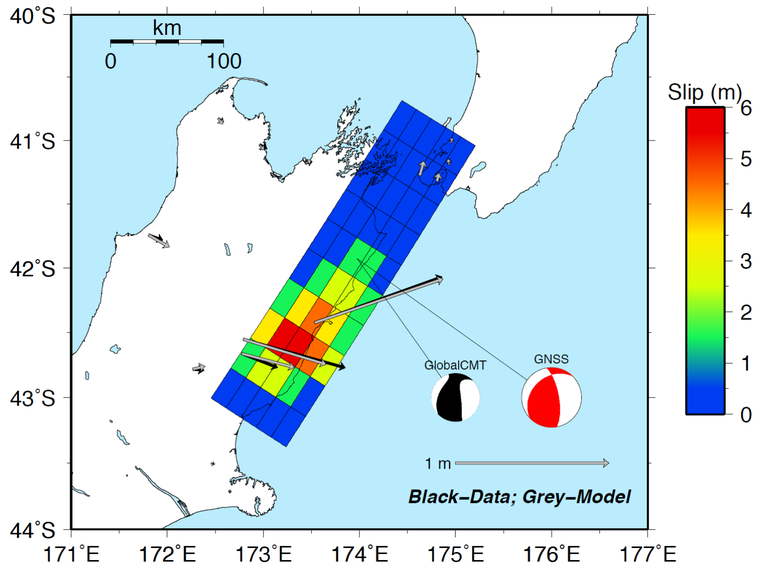


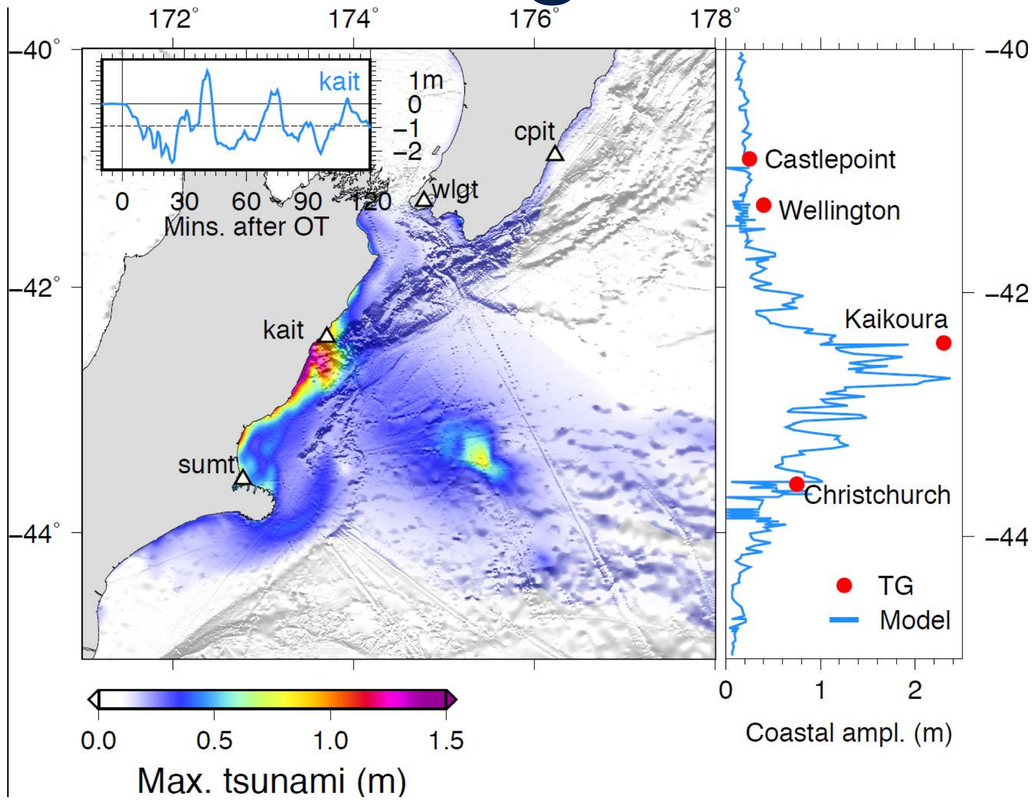
We measure both dynamic motions and permanent offsets

We can use scaling laws to get magnitude quickly and use the offsets to get the slip on the fault

GNSS/GPS Allows for Local Warning







We can fully characterize large earthquakes and the tsunamigenic potential in under 5 minutes

We process over 1400 sites globally in real-time

EARTH SCIENCE
APPLIED SCIENCES

Development and Implementation of Remote Sensing Techniques for Oil Spill Monitoring and Storm Damage Assessment in an Operational Context

A.37 Oil Spills

Presented by: Ellen Ramirez, NOAA

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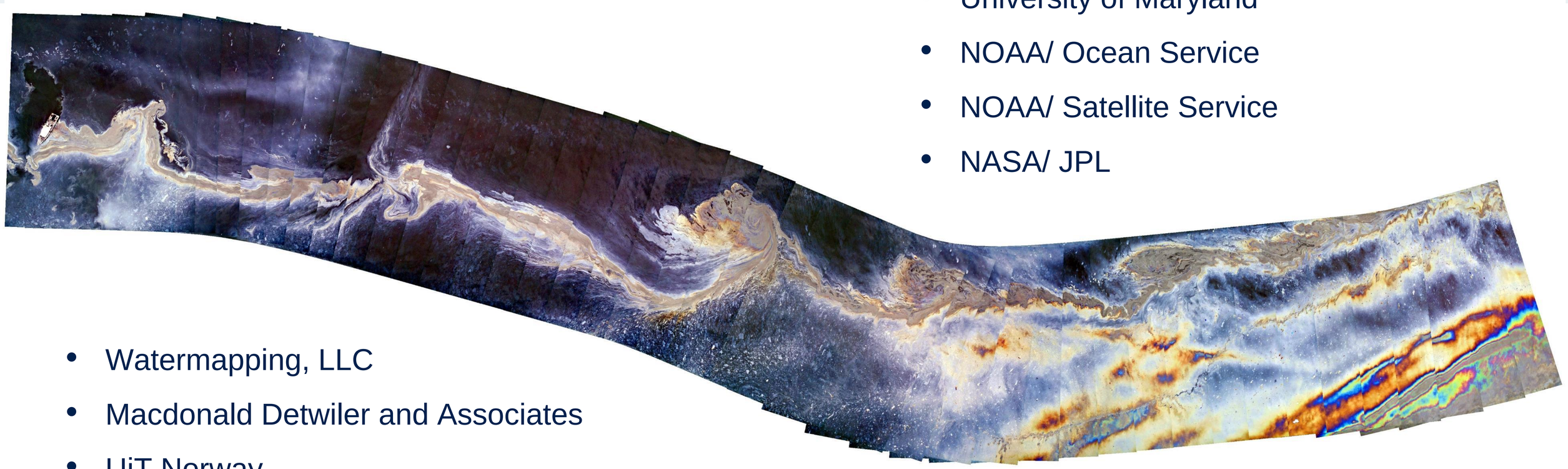
Interdisciplinary Team of Research Partners

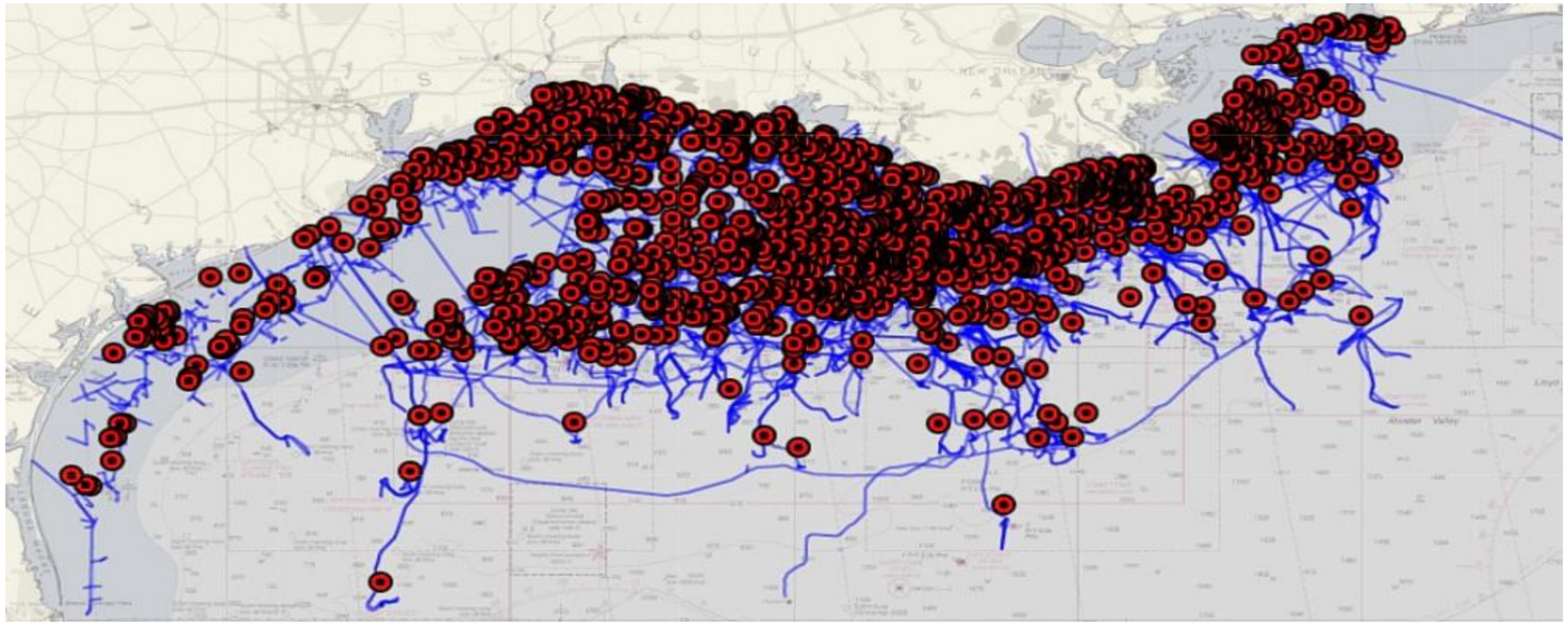


- University of Maryland
- NOAA/ Ocean Service
- NOAA/ Satellite Service
- NASA/ JPL

- Watermapping, LLC
- Macdonald Detwiler and Associates
- UiT Norway
- United States Coast Guard

Oil Pollution Sources

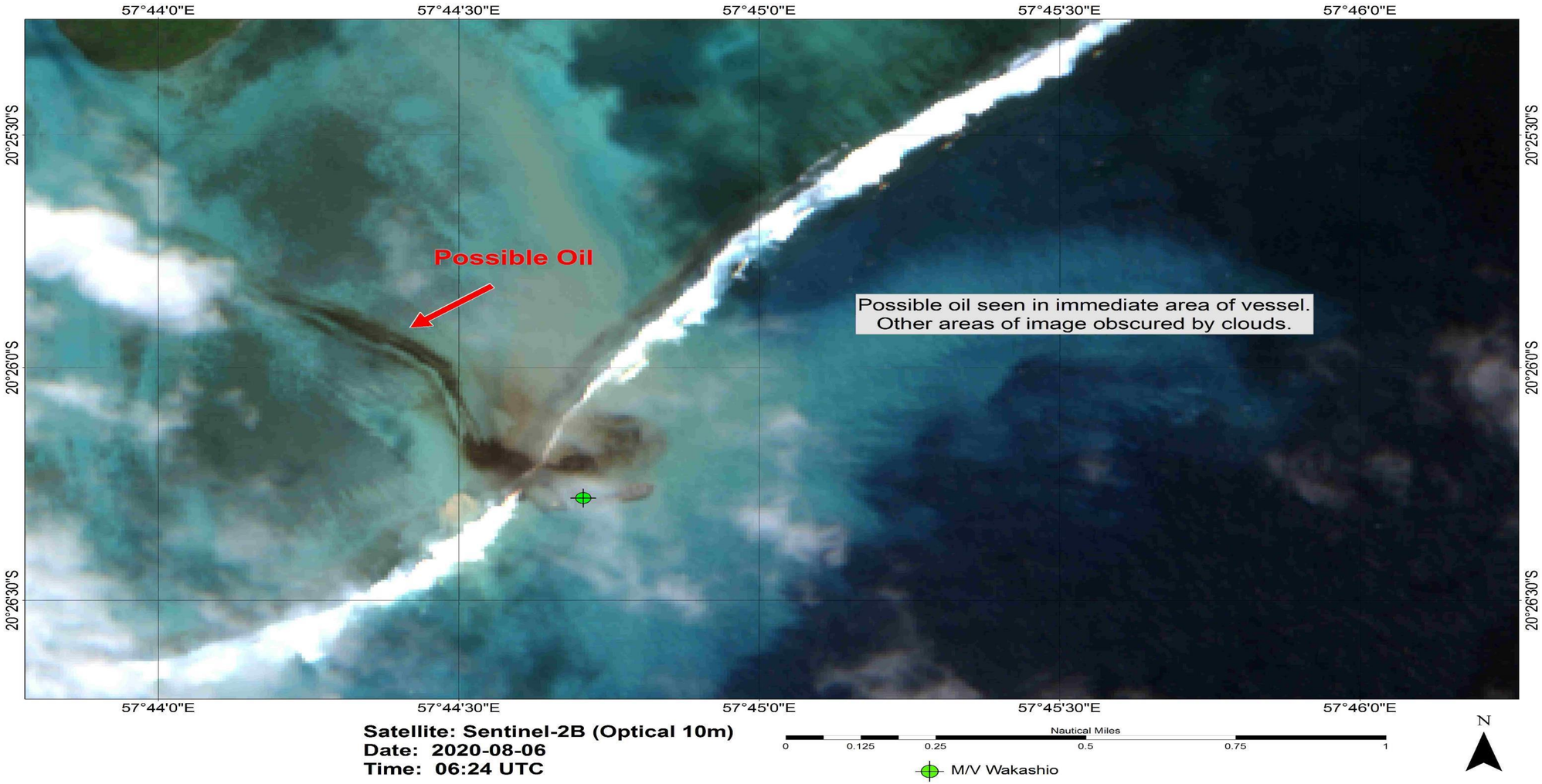
- 2,000+ Oil Industry Structures in the Gulf of Mexico



INTERNATIONAL EVENTS

- Brazil, Mystery Spill
- Sri Lanka, Cargo Tanker
- Israel, Mystery Spill
- Mauritius, Tanker aground
- Grand Bahama, Storage facility

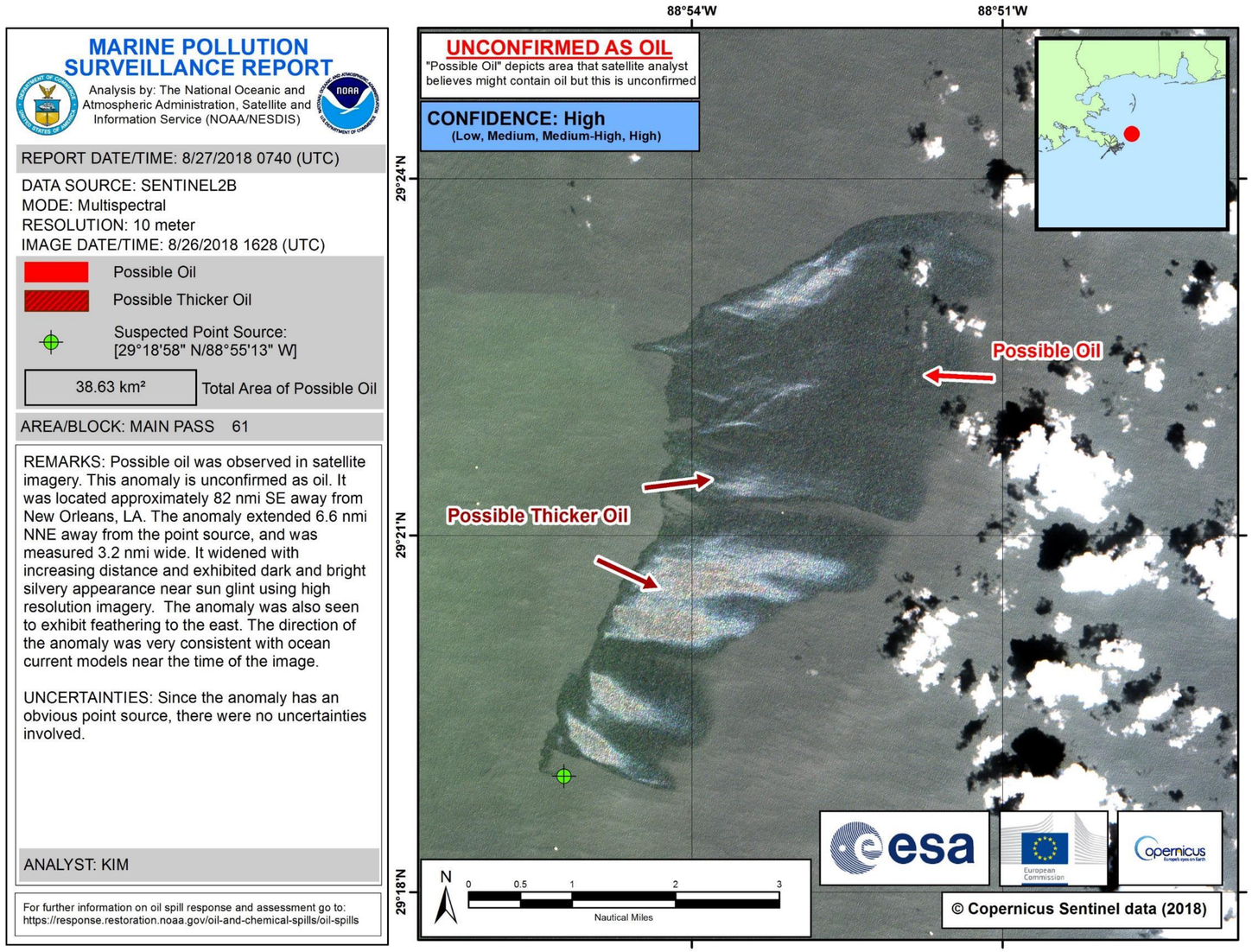
Satellite Technology to Detect Oil Spills



Stakeholders

- Dept. of Homeland Security: U.S. Coast Guard
- Dept. of the Interior: Bureau of Safety and Environmental Enforcement
- Dept. of Commerce: NOAA
- Environmental Protection Agency
- International Disasters Charter
- State Authorities (i.e. Texas General Land Office, Alaska Dept. of Environmental Conservation, Louisiana Oil Spill Coordinator's Office, Florida Fish and Wildlife
- Private Sector
- Public Citizens

Manual → Automated Implementation



MARINE POLLUTION SURVEILLANCE REPORT

Analysis by: The National Oceanic and Atmospheric Administration, Satellite and Information Service (NOAA/NESDIS)

REPORT DATE/TIME: 8/27/2018 0740 (UTC)

DATA SOURCE: SENTINEL2B
MODE: Multispectral
RESOLUTION: 10 meter
IMAGE DATE/TIME: 8/26/2018 1628 (UTC)

Possible Oil
Possible Thicker Oil
Suspected Point Source: [29°18'58" N/88°55'13" W]

38.63 km² Total Area of Possible Oil

AREA/BLOCK: MAIN PASS 61

REMARKS: Possible oil was observed in satellite imagery. This anomaly is unconfirmed as oil. It was located approximately 82 nmi SE away from New Orleans, LA. The anomaly extended 6.6 nmi NNE away from the point source, and was measured 3.2 nmi wide. It widened with increasing distance and exhibited dark and bright silvery appearance near sun glint using high resolution imagery. The anomaly was also seen to exhibit feathering to the east. The direction of the anomaly was very consistent with ocean current models near the time of the image.

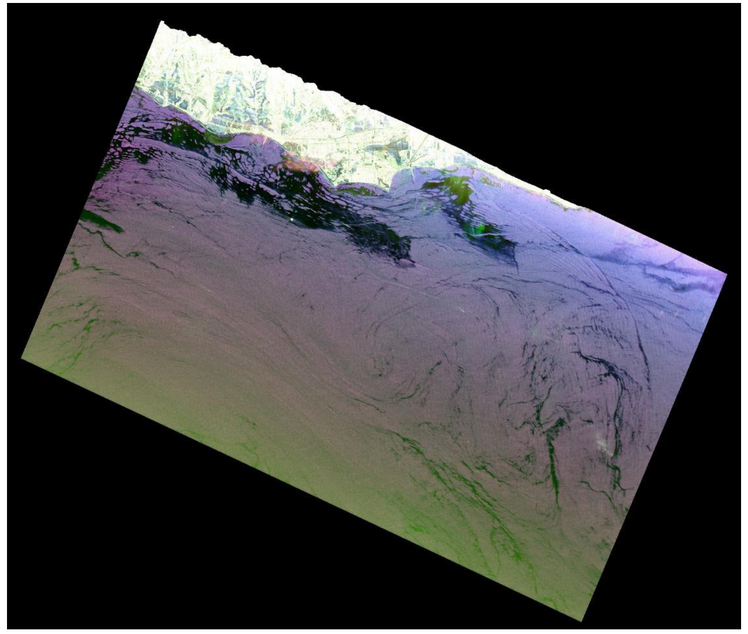
UNCERTAINTIES: Since the anomaly has an obvious point source, there were no uncertainties involved.

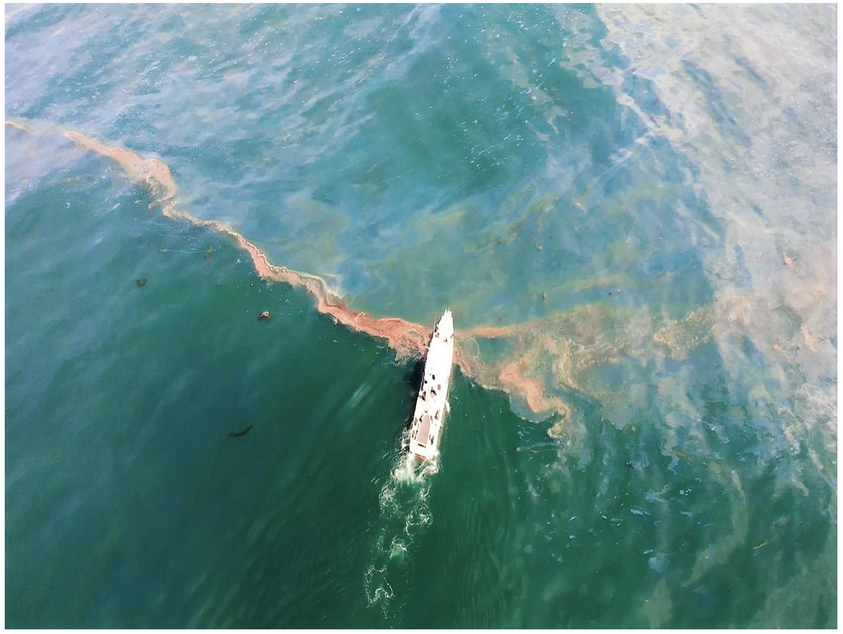
ANALYST: KIM

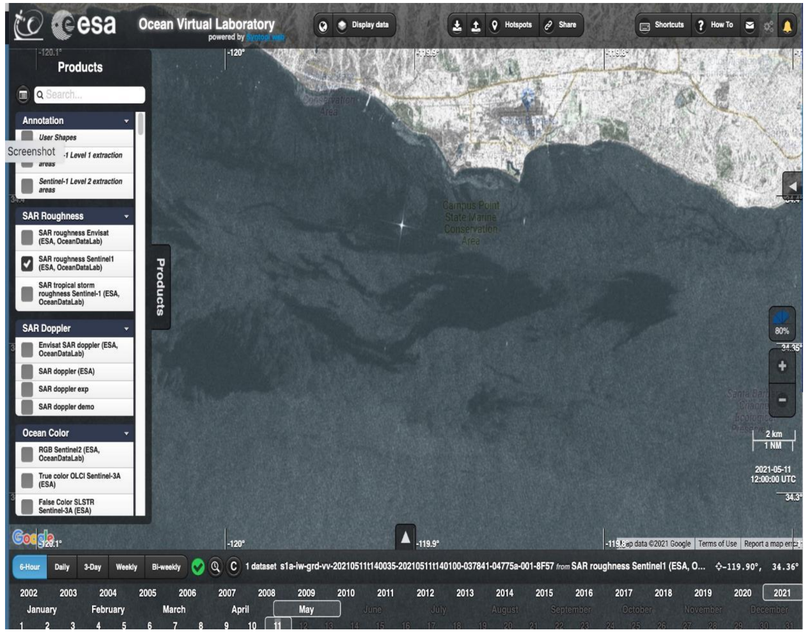
For further information on oil spill response and assessment go to: https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills

- Marine Pollution Surveillance Report from NOAA/NESDIS
- Detection vs Characterization
- Why is thickness information so important?
- Natural Resource Damage Assessment
- Civil Liability
- Impact to the Economy

Active Fieldwork at Santa Barbara, CA







- Natural Oil Seep Site
- Ground Validation
- Drone sensors, satellite imaging, drifters, in-situ sampling

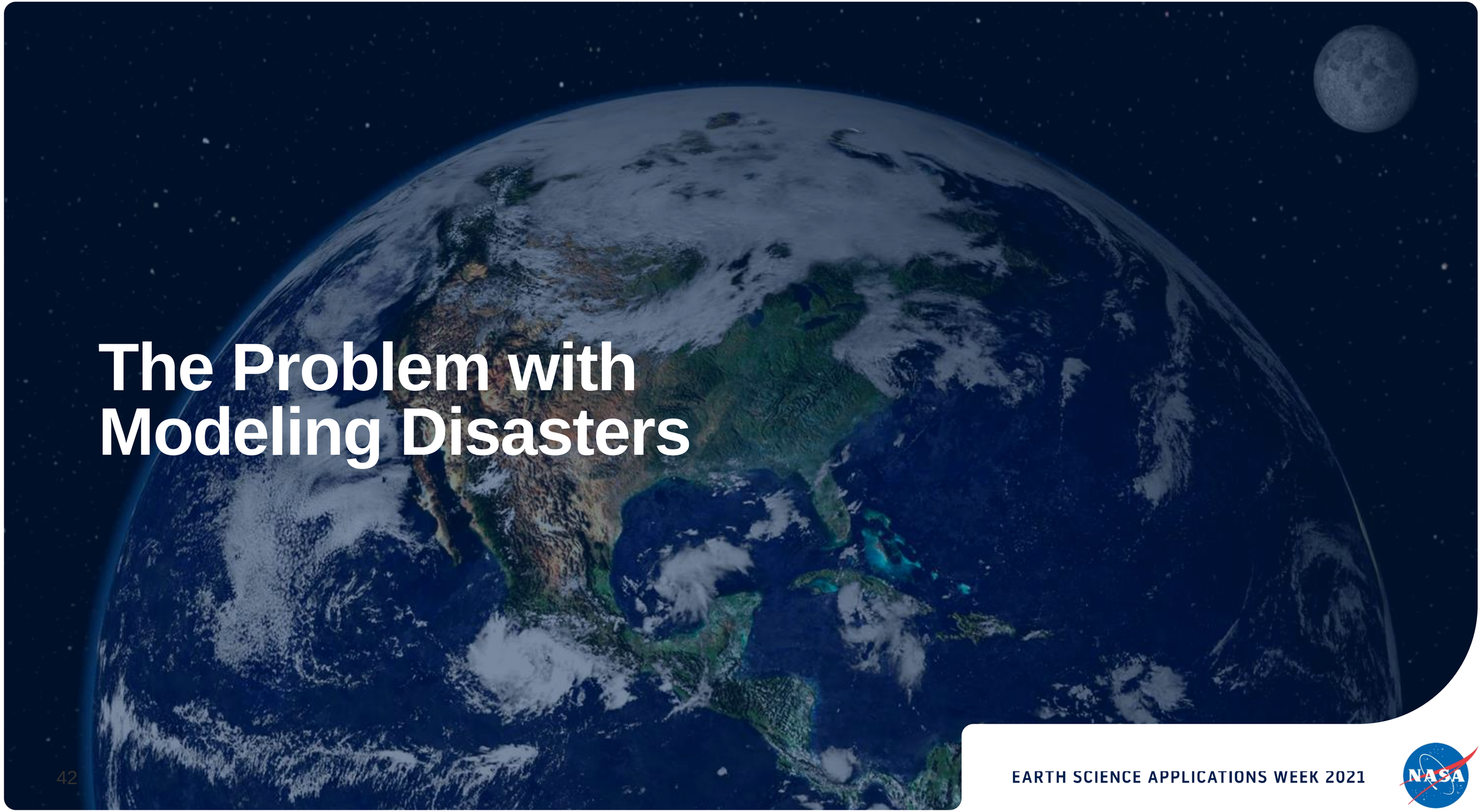
THANK YOU!

EARTH SCIENCE
APPLIED SCIENCES

Critical Infrastructure

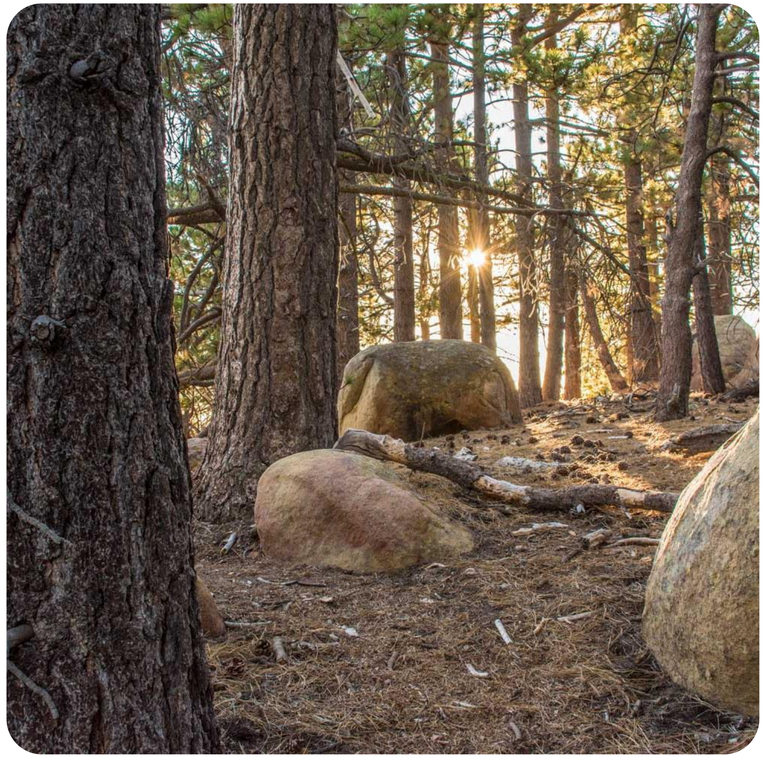
Characterizing Risk from Disruption

EARTH SCIENCE APPLICATIONS WEEK 2021



The Problem with Modeling Disasters

Critical Infrastructure and Economies Not Included



- Disaster have a “tipping point”
- Supply chains are dynamic
- Location data are lacking
- Fragilities unknown
- Data tightly held
- The data that is available presents an observation bias

- A MACRO solution is needed to see the forest though the trees

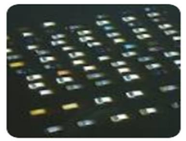
Thailand example, floods of 2011

WSJ Wall Street Journal

Thai Floods Disrupt Car Production - WSJ

BANGKOK—Thailand's auto exporters are being hit by supply-chain ... Prior to the floods, Thailand's National Economic and Social Development Board forecast ...

Oct 12, 2011



BBC News

Thailand floods disrupt production and supply chains

Factories and supply chains are facing disruption as some of the worst flooding in decades starts to affect Thailand's economy. Western Digital, Honda Motor ...

Oct 13, 2011

CW Computerworld

Thailand floods spur rush to SSDs

Thailand floods spur rush to SSDs ... products, including PCs, smartphones and tablet PCs, continued to drop because of sluggish economic conditions. Another ...

Dec 1, 2011

WSJ Wall Street Journal

Thai Authorities,Companies Blamed for Extent of Flood Damage

Some experts say yes, and that the international impact of Thailand's floods should ... the monsoon rains turned into such a devastating setback for the economy.

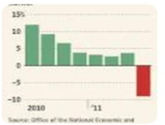
Nov 3, 2011

WSJ Wall Street Journal

Thailand GDP Shrinks 10.7%

BANGKOK—Thailand's economy contracted more than expected in the fourth quarter of last year as the country was hit by its worst floods in decades, pulling ...

Feb 20, 2012

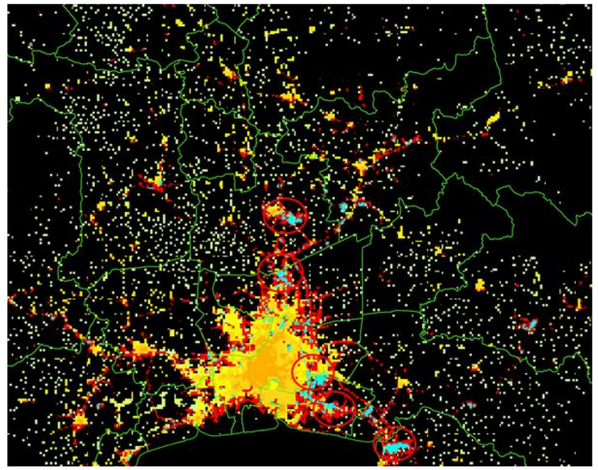


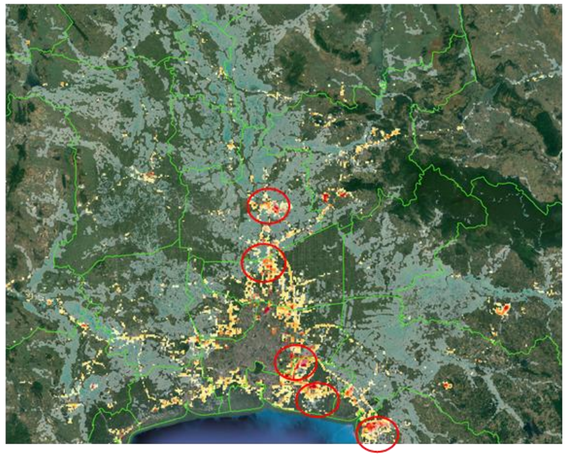
Proposed solution with EO data

Critical Infrastructure Interdependency Risk Index (CIIRI)

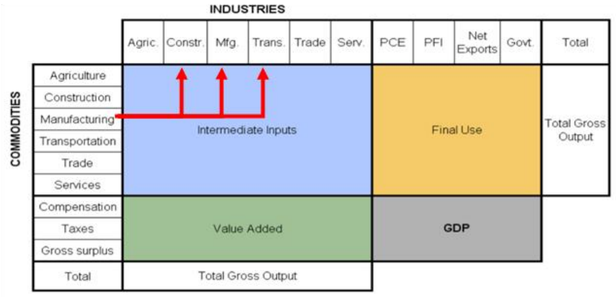
Regions of production and CI are visible

…detectable through segmentation



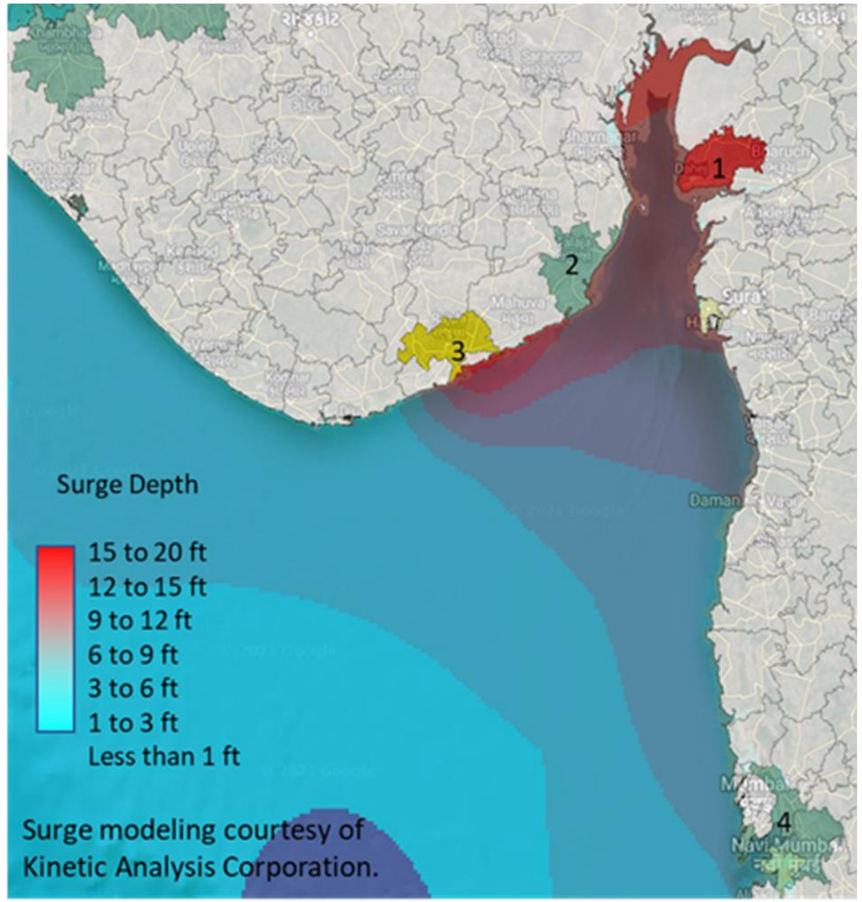


…and can be used to disaggregate/allocate production for overlaying with hazard data

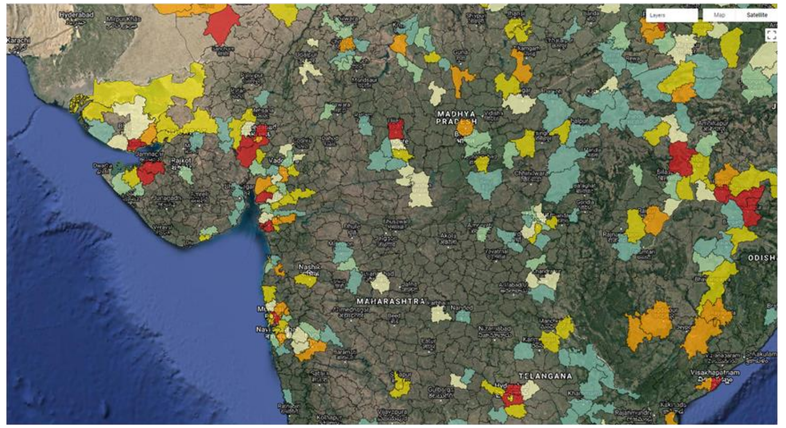


… and modeling via input-output economic models

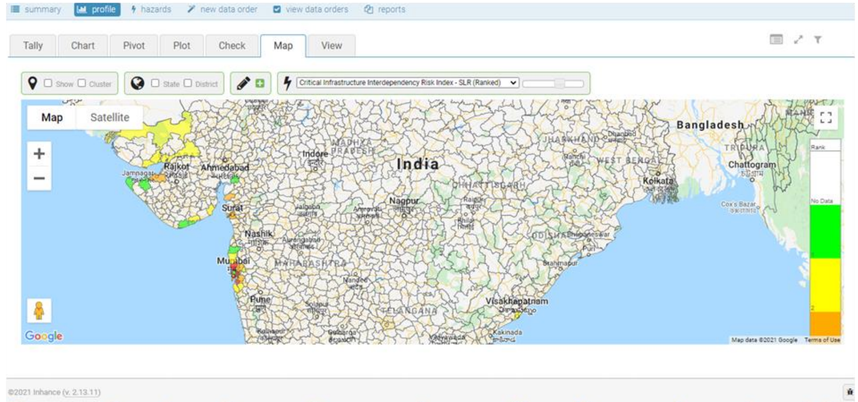
Critical Infrastructure Interdependency Risk Index (CIIRI)



Where active events, such as typhoons, are likely to cause disruption



Where 1% annual chance of flooding could cause cascading effects



County-level regions where nuisance flooding and sea level rise stand to disrupt industry and economies

Challenges and next steps

Modified Mercalli Intensity

LEVEL	DESCRIPTION
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably indoors, especially on upper of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all, many frightened and run indoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rail bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen of ground surface. Lines of sight and level are distorted. Objects are thrown into the air.

- Acceptance and validation
- Need something that is
  - Verifiable
  - Standardized
  - Intuitively meaningful

EARTH SCIENCE
APPLIED SCIENCES

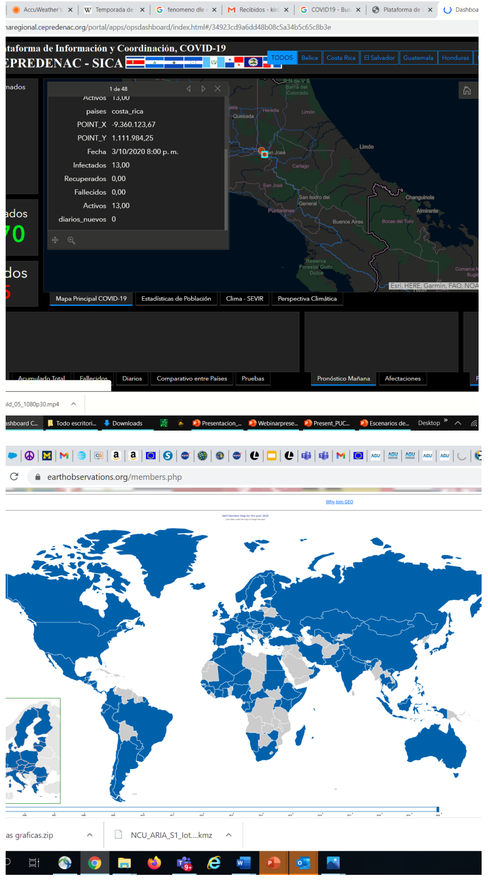
AmeriGEO

Ricardo Quiroga

EARTH SCIENCE APPLICATIONS WEEK 2021

AmeriGEO

Earth Observations for the Americas



Geospatial data to Sendai

EO Forums Disasters

Mapathon Innovation Challenges.

GEO-LABS

Webinars-Workshops

Applied Research

OGC pilots

Embassies of the Americas

UNDRR

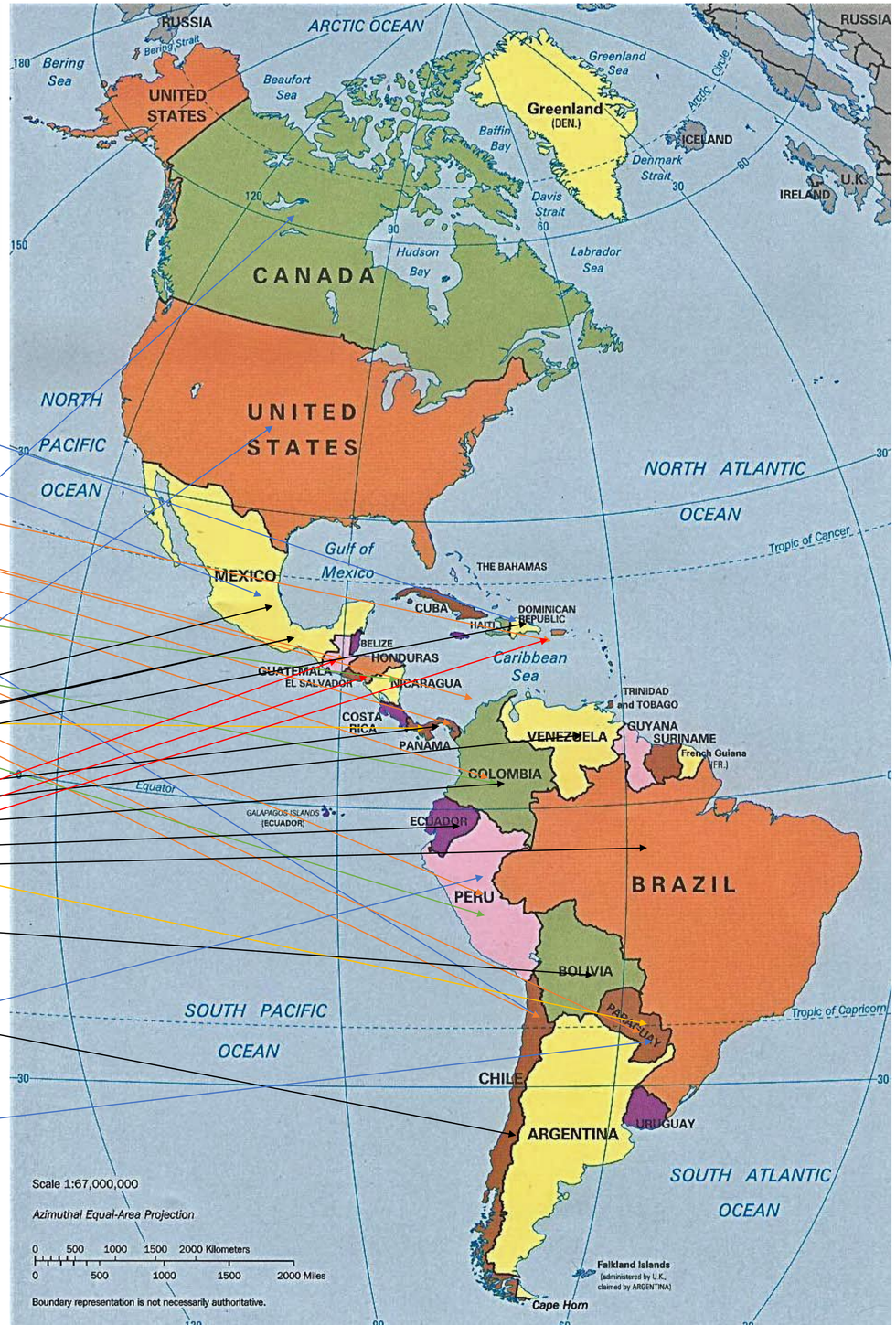
Governments

Academy

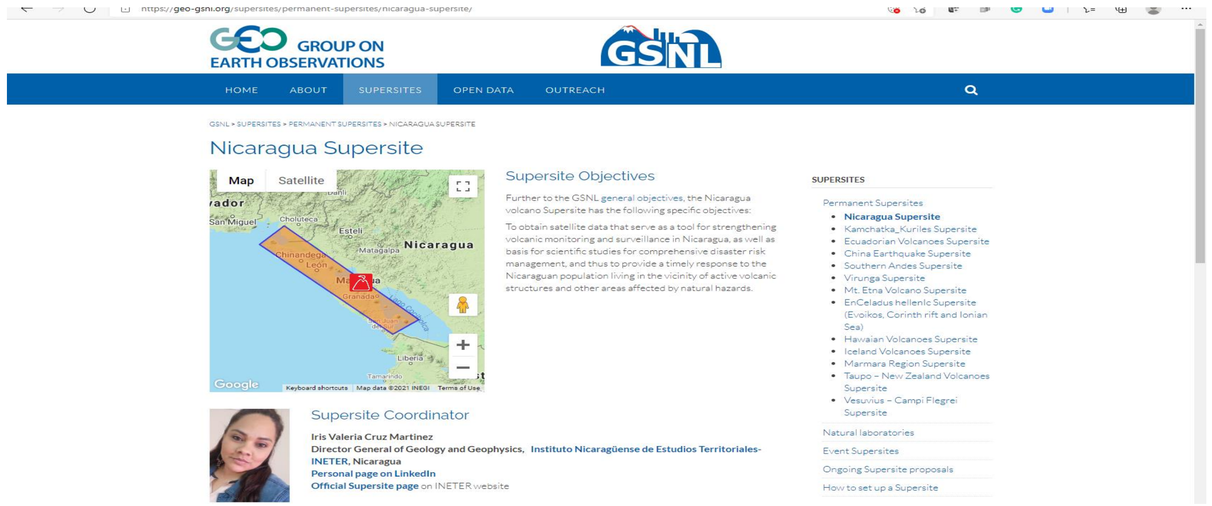
NGO’s

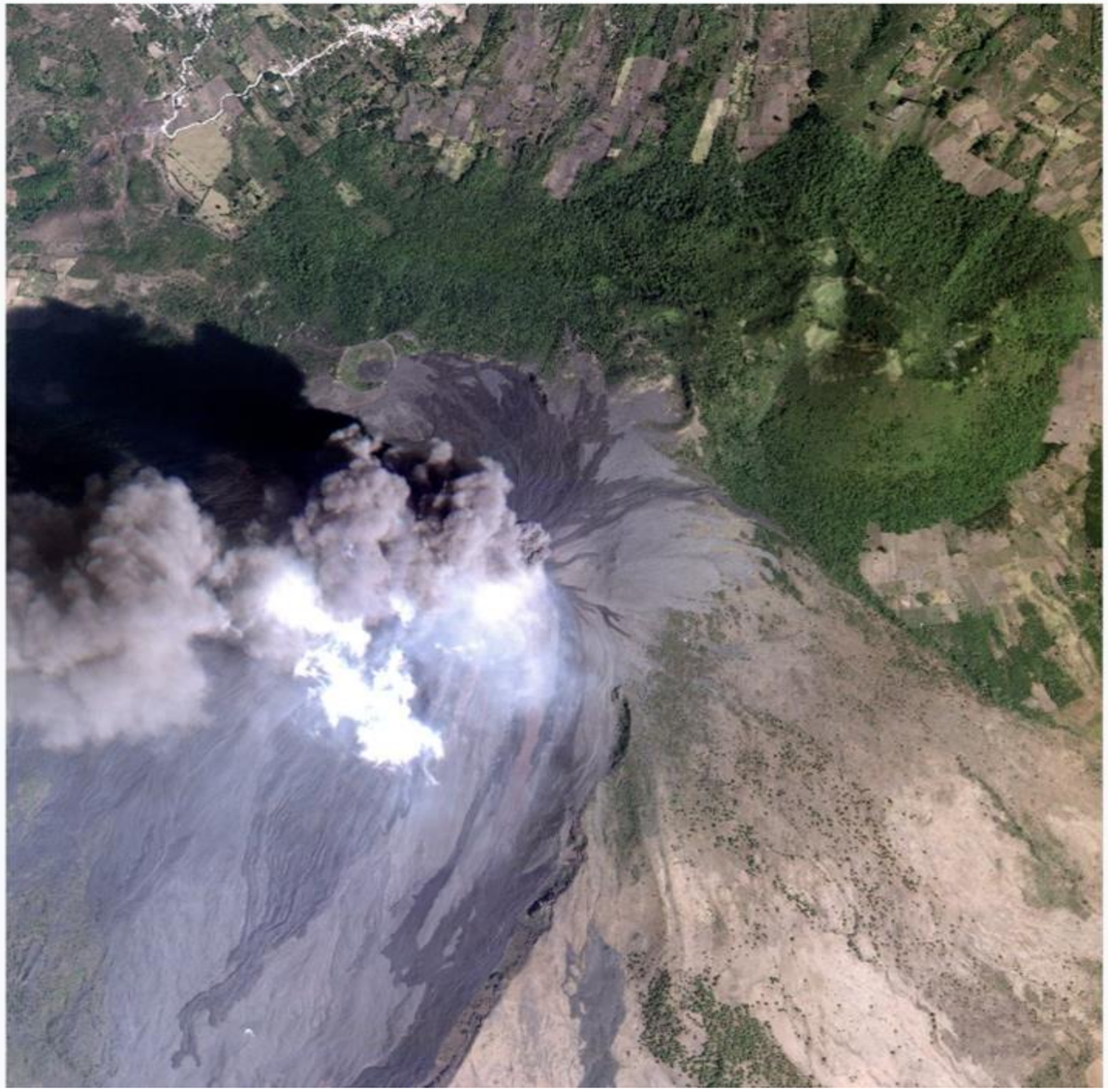
AmeriGEO

Earth Observations for the Americas

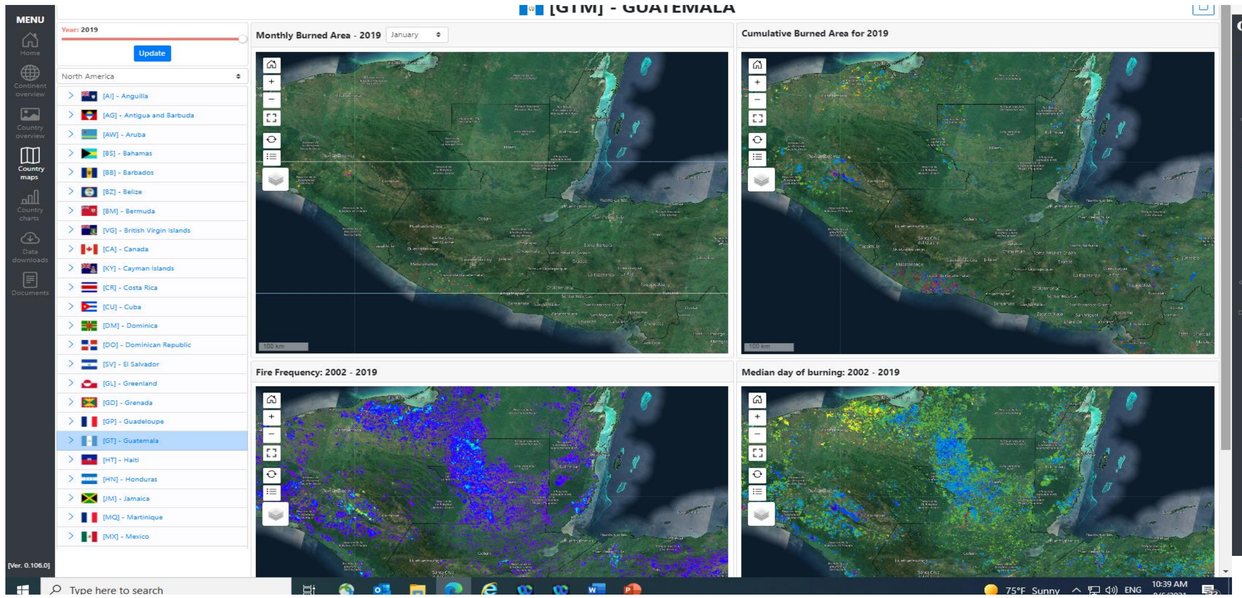


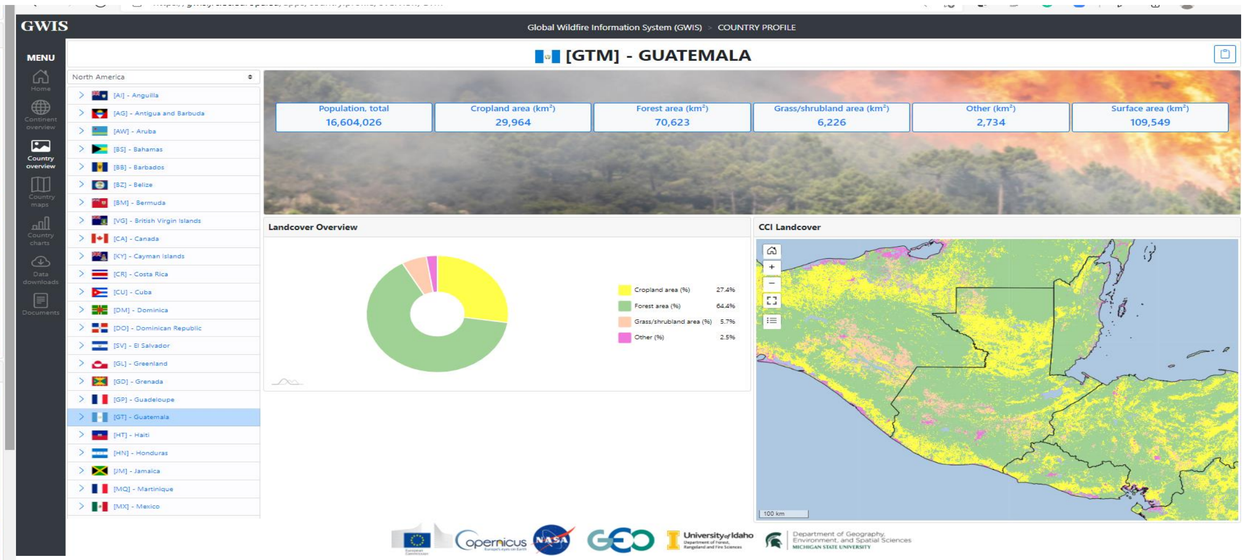
Nicaraguan Supersite of Volcanic Risk Created 2021

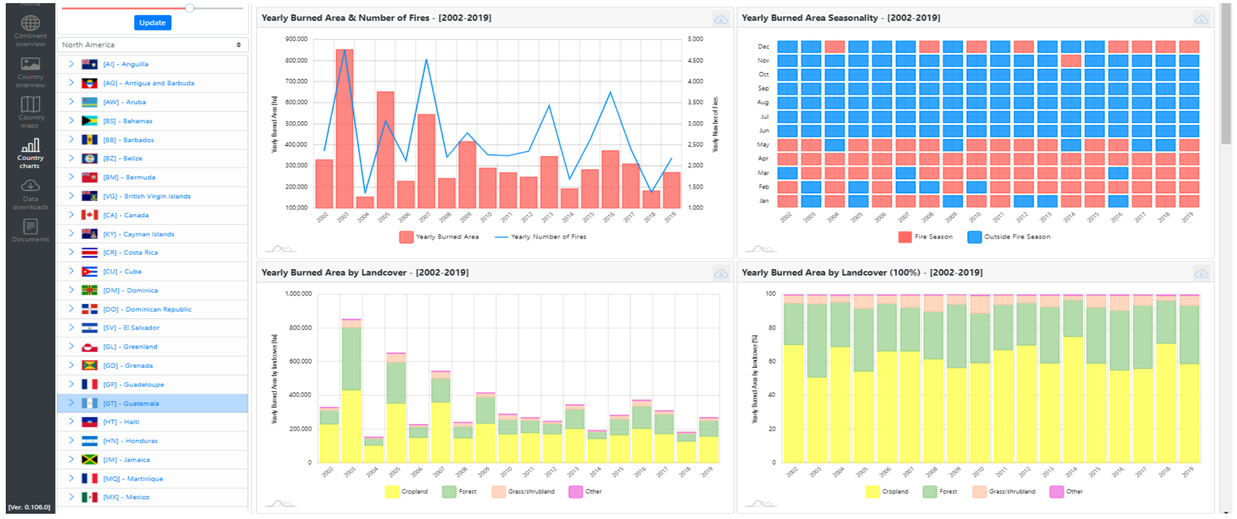


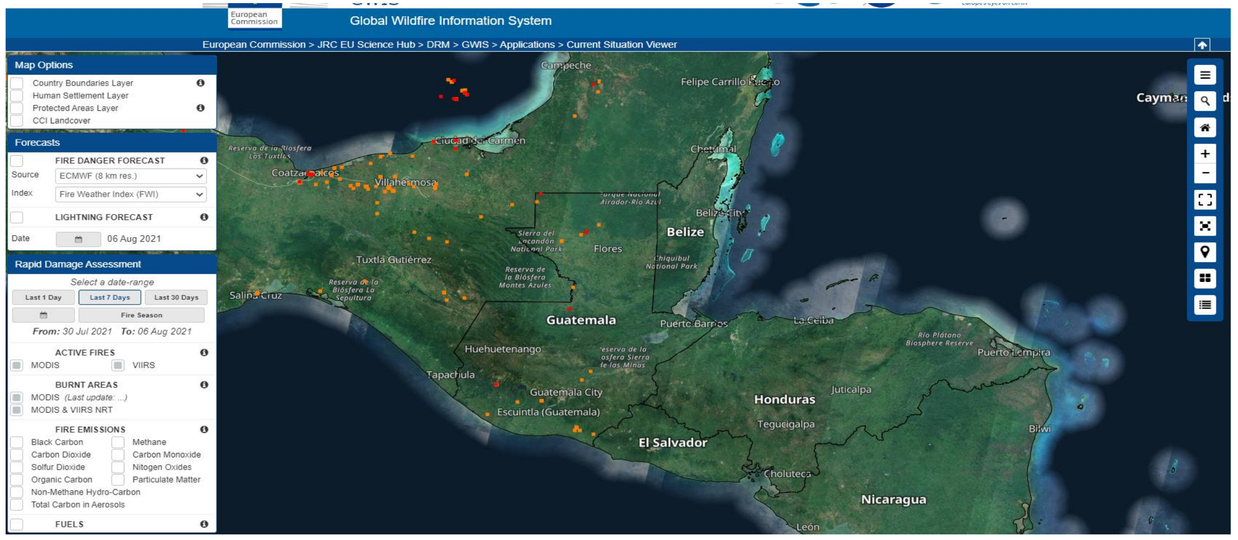


Fire Historical Data Supporting GWIS App.

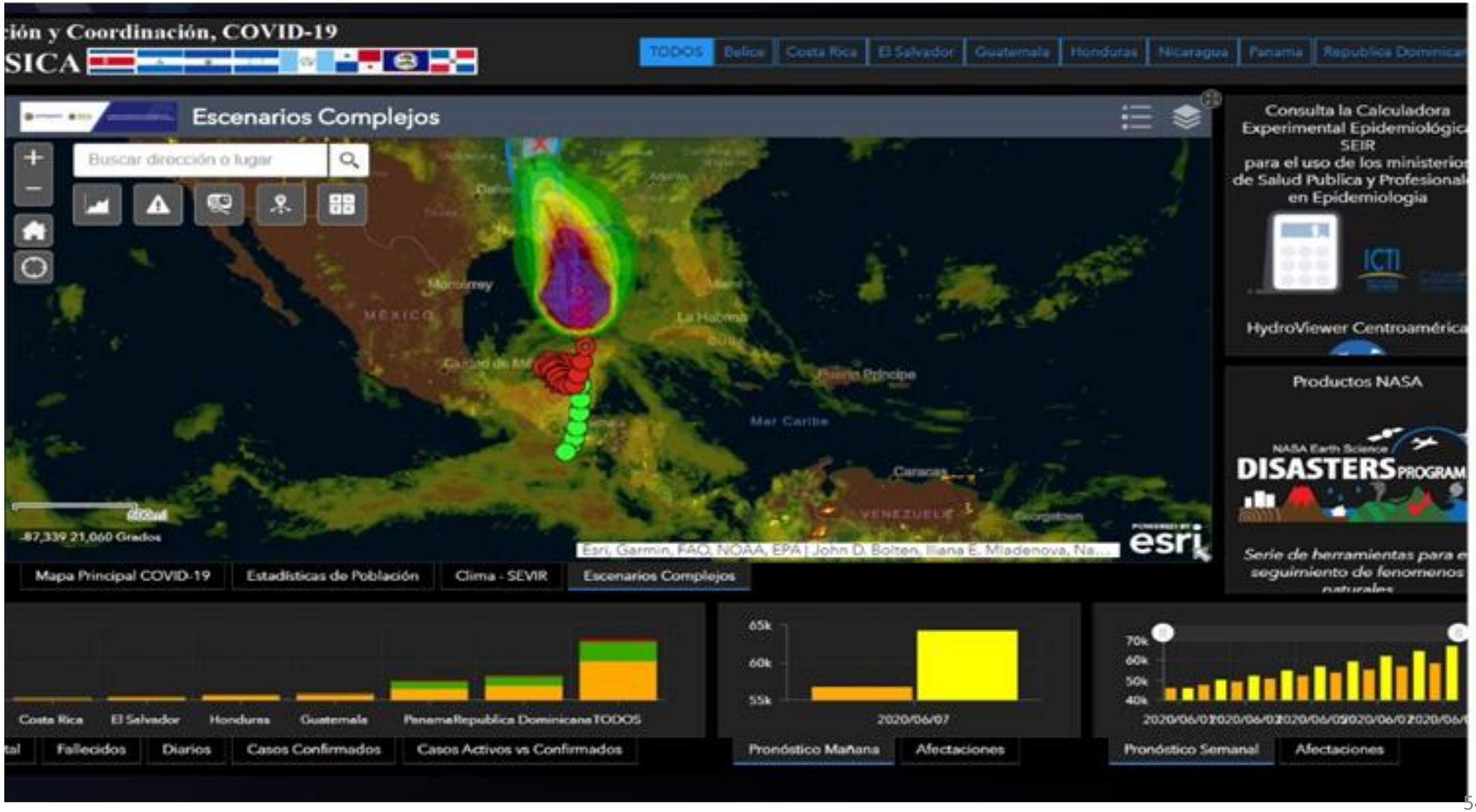






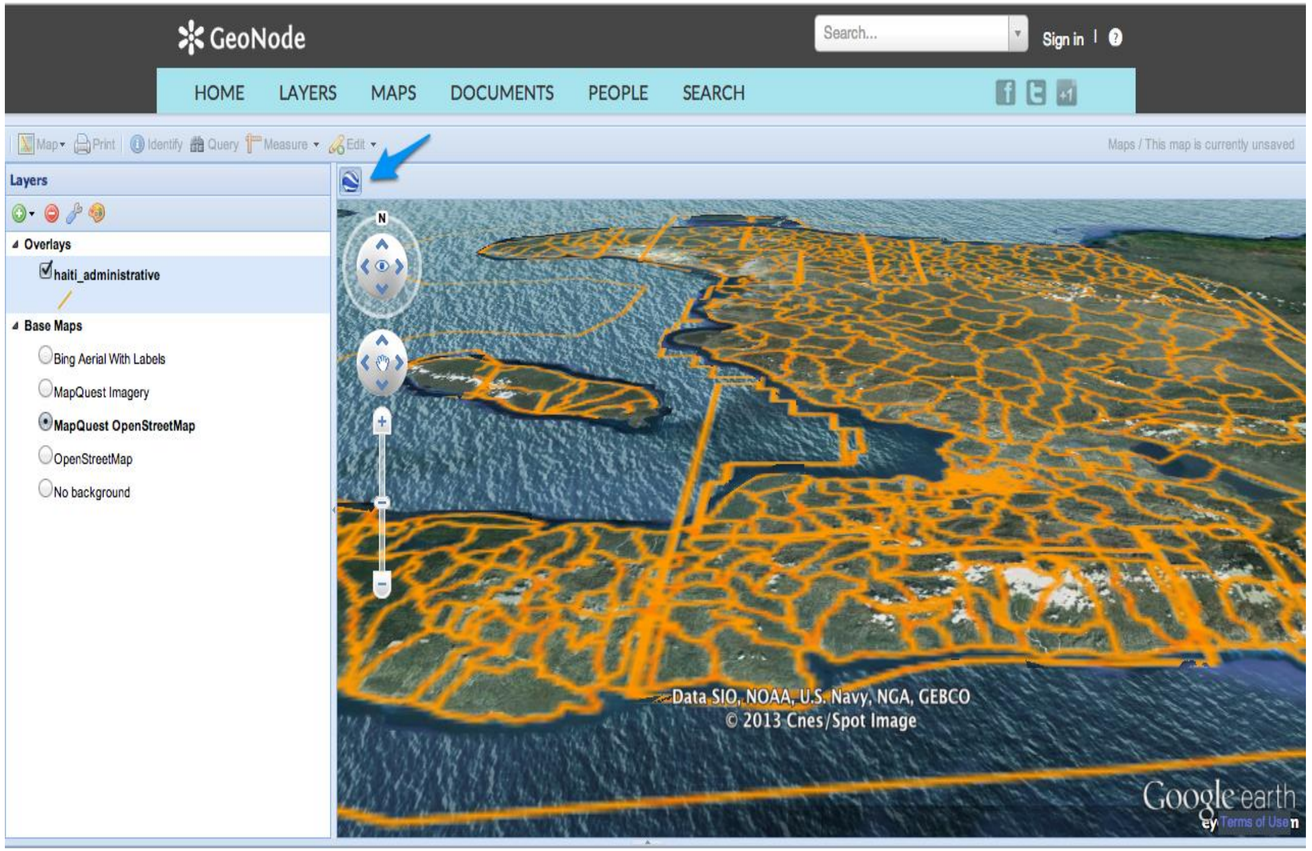


NASA Near Real-Time Observation Data Connected to Regional Platforms-CEPREDENAC



NASA-CEPREDENAC

Taller Software GEO-NODE-SERVER Agosto 18-19-20



Innovation Challenge for DRR.-SICA Region

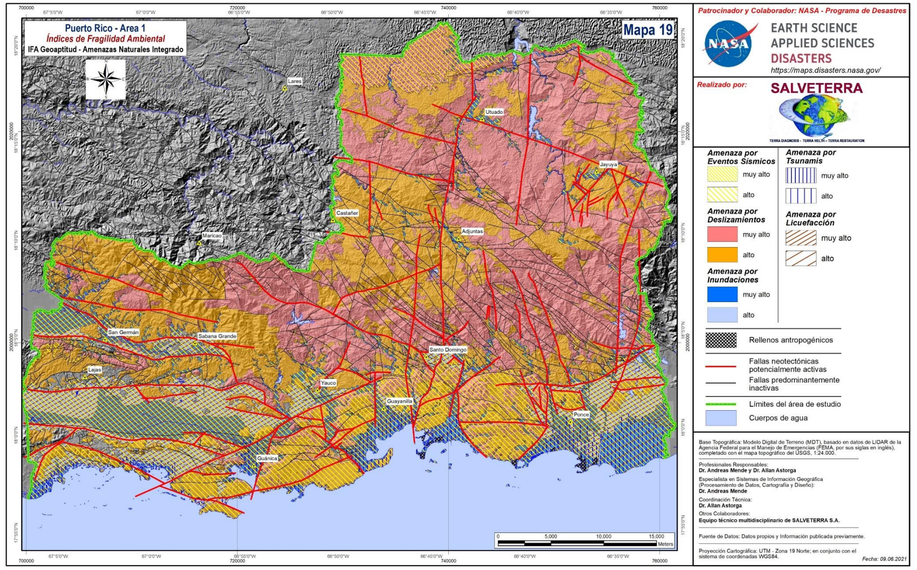
NASA-Amazon WS-ESRI-CEPREDENAC Agosto 23-sep 23 , 2021

Understanding Hazards and Exposure in 14 Municipalities in Puerto Rico

EARTH SCIENCE
APPLIED SCIENCES
DISASTERS

AmeriGEO
Earth Observations
for the Americas

para la
Naturaleza



Patrocinador y Colaborador: NASA - Programa de Desastres
EARTH SCIENCE APPLIED SCIENCES DISASTERS
https://maps.disasters.nasa.gov/

Realizado por: SALVETERRA

Amenaza por Eventos Sísmicos: muy alto, alto
Amenaza por Tsunamis: muy alto, alto
Amenaza por Deslizamientos: muy alto, alto
Amenaza por Licuefacción: muy alto, alto
Amenaza por Inundaciones: muy alto, alto

Rellenos antropogénicos
Fallas neotectónicas potencialmente activas
Fallas predominantemente inactivas
Límites del área de estudio
Cuerpos de agua

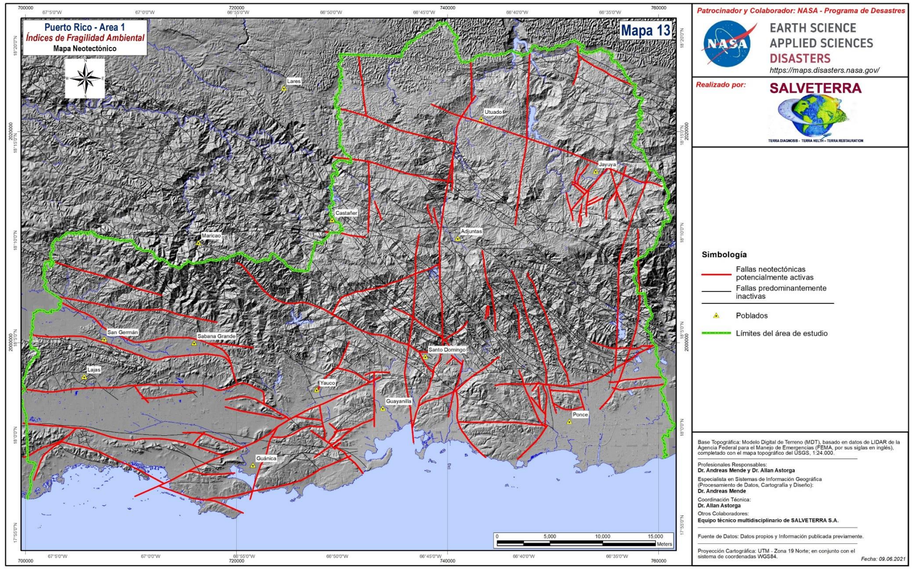
Base Topográfica: Modelo Digital de Terreno (MDT), basado en datos de LiDAR de la Agencia Federal para el Manejo de Emergencias (FEMA, por sus siglas en inglés), completado con el mapa topográfico del USGS, 1:24.000.

Profesionales Responsables:
Dr. Andreas Mende y Dr. Allan Astorga
Especialista en Sistemas de Información Geográfica (Procesamiento de Datos, Cartografía y Diseño):
Dr. Andreas Mende
Coordinación Técnica:
Dr. Allan Astorga
Otros Colaboradores:
Equipo técnico multidisciplinario de SALVETERRA S.A.

Fuente de Datos: Datos propios y Información publicada previamente.

Proyección Cartográfica: UTM - Zona 19 Norte; en conjunto con el sistema de coordenadas **WGS84.**

Fecha: 09.06.2021



Patrocinador y Colaborador: NASA - Programa de Desastres
EARTH SCIENCE APPLIED SCIENCES DISASTERS
https://maps.disasters.nasa.gov/

Realizado por: SALVETERRA

Simbología
Fallas neotectónicas potencialmente activas
Fallas predominantemente inactivas
Poblados
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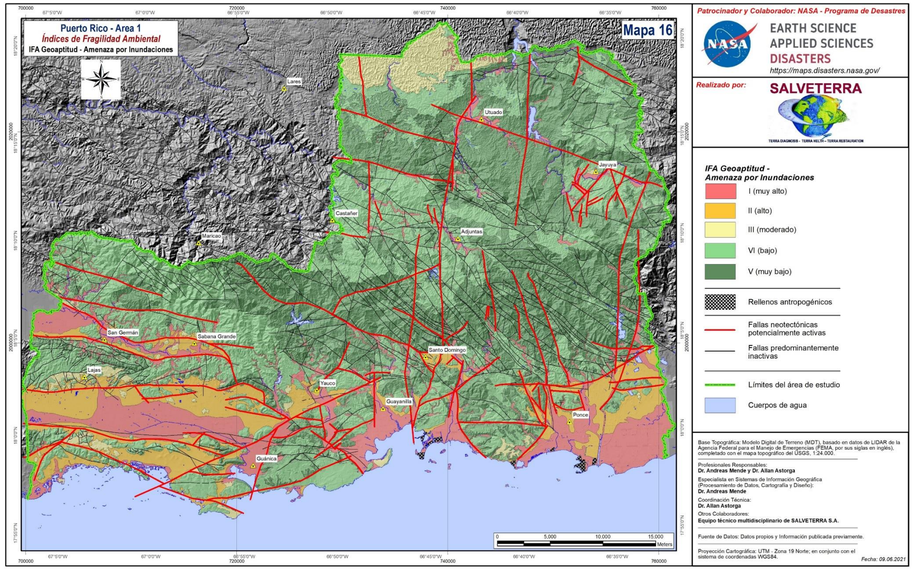
Equipo técnico multidisciplinario de SALVETERRA S.A.

Fuente de Datos: Datos propios y Información publicada previamente.

Proyección Cartográfica: UTM - Zona 19 Norte; en conjunto con el sistema de coordenadas **WGS84.**

Fecha: 09.06.2021



Patrocinador y Colaborador: NASA - Programa de Desastres
EARTH SCIENCE APPLIED SCIENCES DISASTERS
https://maps.disasters.nasa.gov/

Realizado por: SALVETERRA

IFA Geoaptitud - Amenaza por Inundaciones
I (muy alto)
II (alto)
III (moderado)
VI (bajo)
V (muy bajo)

Rellenos antropogénicos
Fallas neotectónicas potencialmente activas
Fallas predominantemente inactivas
Límites del área de estudio
Cuerpos de agua

Base Topográfica: Modelo Digital de Terreno (MDT), basado en datos de LiDAR de la Agencia Federal para el Manejo de Emergencias (FEMA, por sus siglas en inglés), completado con el mapa topográfico del USGS, 1:24.000.

Profesionales Responsables:
Dr. Andreas Mende y Dr. Allan Astorga
Especialista en Sistemas de Información Geográfica (Procesamiento de Datos, Cartografía y Diseño):
Dr. Andreas Mende
Coordinación Técnica:
Dr. Allan Astorga
Otros Colaboradores:
Equipo técnico multidisciplinario de SALVETERRA S.A.

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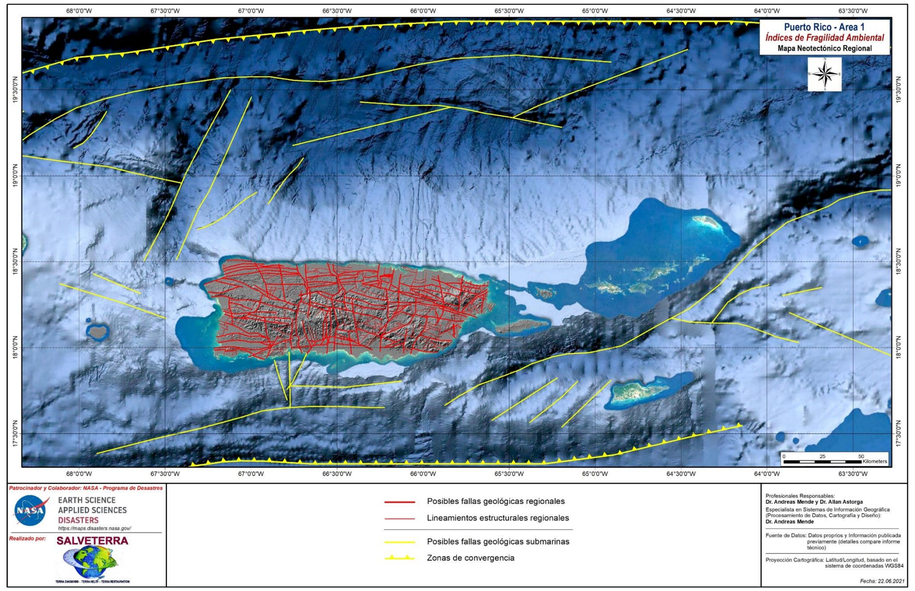


Patrocinador y Colaborador: NASA - Programa de Desastres
EARTH SCIENCE APPLIED SCIENCES DISASTERS
https://maps.disasters.nasa.gov/

Realizado por: SALVETERRA

Posibles fallas geológicas regionales
Lineamientos estructurales regionales
Posibles fallas geológicas submarinas
Zonas de convergencia

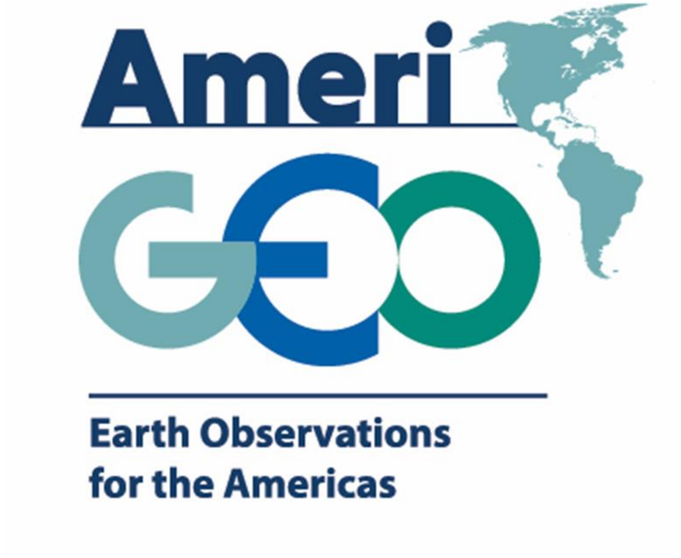
Profesionales Responsables:
Dr. Andreas Mende y Dr. Allan Astorga
Especialista en Sistemas de Información Geográfica (Procesamiento de Datos, Cartografía y Diseño):
Dr. Andreas Mende

Fuente de Datos: Datos propios y Información publicada previamente (detalles compare informe técnico).

Proyección Cartográfica: Latitud/Longitud, basado en el sistema de coordenadas WGS84

Fecha: 22.06.2021

High Resolution Multi-Hazards-Exposure Assessments in Guatemala City with VR_ Visualization



!Thanks!

ricardo.quirogavanegas@nasa.gov

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Disasters Mapping Portal

Jeremy Kirkendall
Disasters Program

maps.disasters.nasa.gov

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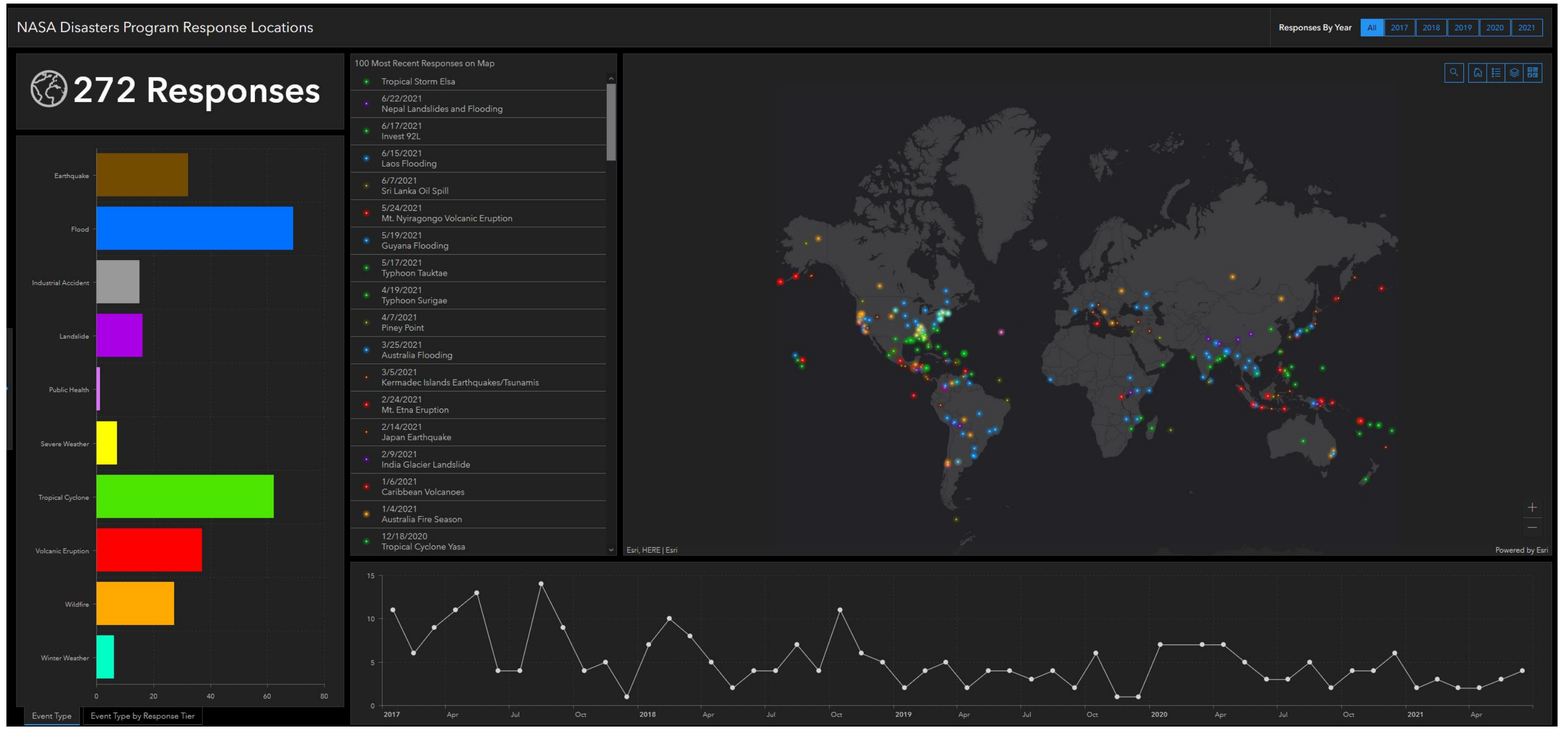
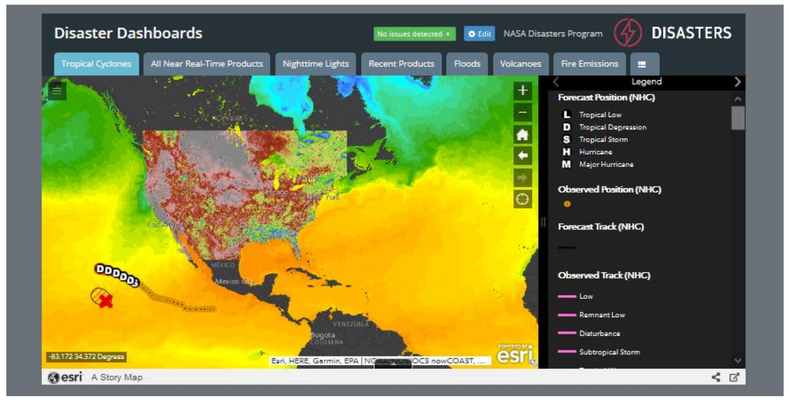
Disasters Program Responses



- 4+ years of responses
- Global
- Many disaster types
- Hundreds of dataset created

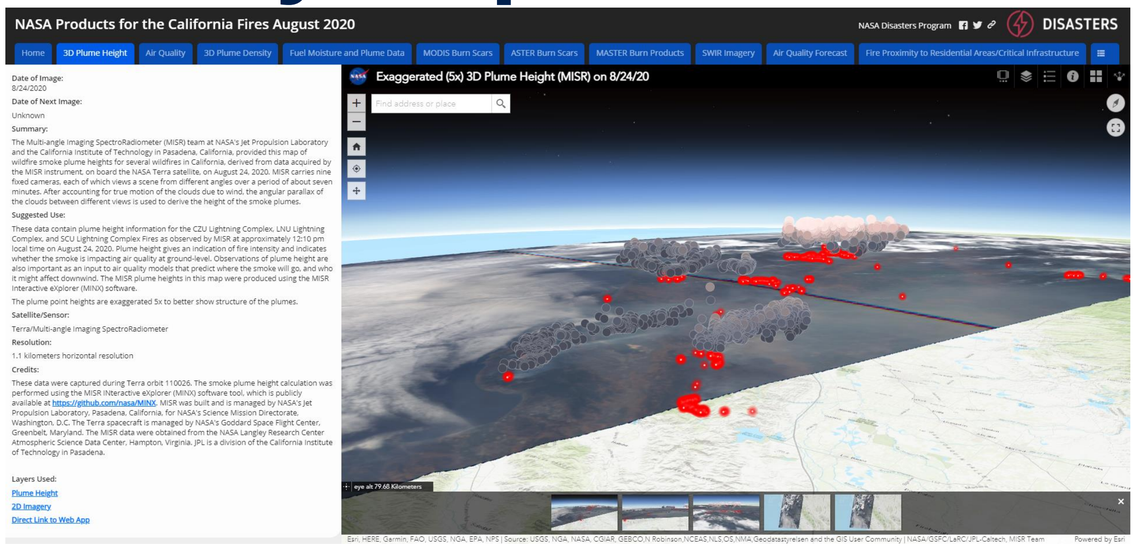
Disasters Mapping Portal



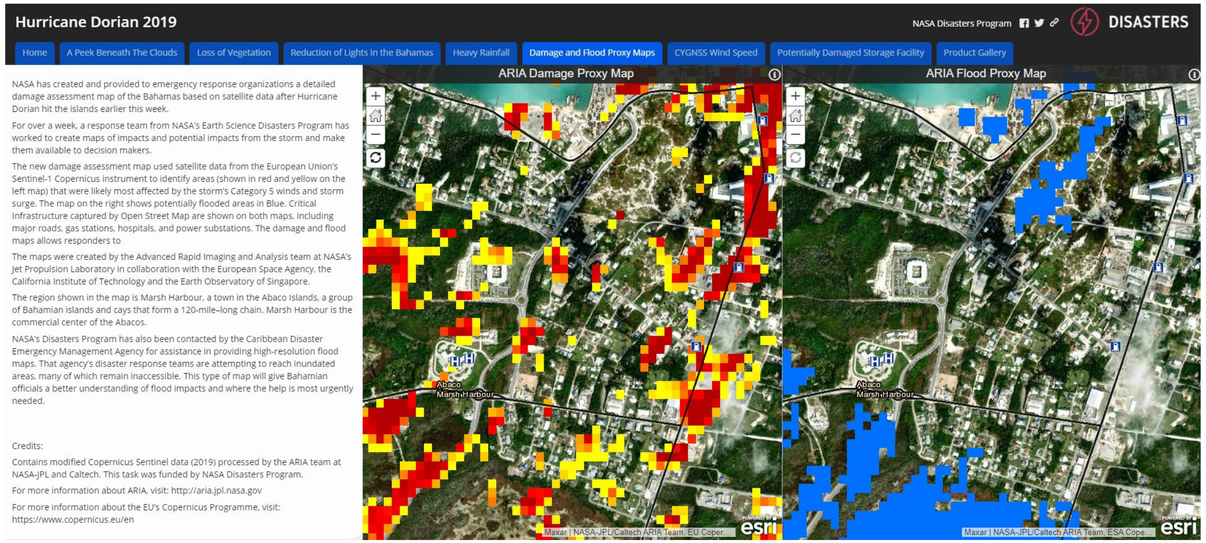
The home of Disasters Program GIS products and apps

- maps.disasters.nasa.gov
- Free
- Open Data
- Story Maps
- Dashboards
- Near Real-Time Products
- Event-Specific Products

Story Maps



California Fires 2020 Story Map showing 3D Smoke Plumes from the MISR instrument

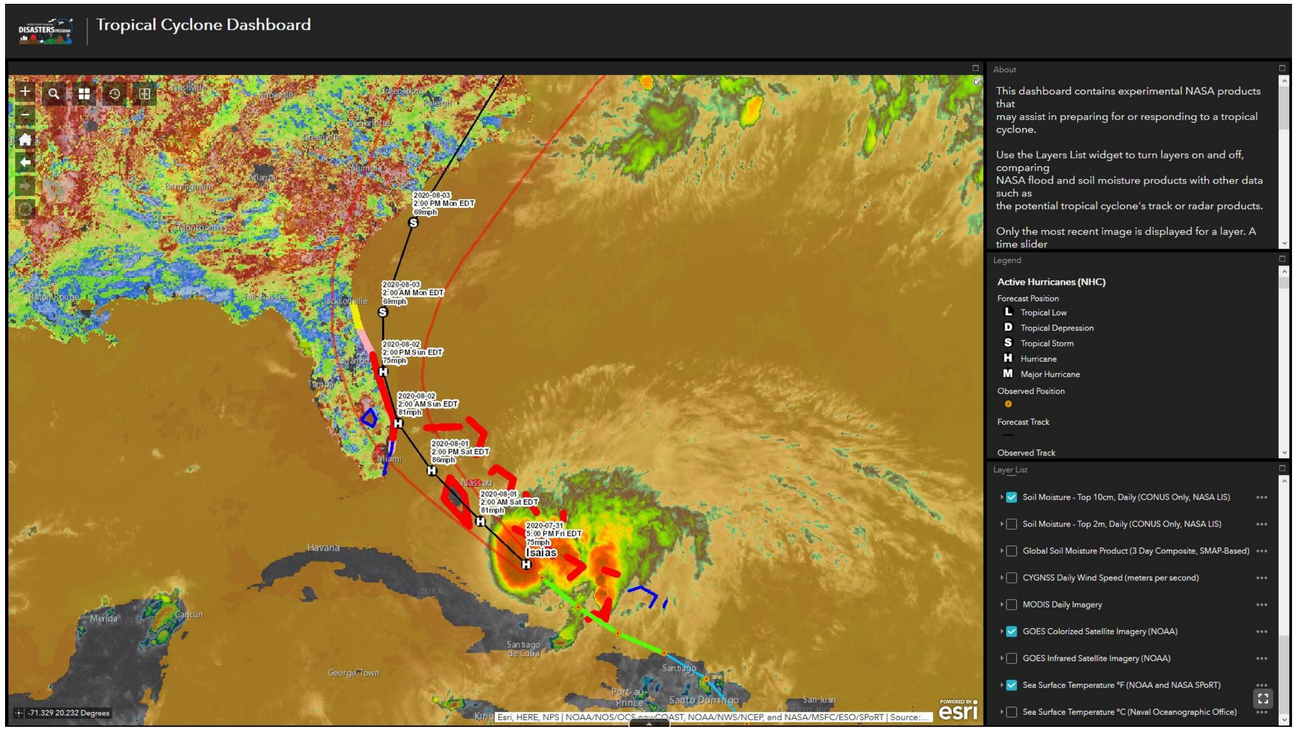


Hurricane Dorian Story Map showing Damage and Flood Extent Maps side by side

Story Maps tell the Disaster's Story

- Created for major events
- Interactive apps show how to use NASA products
- Contain all products for event

Dashboards

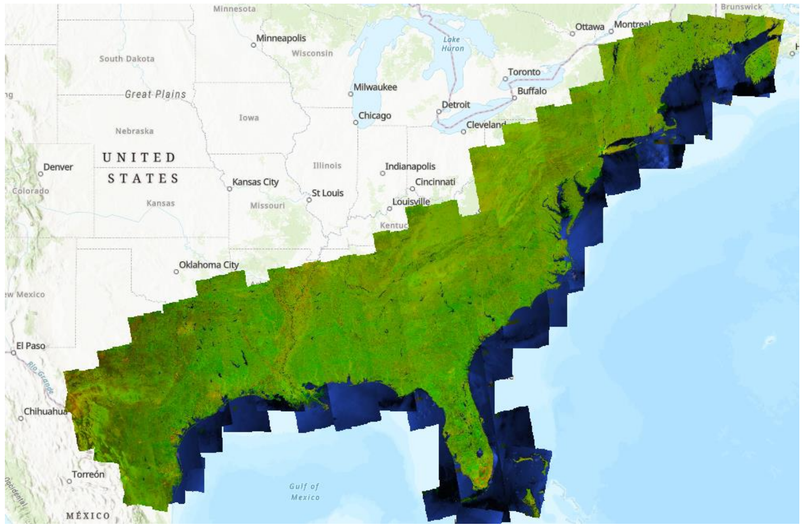


Tropical Cyclone Dashboard showing Hurricane Isaias approaching Florida

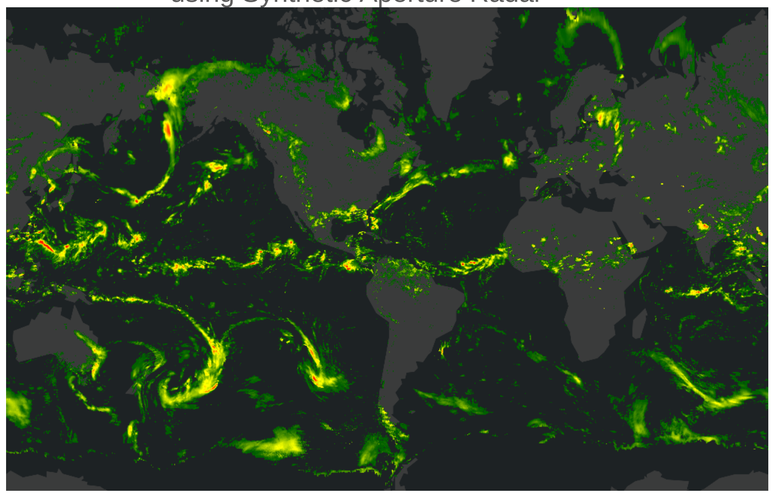
Show what's possible

- Combines NASA and NOAA Near Real-Time products
- More complete situational awareness
- Build your own dashboard with our data and yours

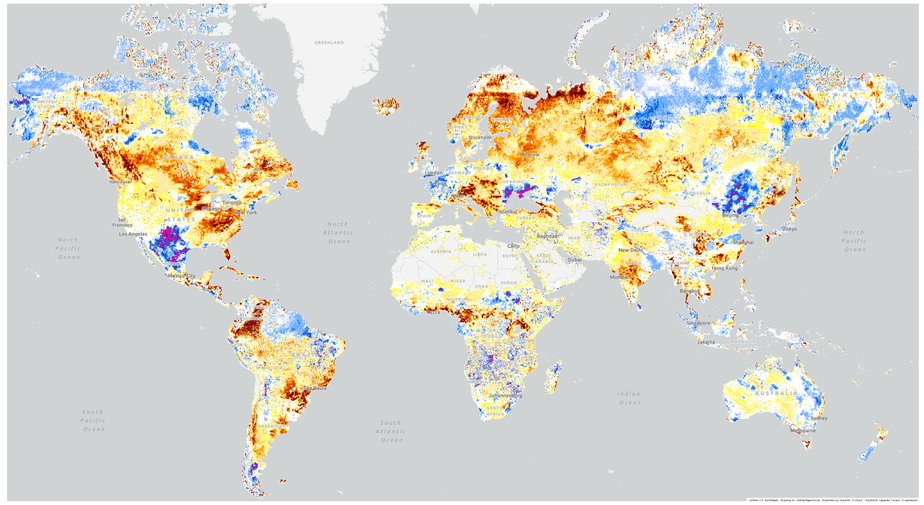
Near Real-Time Products



Near Real-Time Hurricane Monitoring Service
using Synthetic Aperture Radar



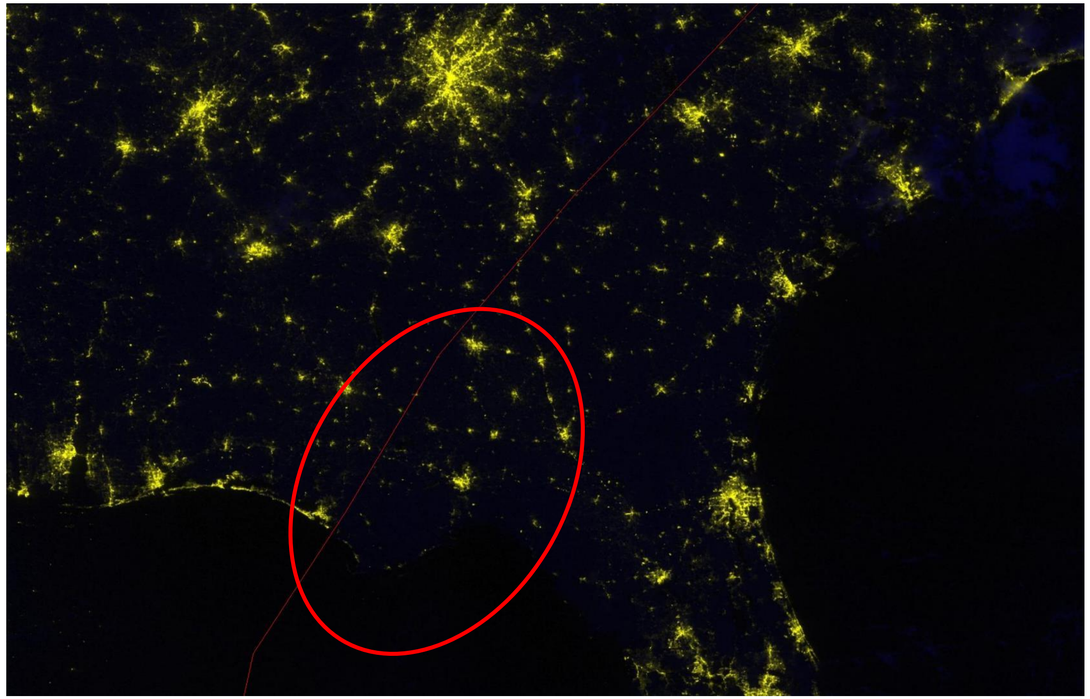
Global Precipitation Measurement
3-hour Precipitation Accumulation



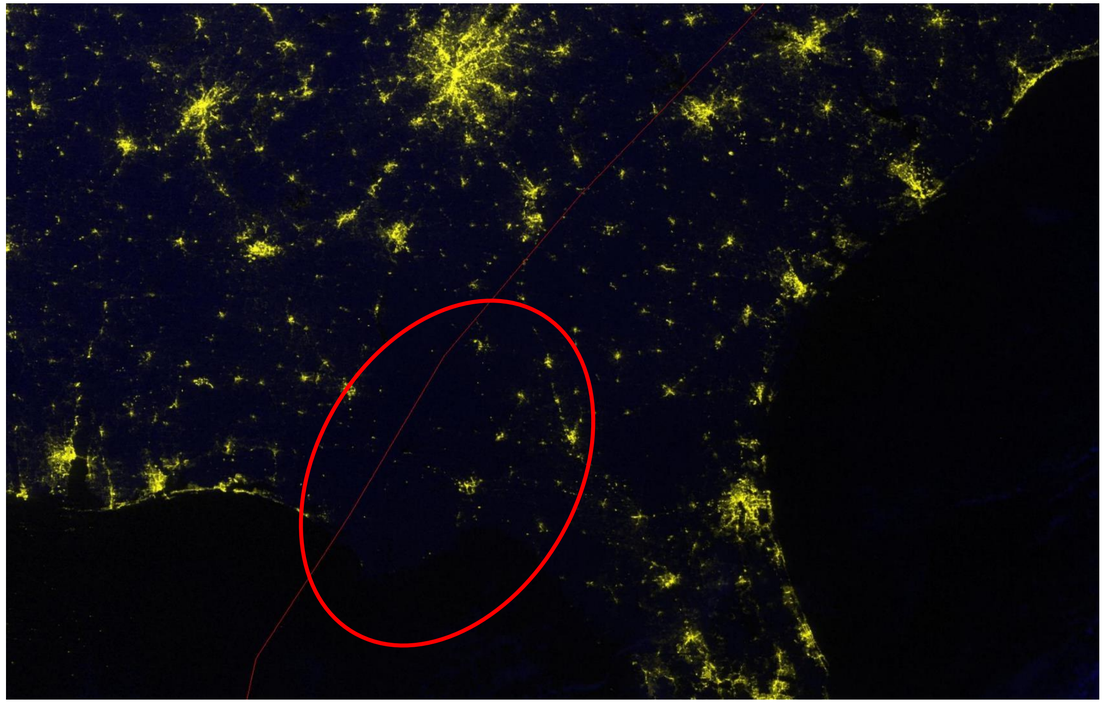
Soil Moisture Anomaly 3-Day SMAP Composite

- Most have global coverage
- Always updating
- Latency of several hours to days
- Includes precipitation products, soil moisture, active fires, landslide nowcast, and many more

Event-Specific Products



Nighttime lights prior to Hurricane Michael's landfall



Lack of nighttime lights after Hurricane Michael's landfall shows areas that may have been impacted most by the storm

- Created for specific disasters (hurricane, earthquake, etc.)
- Cover specific area of interest
- Products include damage or flood extent, ground surface change, burn scar, and more

Disasters Mapping Portal
maps.disasters.nasa.gov

GIS Questions:
hq-disasters-gis@mail.nasa.gov

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Illinois Disasters

Utilizing NASA Earth Observations to Enhance Drought Monitoring in Illinois

Kyle Pecsok*, Joshua Green, Julia Marturano, Emma Myrick, & Victor Schultz

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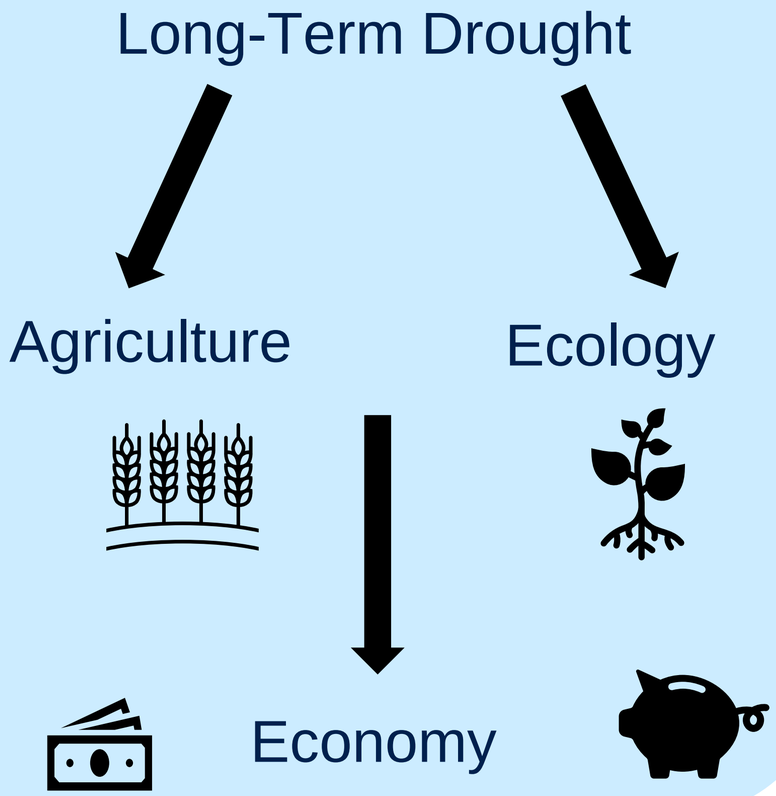
Community Concerns & Project Objectives

Community Concerns



Project Objectives

Comprehensive assessment of soil moisture data products

Enhance environmental forecasting and decision-making

Project Partners

Illinois State Water Survey

USDA Midwest Climate Hub

NOAA Regional Climate Services Central Region

NOAA North Central River Forecasting Center

NOAA National Integrated Drought Information System

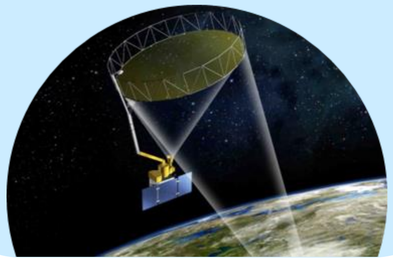
Earth Observation & Methodology

Data Sources

WARM In-Situ
(2003 – 2021)

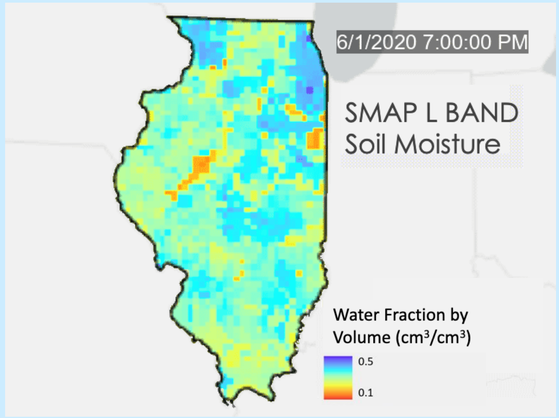
SPoRT-LIS
(2003 – 2021)

SMAP L4
(2015 – 2021)

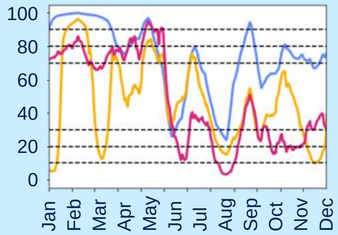


Processing & Analysis

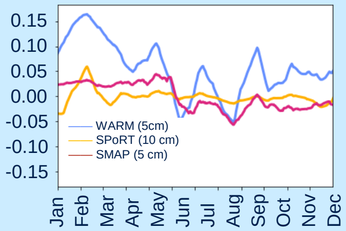
Time Series



Percentiles

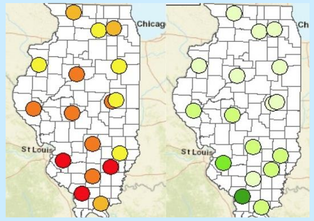


Anomalies

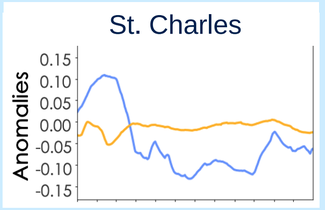


Products

Spatial Comparison



Case Studies



Statistical Comparison

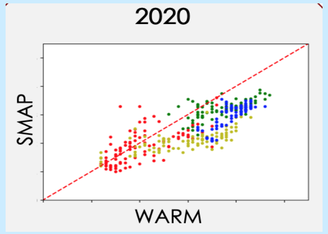
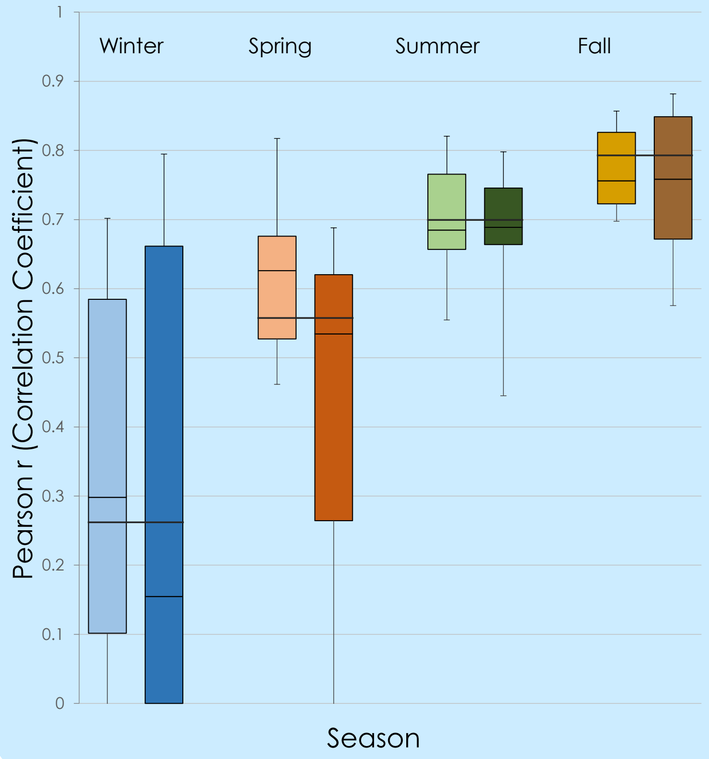


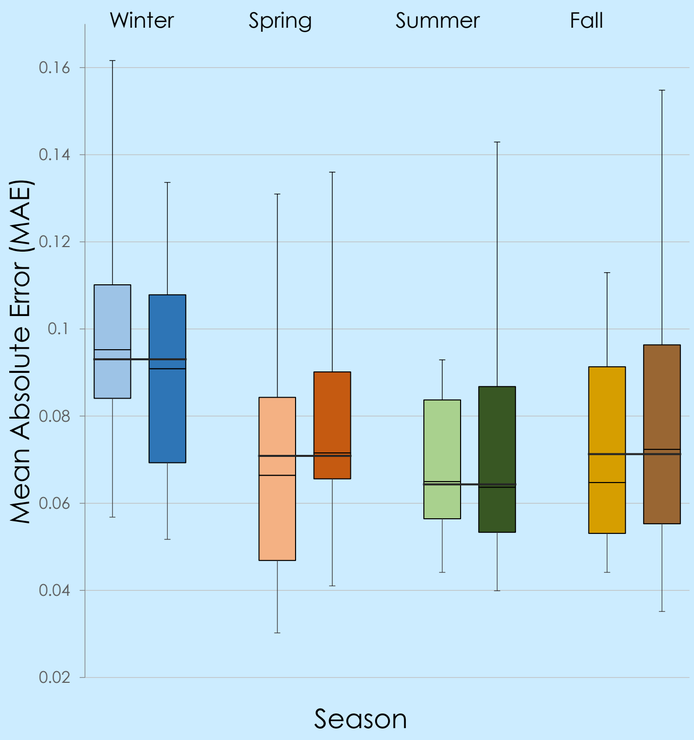
Image Credits: (Top) Illinois State Water, (Bottom) NASA

Results

Soil Moisture Product Comparison Correlation Coefficient (r) (2015-2021)



Soil Moisture Product Comparison Mean Absolute Error (2015-2021)



Both data products exhibit seasonal variability and interannual trends

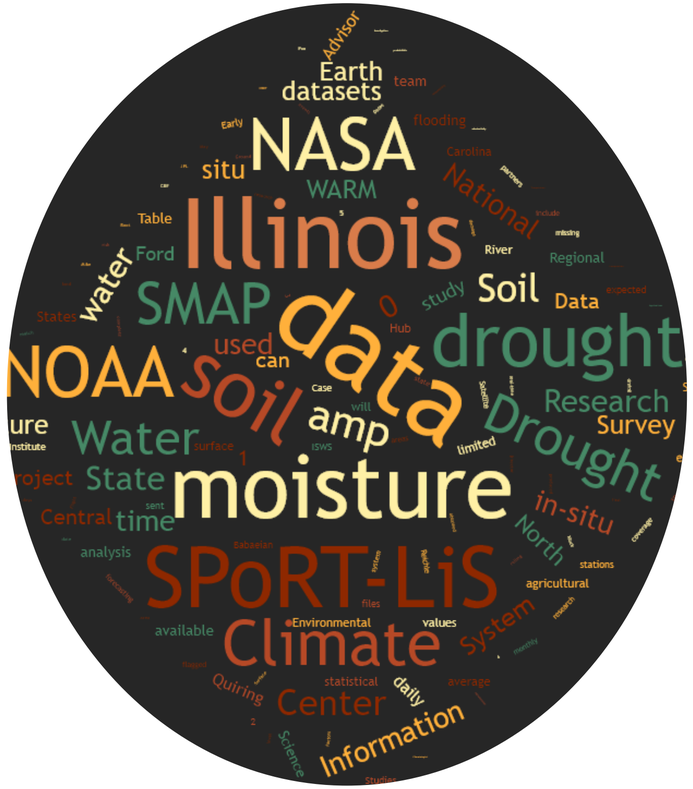
- **WARM-SMAP** correlation **≥ WARM-SPoRT** correlation
- **WARM-SMAP** Mean Absolute Error **≤ WARM-SPoRT** Mean Absolute Error
- **SPoRT** values are closer in range with **WARM** values during wet conditions
  - **WARM-SPoRT** RMSE **≤ WARM-SMAP** RMSE when WARM percentiles > 80

WARM-SMAP Spring
WARM-SPoRT Spring
WARM-SMAP Summer
WARM-SPoRT Summer
WARM-SMAP Fall
WARM-SPoRT Fall
WARM-SMAP Winter
WARM-SPoRT Winter

Conclusions & End User Benefit

Conclusions

- SMAP and SPoRT-LIS are **most accurate** during summer and fall
- SMAP has a **higher correlation** to WARM than SPoRT, and exhibits a **dry bias**
- Lower variability and error suggest SPoRT is suitable in **wet conditions**



End User Benefit

The findings from this study can help project partners understand differences in the behavior of soil moisture products and select the datasets that best support monitoring areas of interest.

Image Credits (Top): United Soybean Board, (Bottom): Bob Nichols

Acknowledgements

Advisors:

- **Dr. Ronald Leeper**, NOAA National Centers for Environmental Information, North Carolina Institute for Climate Studies
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DEVELOP Node Fellows:

- **Katie Lange**, NCEI
- **A.R. Williams**, MSFC

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- **Doug Kluck**, Regional Climate Services Director, NOAA Regional Climate Services Central Region
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- **Steve Buan**, Hydrologist, NOAA North Central River Forecast Center
- **Mike Welvaert**, Senior Hydrologist, NOAA North Central River Forecast Center

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THANK YOU!

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