Flood Risk Workshop

Oct 1, 2018

Space for Risk Global Flood Risk Monitoring



National Aeronautics and Space Administration



SCIENCE



Who's at Risk? What's at Risk? "A picture is worth a thousand actions" https://disasters.nasa.gov/home https://maps.disasters.nasa.gov/arcgis/home/

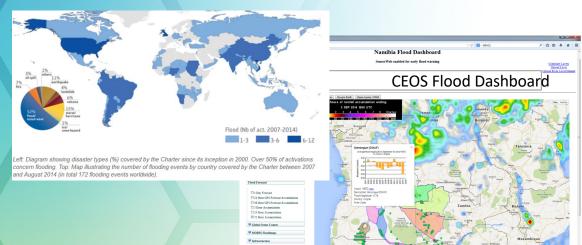
Dr. David Green Program Manager, Disasters Earth Science Division david.s.green@nasa.gov

Oct A2018

Intergovernmental and International Coordination and Data Sharing

Group on Earth Observations

- Committee of Earth Observing Satellites
- Other Participating Organizations.
- Eg. GFP, GLOFAS, GEOGLOWS, GEOGLAM... GEOFLOOD



GEO Flood Task: Supporting access to a unified system of space data acquisition and delivery, models and mapping to support those affected by natural or man-made disasters



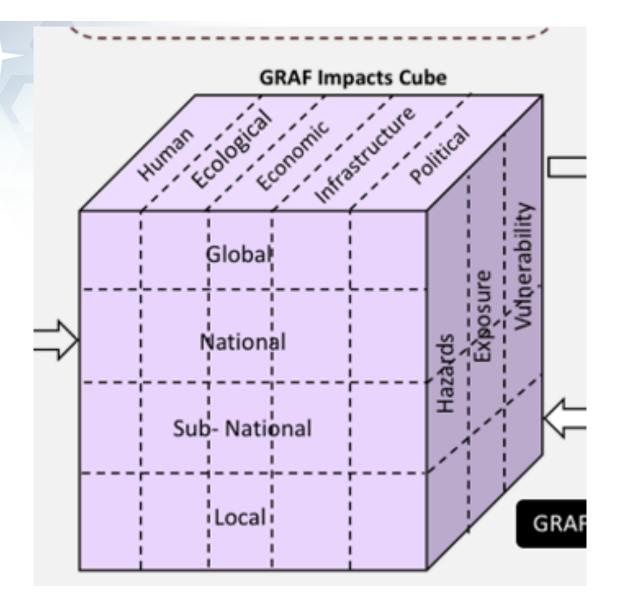


Various UN bodies Eg. WMO, UNISDR, WHO, ...

Civil Society Groups Red Cross Red Crescent Mercy Corp Conservation International

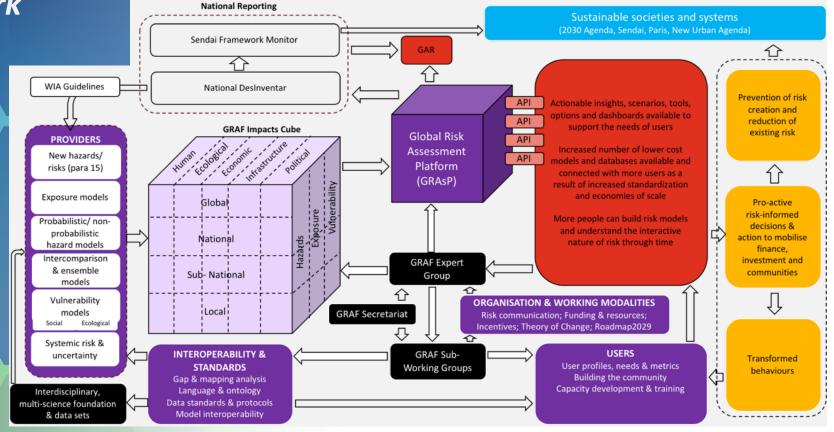
Networks Global Flood Partnership Water Youth Network GRAF Global Risk Assessment Framework

Toward Assessing Impacts



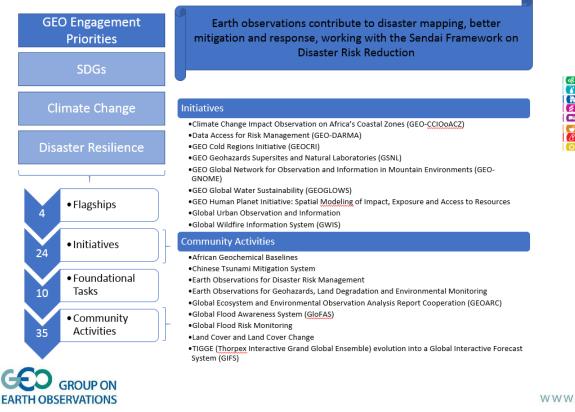
GRAF Global Risk Assessment Framework

Assessing Risk Impact and Sustainability



What does GEO do?

Disaster Risk Reduction in the GEO Work Programme



GEO Societal Benefit Areas

Biodiversity and Ecosystem Sustainability	
	Water Resources Management
ì	Sustainable Urban Development
	Public Health Surveillance
•	Infrastructure and Transportation Management
	Food Security and Sustainable Agriculture
`	Disaster Resilience
	Energy and Mineral Resource Management

What is the Subgroup doing?

Coordinating efforts, BUT what is the problem we are trying to solve.

Update to 9th Programme Board Meeting

Sendai Subgroup Update

This note provides an update of the activities undertaken that relate to the Sendai Strategic Engagement Priority of GEO. It is not an exhaustive list. Programme Board are asked to note the activities undertaken and planned, and to provide guidance on areas for increased focus.

Background

The Senda' Subgroup agreed the following activities should be undertaken through a combination on Subgroup Members as well as GEOSEC staff. The Terms of Reference for the Sendal Subgroup are submitted to Programme Board for Information.

1. Sendai Subgroup It was agreed at the 8th Programme Board that a subgroup should be set up to support GEDs strategic It was agreed at the form of the Sendal Framework for Disaster Bis Robust on Safety of Safety and the Sendal Framework for Disaster Bis Robust on The subgroup has now been convened with the stated aim to encourage GEO Members and Participating Organisations to champion and support the development of op by objectives that add value, drive efficiencies, and promote the uptake of Earth observations, in alignment with the Senda' Framework and other Disaster Risz Reduction activities

The Subgroup current vihas 18 active members and has met virtually twice since the last Programme Board, "To date the activities have been confined to 'understanding the ask' and refining the actions that the subgroup can take to further promote the role that Earth observations, and insitu observations given DRR. This can be expressed in the three orimary activities:

- · Identifying the connections between the Sendal Framework, Paris Agreement, and Sustainable Development Goals;
- · Share best practice and resources amongst GEO Work Programme activities including the Provide value statements of the need to use Earth observations for managing disaster risks
- and hazards. These activities are in alignment with the stated aims of the sub-group which were agreed during the

8th Programme Board.

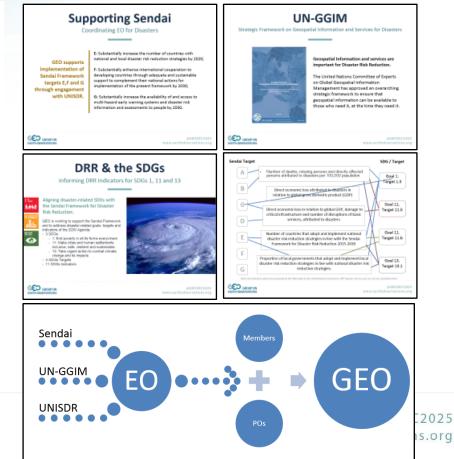
As well as the specific activities, we have been developing a "Policy Brief" which provides a high-level strategic overview of the role that Earth observations can play in Disaster Risk Reduction activities. This brief is almed as senior decision makes and reiterates the need for accessible Earth observations as a key element of the lifecycle of disaster risk management.

2. Identifying the connections between the Sendai Framework, Paris Agreement and Sustainable Development Goals. Senda' Framework

The Sendal Framework for Disaster Risk reduction is one of the key engagement priority areas for GEO, and as such GEO has been actively involved at both strategic and operational levels. Strategic engagement has included Barb Ryan accepting an invitation to become a memoer of the Advisory Board on the Global Assessment Report on Disaster Risk Reduction. The invitation to participate was extended by the Special Representative of the UN Secretary-General for Disaster Risk Reduction, Robert Glasser,

The UN Global Assessment Report on Disaster Risk Reduction (GAR) is a flagship report by the United Nations on the worldwide efforts to reduce disaster risk. It is a biennial publication be the UN Office







Supporting Sendai

Coordinating EO for Disasters

GEO supports implementation of Sendai Framework targets E,F and G through engagement with UNISDR. **E:** Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

F: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present framework by 2030;

G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.





UN-GGIM

Strategic Framework on Geospatial Information and Services for Disasters



Geospatial Information and services are important for Disaster Risk Reduction.

The United Nations Committee of Experts on Global Geospatial Information Management has approved an overarching strategic framework to ensure that geospatial information can be available to those who need it, at the time they need it.



DRR & the SDGs

Informing DRR Indicators for SDGs 1, 11 and 13



aee

13 CLIMATE ACTION

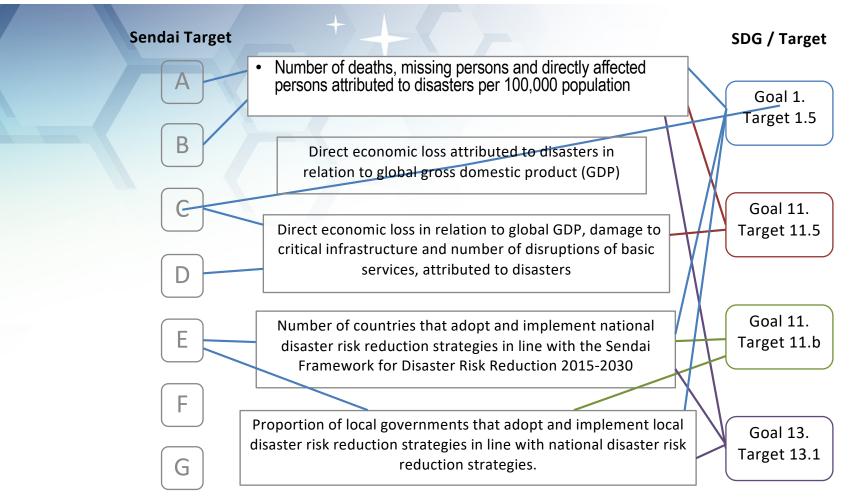
Aligning disaster-related SDGs with the Sendai Framework for Disaster Risk Reduction.

GEO is working to support the Sendai Framework and to address disaster-related goals, targets and indicators of the 2030 Agenda:

- 3 SDGs
 - 1: End poverty in all its forms everywhere
 - 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
 - 13: Take urgent action to combat climate change and its impacts
- 4 SDGs Targets
- 11 SDGs indicators







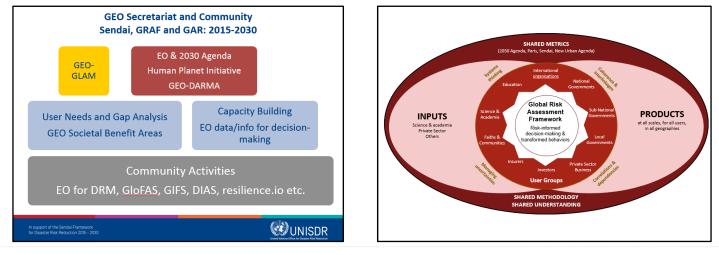
Note: the indicators above are proposed by the IAEG-SDGs to the UN Statistical Commission, 48th Session, and as such are not yet considered final.



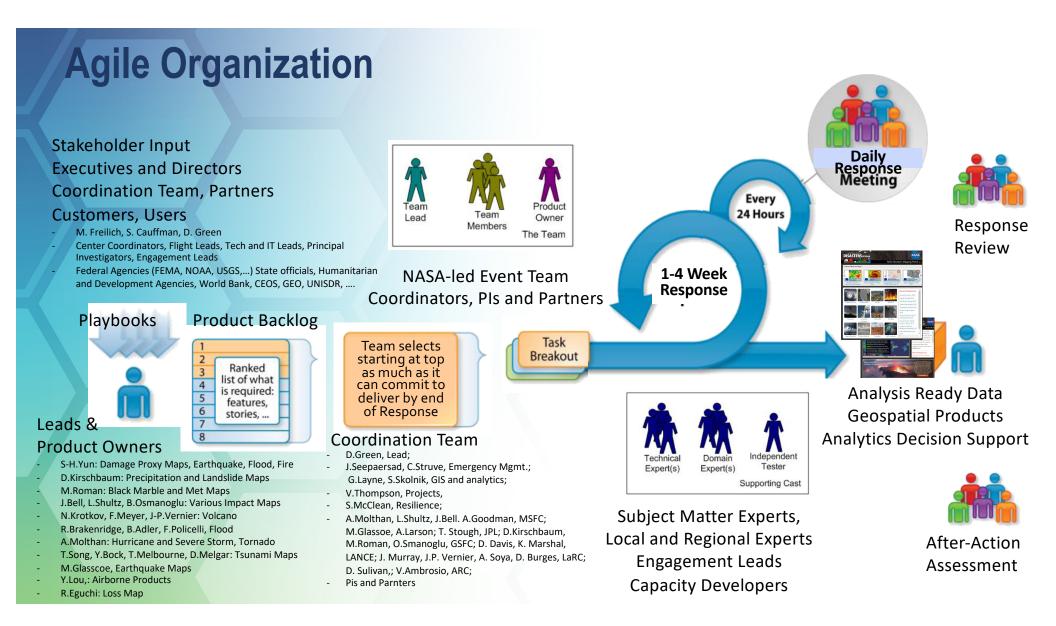
What should the NASA with GEO do?

What is the problem we are trying to solve?

How can NASA with GEO, through its Work Programme, support and inform the Global Assessment Report on Disaster Risk Reduction and the overarching Sendai Framework?









Information Support Geospatial Products a Analytics Timely Executive situational reports

Media coordination and dissemination

Geospatial Products and NRT Analytics

- Disasters GIS Portal and analysis tools ٠
- Event data sets and rapid data cubes •
- Web Services and Damage/Loss Maps •

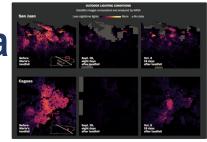
Leveraged resources (ROI est. 10:1)

- PI research and products
- Airborne and CEOS partner missions
- Stakeholder/Partner products/resources • hazard, exposure and resilience
- Transition and sustainability •



Follow

#NASABlackMarbleHD @NASANPP products being disseminated via @washingtonpost. Thanks go to @NASA_SPoRT and @NASAEarth wapo.st/puerto-rico-po ...



11:59 AM - 11 Oct 2017

Strategy: From Response to Resilience

• Vision

- To create the most innovative disaster risk reduction and resilience program by using earth observations to inform decisions across the disaster cycle from local to global scales.

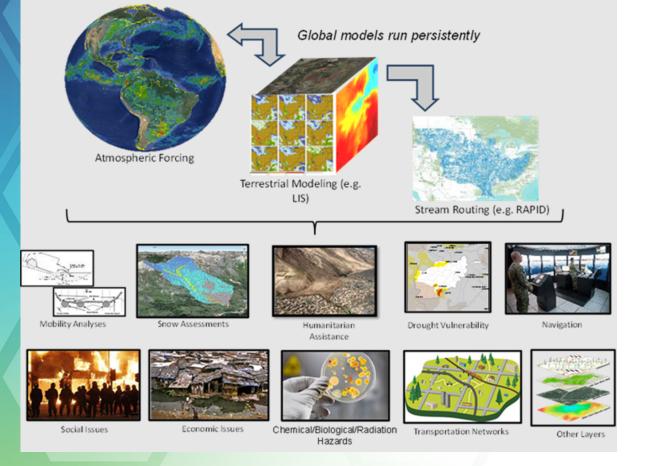
Mission

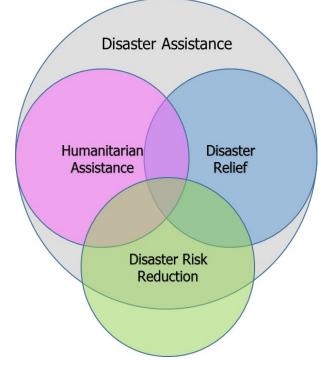
 NASA's Earth Science Disasters Program harnesses the most advanced earth observation science and technology, creates and leverages key partnerships, which supports decisions with trusted, timely and effective sources of situational awareness, predictive information and actionable decision support before, during and after disasters

• Goals

- Harness NASA Earth Science Division capabilities for disaster risk reduction and resilience
- Engage stakeholders in the use of earth observations throughout the disaster lifecycle
- Demonstrate the value and impact of earth observations to support decision making and actions
- Grow and maintain an organization recognized as a trusted and reliable source of science and technology that serves society
- SMART Objectives
- Tasks

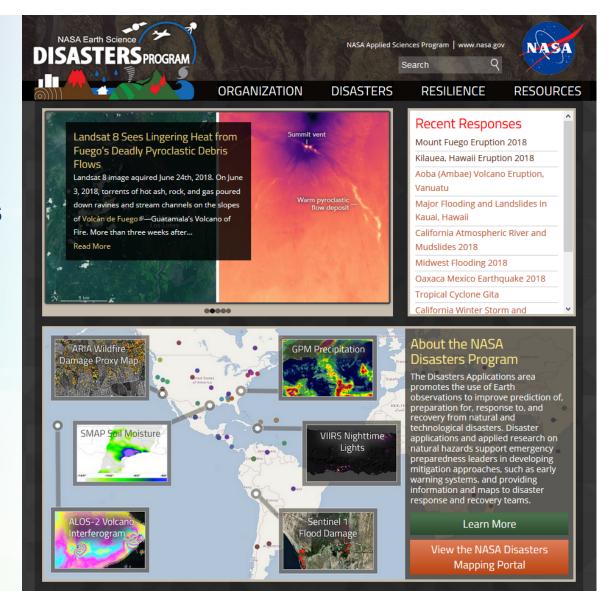
Making Sense of the Data and Providing Tools for Decision Support



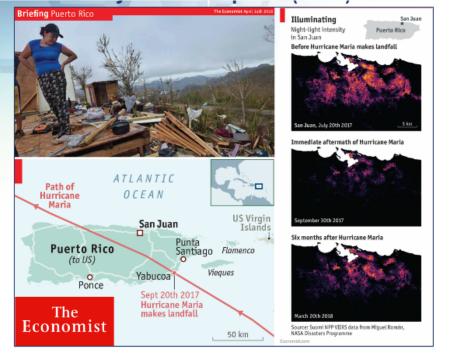


Disasters.nasa.gov

- Highlights recent efforts in disaster resilience and responses from the NASA Earth Science Disasters Program
- Provides examples of how NASA Earth Science data is used to support disaster risk reduction
- Provides link to NASA Disasters Mapping Portal



CAIR – Communities and Areas at Intensive Risk Demonstrate Island Situational Awareness and Resilience



The April 2018 issue of The Economist featured data and images from NASA's Black Marble Science Team in an article about the recovery of Puerto Rico's energy sector six months after Hurricane Maria devastated the island.



https://bit.ly/2IXJmfs

Islands CAIR

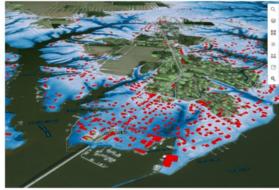
Identify and assess
impacts of substantial
gaps in situational
awareness before, during
and after disasters
Engage public-private

stakeholder groups, including suppliers of key services

CAIR – Communities and Areas at Intensive Risk

Demonstrate east coast resilience to sea level rise, hurricane surges and subsidence





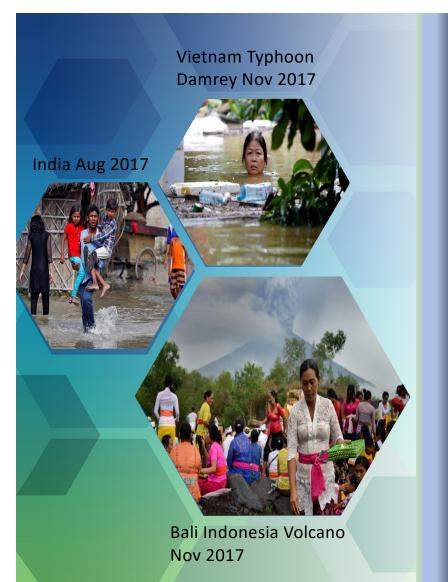
Oriental, NC – Hurricane Irene (27-29 Aug 2011) Blue represents predicted flooding based on VIMS Street level flood modeling Photos are actual flooding following Hurricane Irene

Oriental, NC – Hurricane Irene (27-29 Aug 2011) Blue represents predicted flooding based on VIMS Street level flood modeling Red indicates homes where high water exceeds the first floor elevation (FFE) – home is flooded Green indicates water has not exceeded FFE

Hurricane simulations (e.g. .hurricane Irene hindcast) can produce flood predictions for vulnerable areas



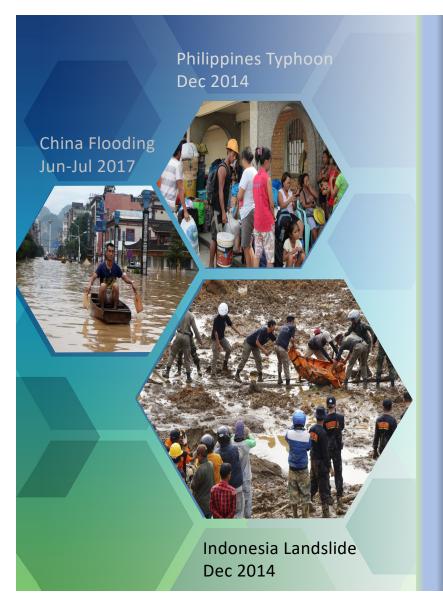




Are these people at risk?



NASA Black Marble - Asia and Australia; Image information was acquired by the Suomi NPP satellite in April and October 2012.



Are these people at risk?



Super Typhoon Yolanda (international name: Haiyan) approaching the Philippines (11/7/2013) A composite image incorporating data captured by the geostationary satellites of the Japan Meteorological Agency (MTSat 2) and EUMETSAT (Meteosat-7), overlaying **NASA's 'Black Marble' imagery**.



Are these people aware of risk?

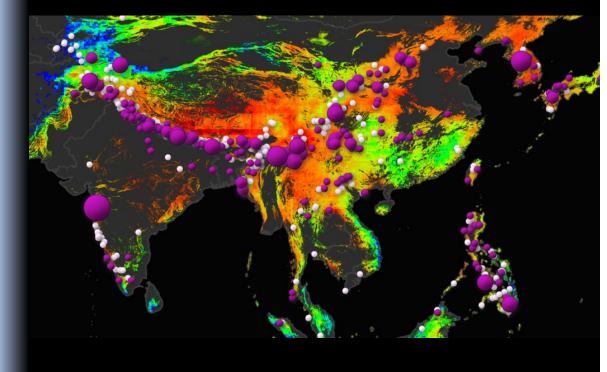


Indonesia Earthquake Dec 2016

Potential landslide activity during July 2018 in Southeast Asia

Evaluated by NASA's Landslide Hazard Assessment model.

Maintaining Situational Awareness

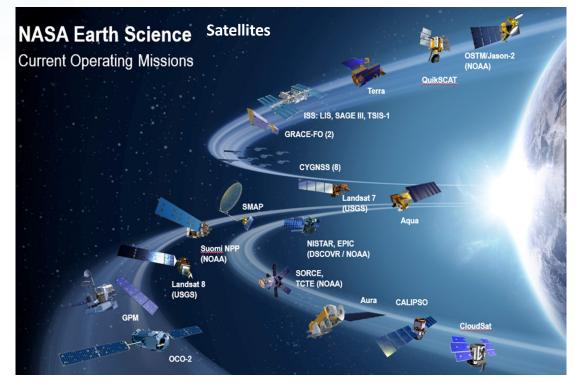


>s://svs.gsfc.nasa.gov/4640

Contributing to the Group on Earth Observations and Group Sendai Framework For Disaster Risk Reduction







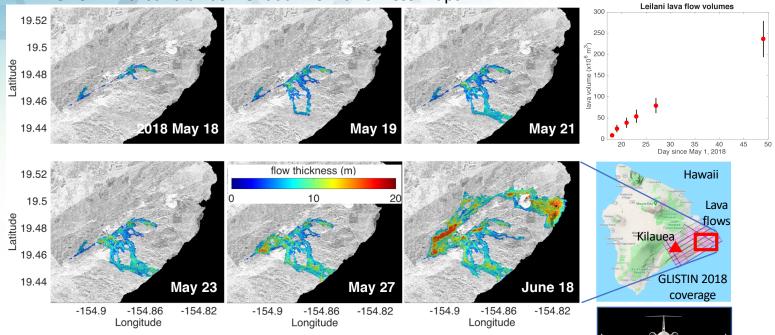
Monitoring hazards, exposure and vulnerability



Tracking the 2018 Kilauea Eruption

Mapping Lava Flows and Impacts with Satellite and Airborne Sensors

GLISTIN Ka-band airborne radar flow thickness maps



- Six sets of flights May 18 through June 18, 2018
- Experiment to measure lava effusion volume over time ٠
- First demonstration shows GLISTIN can map new lava flows with meter thicknesses at volcano scale
- Lava volume time series will be used to constrain mass conservation models of volcanic processes
- Could inform future volcano hazard assessments

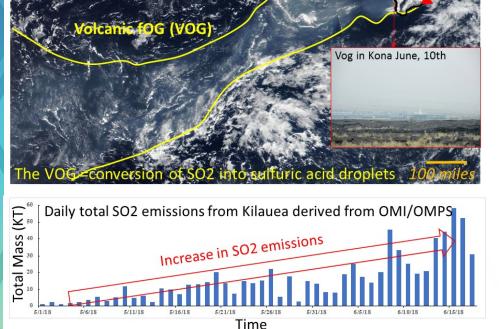




Human impact & response • First fissure May 4th

- Continuous eruption
- 670 home destroyed
- 2000 people evacuated
- 5000 acres covered
- NASA provides unique satellite and airborne observations and analysis to USGS and other stakeholders to help assess, support decisions, and quide action.

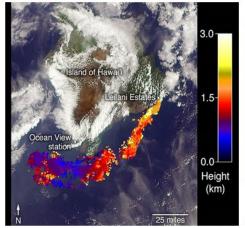
Air quality risks from the Volcanic fOG (VOG)



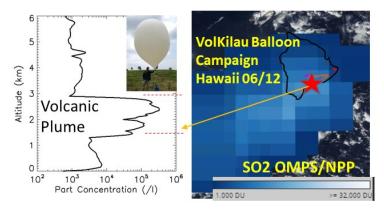
NASA

June 7th 2018

NASA helps assessing air quality risks from continuous SO2 emissions and VOG from Kilauea with consequences on health and impact on tourist industry **Plume height from MSIR**



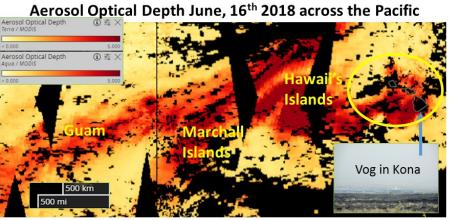
First Aerosol Concentration Profile



Plume height, concentration and composition to improve air quality forecast and assess impacts on aviation



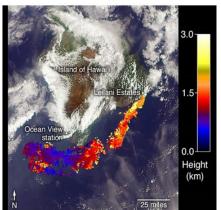
Air quality risks from the Volcanic fOG (VOG)



NASA

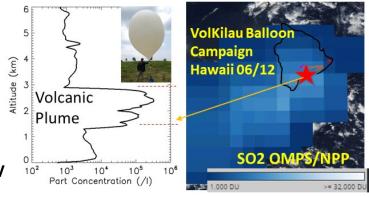
The VOG = conversion of SO_2 into sulfuric acid droplets

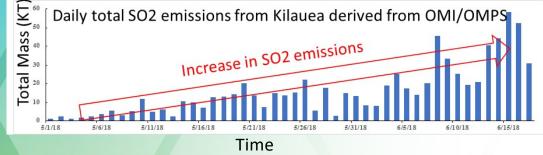
Plume height from MSIR



First Aerosol Concentration Profile

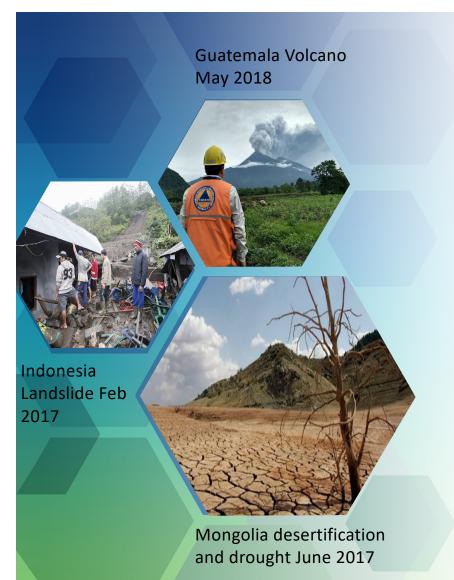
Plume height, concentration and composition to improve air quality forecast and assess impacts on aviation





NASA helps assessing air quality risks from continuous SO2 emissions and V from Kilauea with consequences on health and impact on tourist industry





Who is at risk here?



Malaysia Flood Jan 2017



How extensive is the risk impact?



Nepal Earthquake 2015

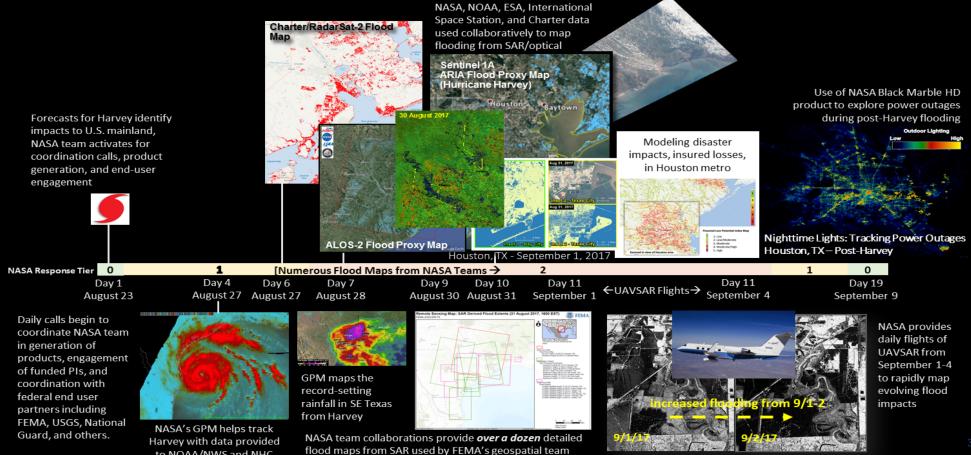
How's the risk changing?



Nepal 2015

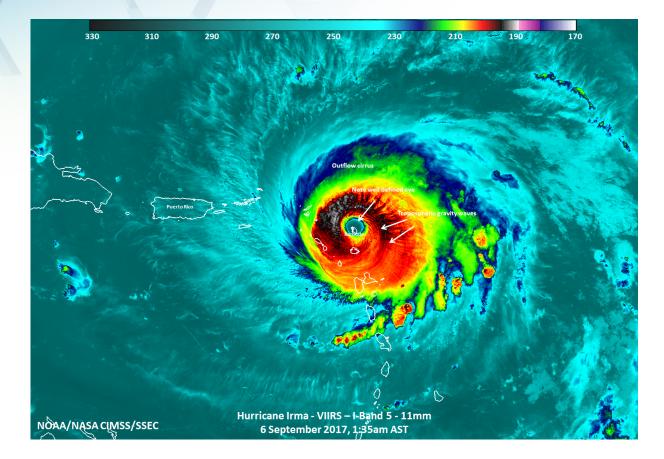
Response Across the Event Timeline Hurricane Harvey (Aug-Sept 2017)

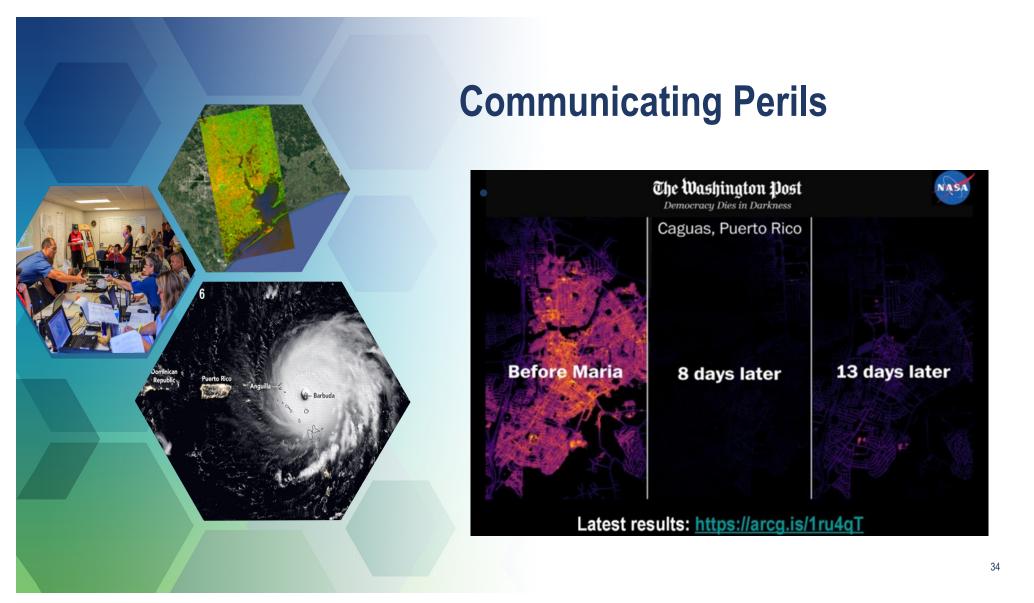
to NOAA/NWS and NHC

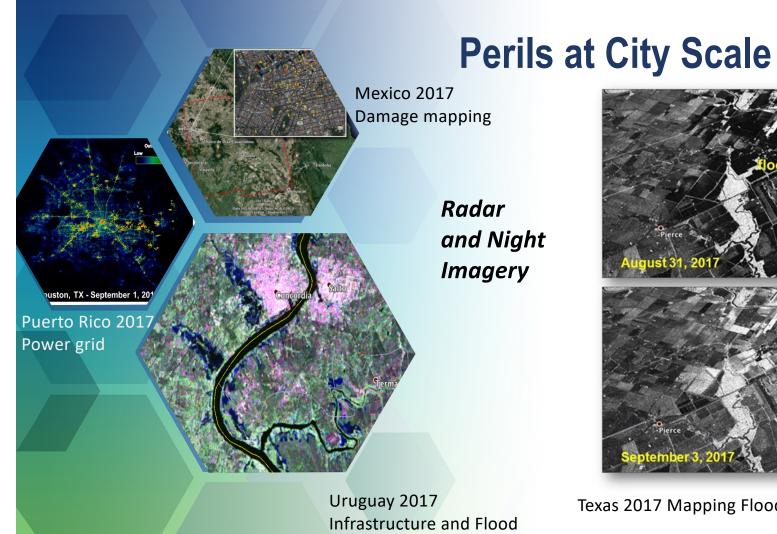


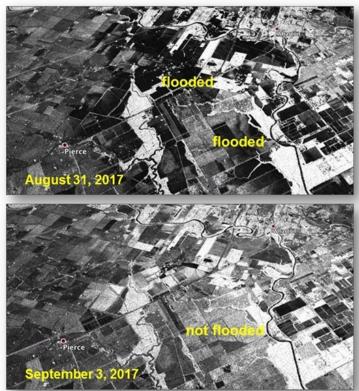


Was the hazard a surprise? The scale? The impact?









Texas 2017 Mapping Flood and NOT Flood



Monitoring Communities and Areas at Intensive Risk CAIR

Satellite-based analysis and Example of mapping and modeling for coastal communities and areas of subsidence, sea level rise and storms



Making Risk Reduction Visual & Scalable,

Satellite and airborne analysis, modeling and mapping of risk and resilience assessment/ loss and recovery

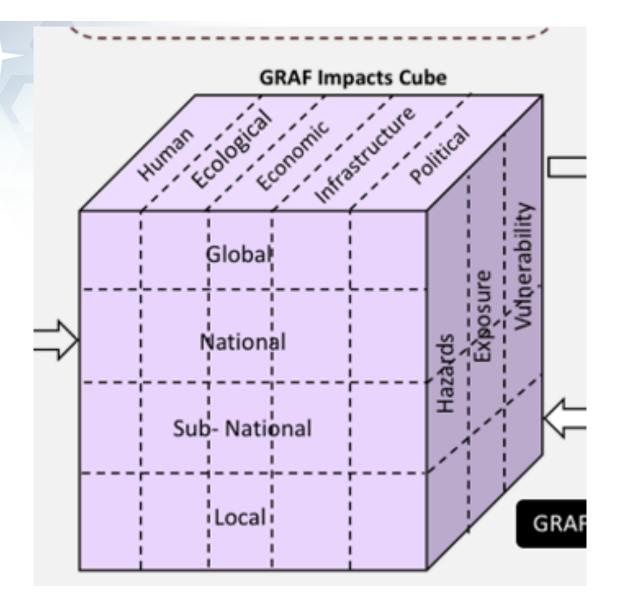
- Land use and Land cover Changes
- Weather and Climate Patterns
- Water and Resource Uses
- Extent and Loss Impact Mapping



Assessing Risk Impact and Sustainability

Research & Understanding Open & Accessible Data Technology Enablement/AI&ML Models & Maps Predictions & Decision Tools Capacity Building GRAF Global Risk Assessment Framework

Toward Assessing Impacts





Building Durability Sustainability and Capacity

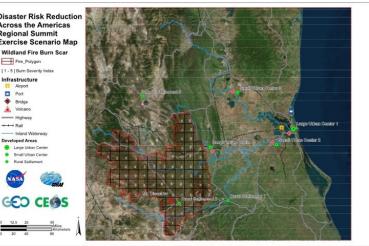
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GED CE

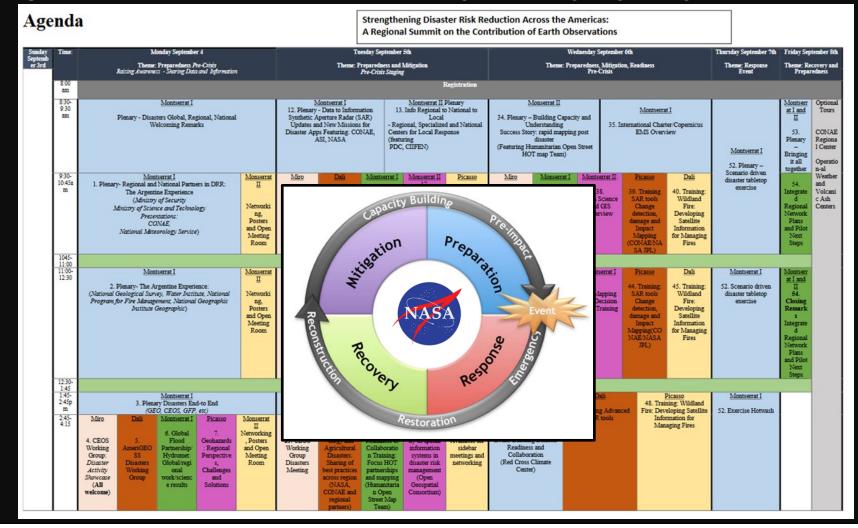
Research & Understanding Open & Accessible Data Technology Enablement/AI&ML Models & Maps

Predictions & Deci Disaster Risk Reduction Exercise Scenario Ma

Scenario Exercise and Practice



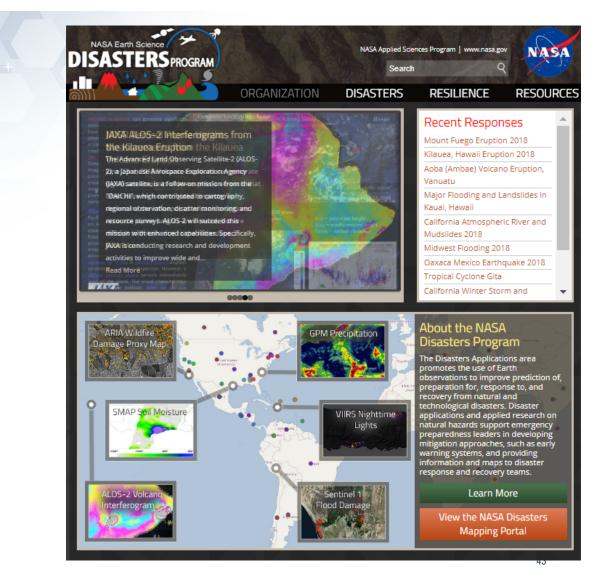
Agenda Follows the Disaster Cycle Day by Day



Regional Disaster Risk Reduction Summit Participants Pull Together to Save Disastrov

Web services and Portals

- Fed agencies need to do a better job at interacting with industry/utilities/civil society groups on
 - Data/information exchange
 - Delivering different levels of bandwidth products...



NASA Disasters – geospatial priorities

- Disaster-lifecycle relevant data and promoting risk assessment and reduction
 - Timely, scheduled, discoverable, accessible, scaled, curated, trusted and digestible (bandwidth ready and analysis ready)
- Tools and services that are stakeholder-responsive and value driven
 - Interoperable and standards-based collaborative environments for operation and development
 - Accessible user-ready, fit-for-use, and intuitive data and products
 - Effectively shared, used, and re-used geospatial information and applications
- Spatial Data Infrastructure (SDI)
 - Sustainable and extensible capacity development (SERVIR, DISASTERS, ESTO...) to ensure disaster risk reduction infrastructure is in place across the globe
- Technology-enabled collection and consumption
 - Comprehensive approach including mobile, crowdsourcing, advanced remote sensing, AI, machine learning, cloud, video, sensors etc.

CEOS Analysis Ready Data



- Near-Real Time Analysis Ready Data (NRT-ARD)
 - Data that has been processed to a minimum set of requirements and organized into a form that allows for immediate analysis with minimum additional user effort and interoperability both through time and with other datasets.
 - Useable products
 - Enhance and complement NASA Disasters Mapping Portal
 - ARD+NRT-ARD that facilitate creation of knowledge products and decsions support tools about risk



CEOS Pilots vs Demonstrators

Demonstrator	Pilot	
Demonstrate sustainability, cost/benefit	Prove feasibility, benefit	Objectives
Driven by user demand – may be limited or global in reach	Limited geographic areas	Physical Scope
Three years	Three years	Duration
Overall demonstrator led by CEOS but individual projects seek user lead	CEOS and technical partners	Leadership
May be components but mostly builds on successful elements of pilots	Prime driver	Technical elements
In-kind contributions of data and services	In-kind contributions of data and services	Financing
End users and practitioners help define demonstrator and work with CEOS teams to achieve sustainability	End users asked for documented input on usefulness and benefit	Users

A Picture's Worth a Thousand Actions

david.s.green@nasa.gov

https://disasters.nasa.gov/home

https://maps.disasters.nasa.gov/arcgis/home/

nitarian Innovation