

GEO & CEOS Flood Community Developments

Global Flood Partnership Virtual Conference 2020

David Borges

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NASA Applied Sciences Disasters Program

4 November 2020

www.earthobservations.org
www.geoportal.org

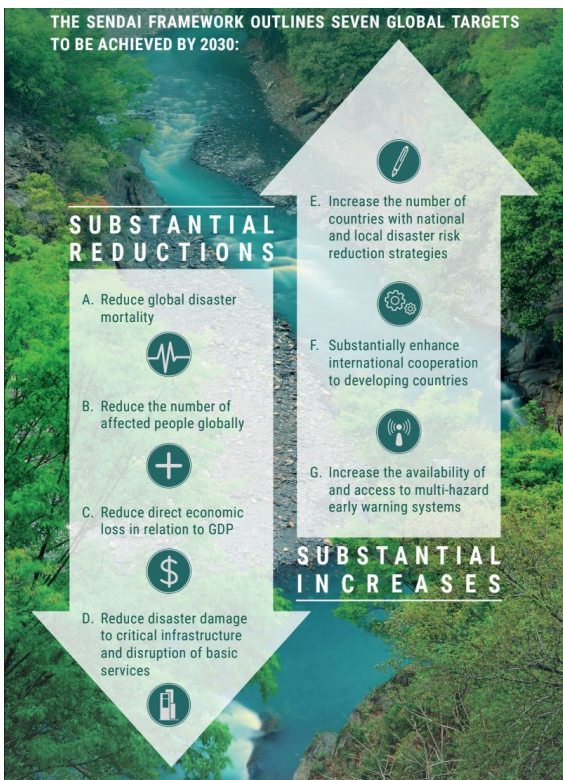
Group on Earth Observations (GEO)

GEO is an international partnership of more than 100 national governments and in excess of 100 Participating Organizations working towards a future where decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations.



About us

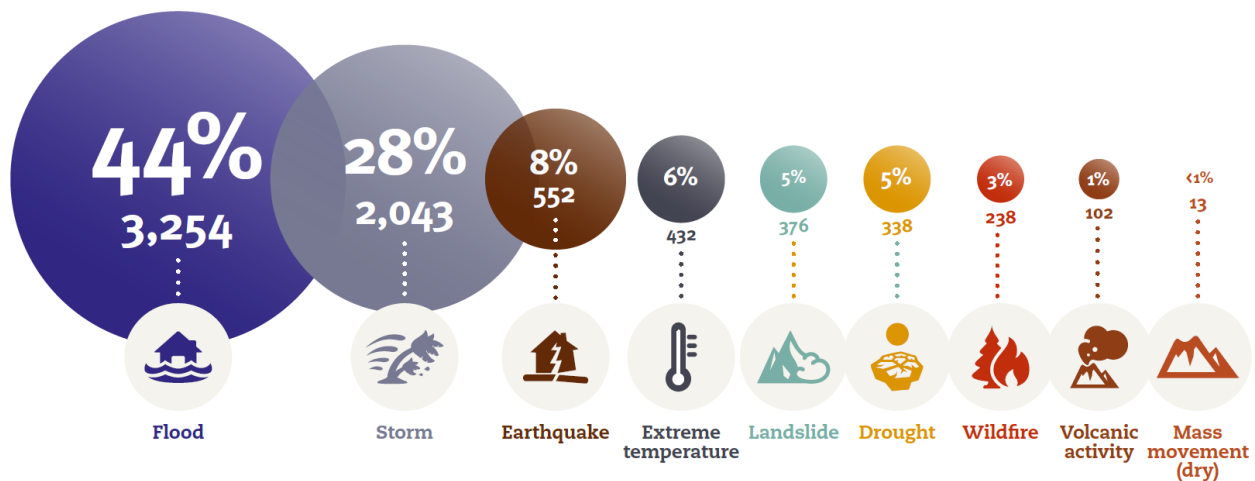
UNDRR Sendai Framework for Disaster Risk Reduction 2015-2030



Promote and increase use of Earth observations to address disaster risk reduction efforts and achieve Global Targets.



Percentage of occurrences of disasters by disaster type (2000-2019)



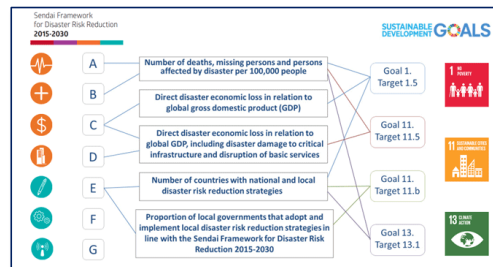
Credit: Human Cost of Disasters, UNDRR

2020 – 2022 GEO Work Programme

GEO Flagships					
GEO Biodiversity Observation Network GEO BON	GEO Global Agricultural Monitoring GEOGLAM	Global Forest Observation Initiative GFOI	Global Observation System for Mercury GOSIM		
GEO Initiatives					
AquaWatch AQUAWATCH	Data Access for Risk Management GEO-DARMA	Data Integration and Analysis System DIAS	Earth Observations for Ecosystem Accounting EO4EA	Earth Observations for Health EO4HEALTH	Earth Observations for the Sustainable Development Goals EO4SDG
GEO Capacity Building in North Africa, Middle-East, Balkans and Black Sea Region GEO-CRADLE	GEO Global Water Sustainability GEOGLOWS	GEO Human Planet HUMAN-PLANET	GEO Land Degradation Neutrality GEO-LDN	GEO Vision for Energy GEO-VENER	GEO Wetlands GEO-WETLANDS
Geohazard Superlaties and Natural Laboratories GSNL	Global Drought Information System GDIS	Global Network for Observations and Information in Mountain Environments GEO-MOUNTAINS	Global Observation System for Persistent Organic Pollutants GOS4POPS	Global Urban Observation and Information GUOI	Global Wildfire Information System GWIS
Oceans and Society: Blue Planet BLUE-PLANET					
GEO Community Activities					
Advancing Communication Infrastructure and Services ACIS	Arctic GEOSS ARCTIC-GEOSS	Chinese High-resolution Satellite Data Resources CSDR	Climate Observation, Simulation and Impacts CLIMATE-OBS	Copernicus Atmosphere Monitoring Service CAMS	Copernicus Climate Change Service CCS
Digital Earth Africa DE-AFRICA	Earth Observation and Copernicus in support of Sendai Monitoring EO4SENDAI-MONITORING	Earth Observation Industrial Innovation Platform for Sustainable Development EO-IP	Earth Observations for Disaster Risk Management EO4DRM	Earth Observations for Managing Mineral and Non-Renewable Energy Resources EO4MIN	Earth Observations for the Atlantic Region ATLANTIC-EO
Earth Observations for the Water-Energy-Food Nexus EO4WEF	Enhancing Food Security in African Agricultural Systems with the Support of Remote Sensing AFRICULTURES	GEO Citizen Science GEO-CITSCI	GEO Essential Variables GEO-EV	GEO Global Ecosystems GEO-ECO	Geodesy for the Sendai Framework GEO4SENDAI
Global Agricultural Drought Monitoring AGRI-DROUGHT	Global Crop Pest and Disease Habitat Monitoring and Risk Forecasting CROP-PEST-MONITORING	Global Ecosystems and Environment Observation Analysis Research Cooperation GEOIARC	Global Flood Awareness System GLOFAS	Global Flood Risk Monitoring GFRM	Global Land Cover LAND-COVER
Global Observation of Deltas and Estuaries DELTA-ESTUARY	In-Situ Observations and Applications for Ecosystem Status of China and Central Asia IN-SITU-ESC	Multi-source Synergized Quantitative Remote Sensing Products and Services MUSYQ	Next Generation Earth Observation Services NEXT-EOS	Night-Time Light Remote Sensing for Sustainable Development Goals NIGHT-LIGHT	Open Earth Alliance OEA
Space and Security SPACE-SECURITY	Space Climate Observatory SCO	The International Grand Global Ensemble TIGGE	Understanding the Impacts and Value of Earth Observations GEO-VALUE		
Regional GEOs					
African Group on Earth Observations AFRIGEO	Americas Group on Earth Observations AMERIGEO	Asia-Oceania Group on Earth Observations ADGEO	European Group on Earth Observations EUROGEO		
Foundational Tasks					
GEO Engagement Priorities Coordination	GEOSS Data, Information and Knowledge Resources	GEOSS Infrastructure Development	GEO Work Programme Support	GEO Secretariat Operations	

GEO Disaster Risk Reduction WG

- Purpose
 - Develop and implement a coherent and crosscutting approach within GEO to advance the use of Earth observations in support of countries' disaster risk reduction and resilience efforts.
- Serve as primary GEO liaison to UNDRR
 - Promote the dissemination and use of Earth observations to strengthen capabilities to reduce disaster risk according to the needs of countries as identified by UNDRR
- Determine links and actionable opportunities between disaster risk reduction, climate change, SDGs and urban activities
- Promote awareness of relevant global policy frameworks across the WP, such as ***UN-GGIM WG-Disasters Strategic Framework on Geospatial Information and Services for Disasters***



GEO DRR WG Governance

Subgroup 1: Coordination across the GEO Work Programme

Co-Chair: David Borges (NASA, United States)

Deputy Chairs: Godstime James (Africa), Fernando Belda (Spain), Tatiya Chuentragun (Thailand)

Subgroup 2: UNDRR Coordination (Sendai Framework Monitoring & Global Assessments)

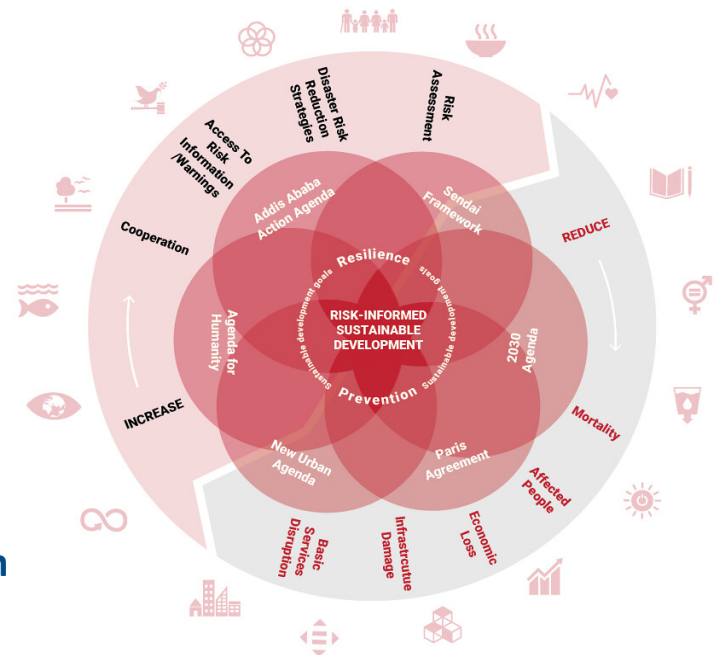
Co-Chair: Janet Edwards (MSB, Sweden)

Deputy Chairs: John LaBrecque (United States), Aliyu Abdullahi (Africa)

Subgroup 3: Climate Change, SDG, Urban Activities Coordination

Co-Chair: Kene Onukwube (DEAR Africa, Nigeria)

Deputy Chairs: Cheila Cullen (United States), Ramesh Singh (United States), Chulam Rhasul (Nepal)



Work Programme: Flood-Related Activities

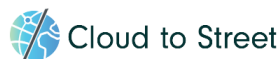
- Global Water Sustainability (GEOGloWS) Initiative
- Data Analysis and Integration System (DIAS) Initiative
- Global Flood Awareness System (GloFAS) Community Activity
- Global Flood Risk Monitoring (GFRM) Community Activity



2020-2022 GEO Work Programme

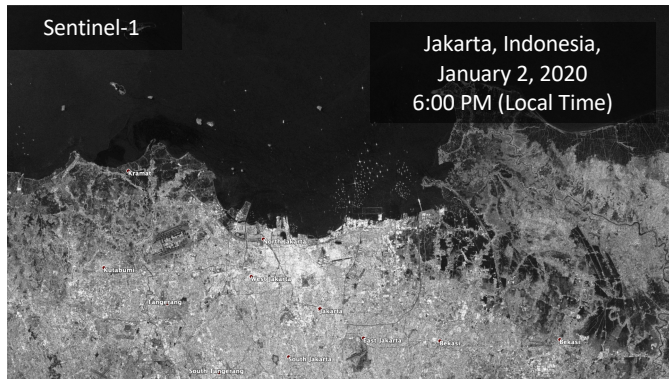
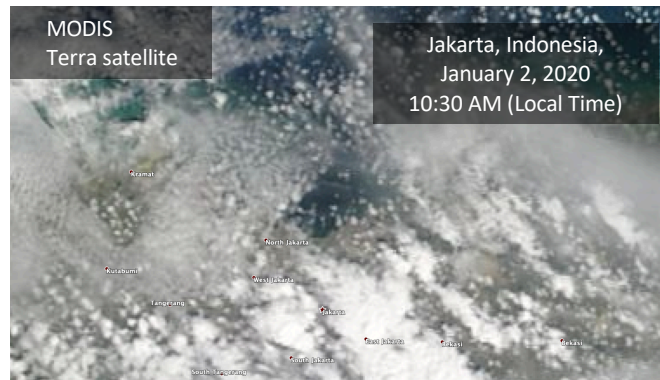
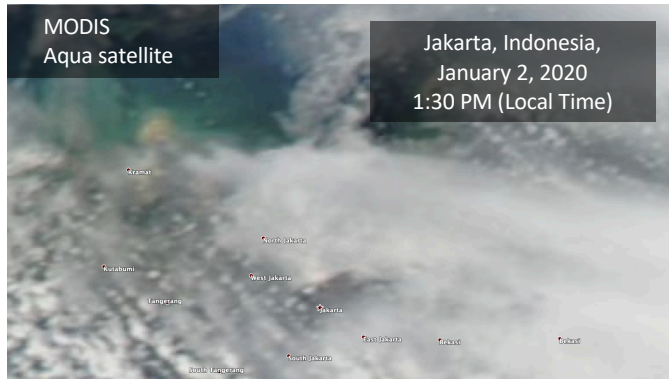
GEO GFRM Community Activity

- Supports and integrates efforts that leverage Earth observations to improve the ability to assess flood risk on a global scale and translate risk information to impacts at the community, national and regional level by supporting risk-informed decision making.
- Maintain a thematically focused space where use cases, good practices, standards and national experiences can be shared.
- Leverage what already exists (Earth observation flood products, methodologies, services) adding vital vulnerability and exposure components.
- Promote Earth observation platforms, toolboxes (i.e. GEO Knowledge Hub, AmeriGEO DataHub, Sentinel Asia).

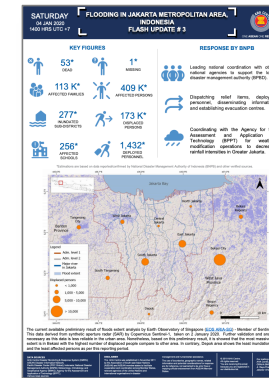


Global Rapid Flood Mapping System with Spaceborne SAR Data

Sang-Ho Yun, Cheryl Tay, Yunung Nina Lin, Shi Tong Chin, Jungkyo Jung, Emma Hill



Project is to develop end-to-end automated flood response process leveraging cloud computing environment and developing advanced algorithm for flood mapping with an emphasis on the urban area floods. The project is led by NASA's Jet Propulsion Laboratory and the Earth Observatry of Singapore for the algorithm and system development efforts. The left panels show the optical and SAR images of Jakarta on January 2, 2020, when flash flooding occurred in the city. We rapidly generated the flash flood extent map (Flood Proxy Map) and validated with crowdsourced information by PetaBencana in Indonesia, and delivered to the AHA center (ASEAN Coordinating Centre for Humanitarian Assistance on disaster management). The AHA center used our map for rapid situational awareness.



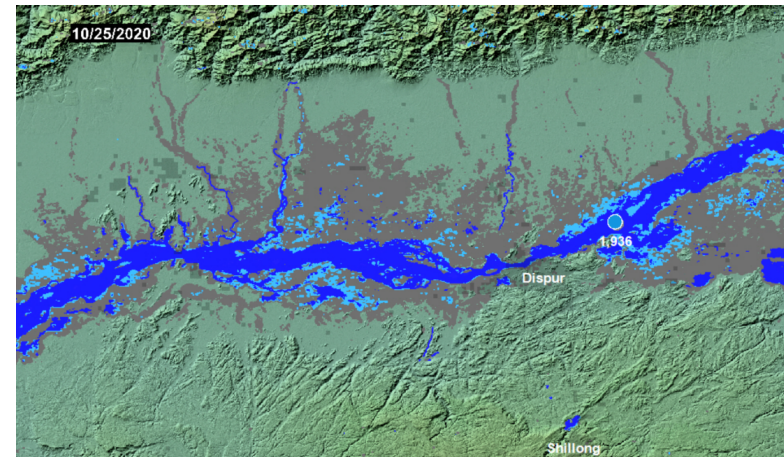
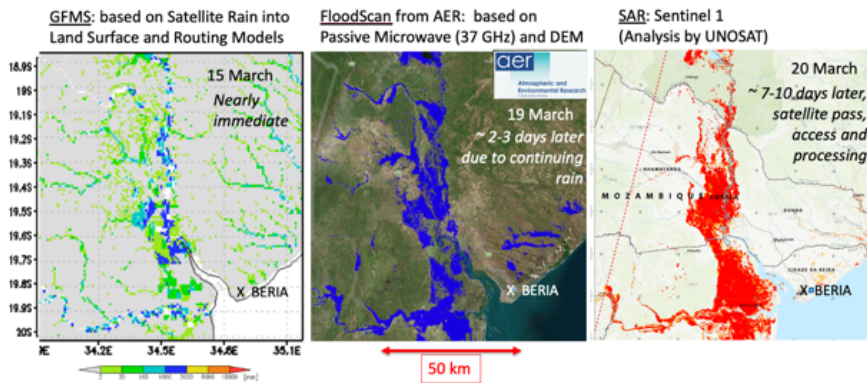
INTEGRATING GLOBAL REMOTE SENSING AND MODELING SYSTEMS FOR LOCAL FLOOD PREDICTION AND IMPACT ASSESSMENT

G. R. Brakenridge, A. J. Kettner, R. A. Adler, F. Policelli, D. Slayback, G. Schumann

Project is to develop and run a global, automated, flood detection, measurement, mapping, and risk-updating system. This by merging relevant remote sensing and model information sources. DFO provides a web portal/integration facility in which these automated systems and their data and services are assembled, inter-compared, and the final information products published, in an interoperable system based on OGC standards. With each new observed flood, the risk map (gray in map below) is updated.

Comparison of (UMD) Global Flood Monitoring to AER FloodScan and Sentinel SAR results. DFO Web Map Server now also provides the UMD output

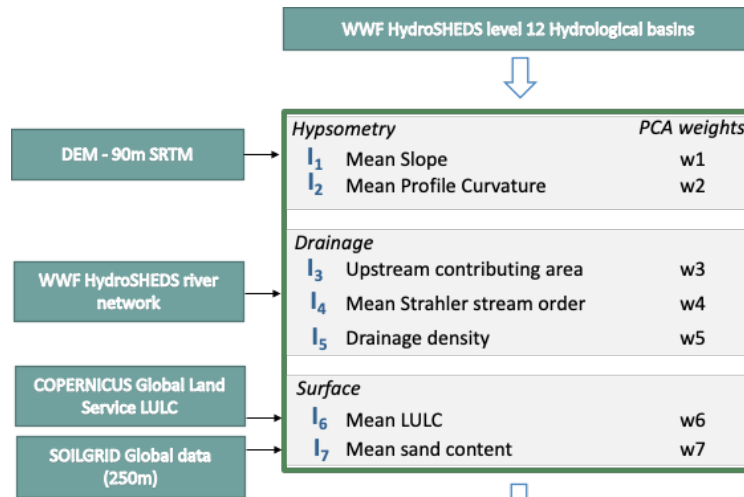
Surface Water Watch. Dark blue, Current MODIS NRT water. Light blue, Annual High Water. Gray, maximum observed flood. Brahmaputra River, India



NASA GEO Global Flash Flood Risk Project

A. Kruczkiewicz, H. Vergara Arrieta

- Terrain derivatives related to the hypsometry are derived from the global NASA's Shuttle Radar Topography Mission (SRTM) 90m Digital Elevation Model (DEM) v4.1
- Drainage network characteristics have been extracted from the WWF HydroSHEDS v1 global datasets (15 arc-seconds resolution). Two products are used, the level 12 hydrological basins and the river routing networks.
- Soil type information are extracted from the global SoilGrids dataset of ISRIC, the World Data Centre for Soils (250 m resolution)
- Land Use Land Cover classification area extracted from Copernicus Products.



Catchment flash flood susceptibility map
 $FFSI = \sum w_i * I_i$

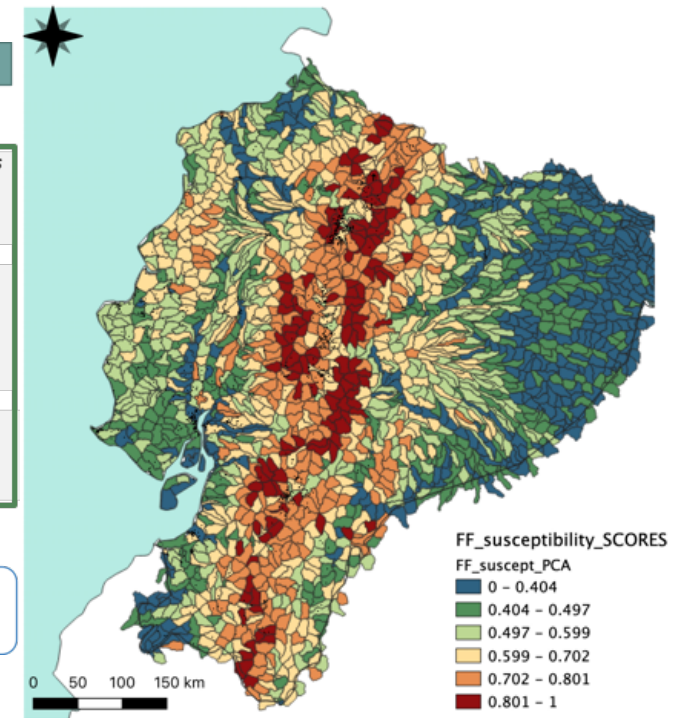


Figure : Flash flood susceptibility from catchment morphometry and surface characteristics



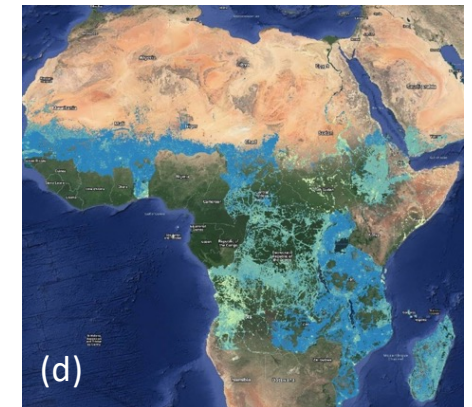
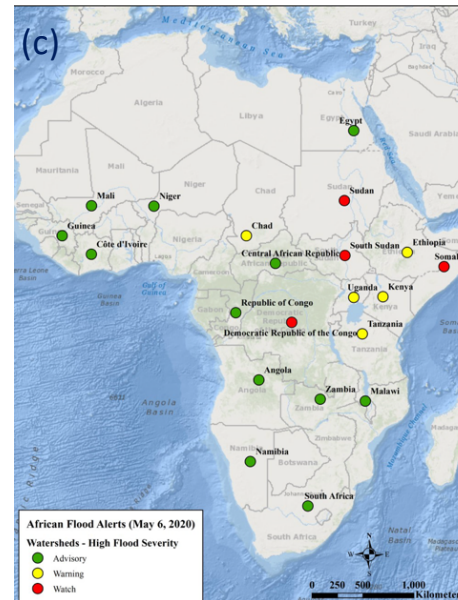
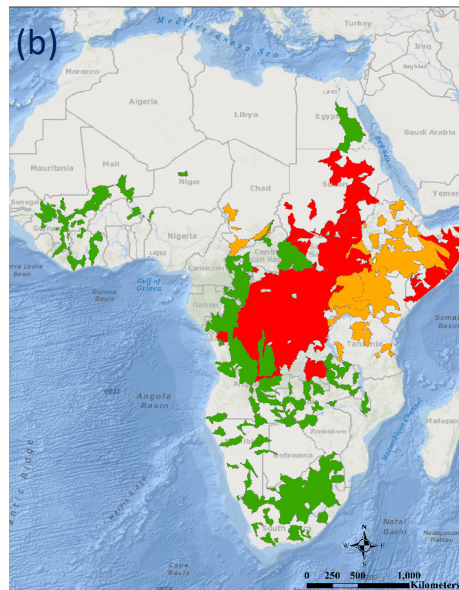
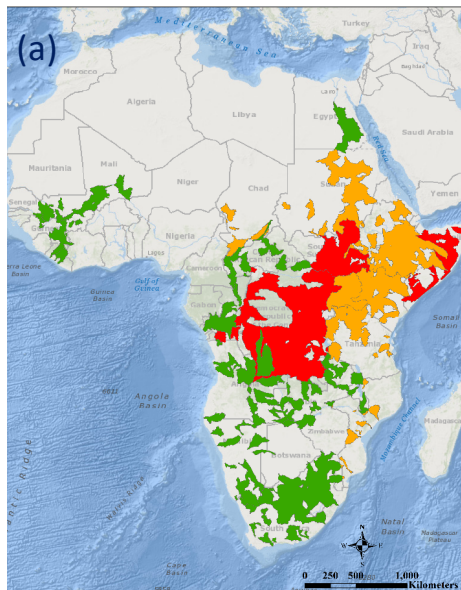
Advancing Access to Global Flood Modeling and Alerting using the PDC DisasterAWARE® Platform and Remote Sensing Technologies

M. Glasscoe, R. Eguchi, M. Pierce, Z. Chen, K. Tiampo, D. Bausch, B. Kar, G. Schumann, C. Chiesa, G. Hampe

Using DisasterAWARE® - an open access, global flood alerting system – for effective dissemination of flood risks and potential impacts to aid with emergency response. Central to the project is the incorporation of flood model outputs and remote sensing derived products from multiple platforms to help with flood risk mitigation and increase resilience of impacted communities.

The system combines model outputs from the Global Flood Monitoring System (GFMS) and the Global Flood Awareness System (GloFAS) with data on watershed risk, which is then validated using Synthetic Aperture Radar (SAR) data for flood inundation and depth, if available.

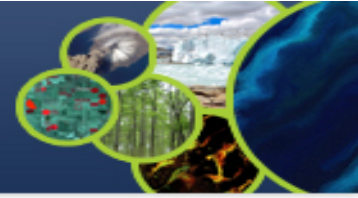
These data are being integrated into the Pacific Disaster Center (PDC) DisasterAWARE® multi-hazard monitoring, early warning, and decision support platform providing an automated source of global information on floods that is supported by a common, normalized data model.



Watersheds (a, b) that are experiencing watches (red), warnings (orange), or advisories (green) are converted into alerts (c) that will be delivered to DisasterAWARE®. Exposure (d) can then be overlaid to show areas of vulnerability.



Committee on Earth Observation Satellites



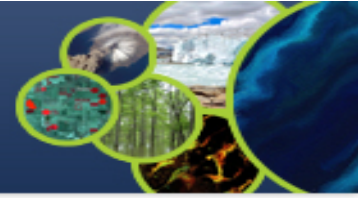
- GEO Participating Organization recognized as the space-based Earth observation authority.
- Mechanism to coordinate civil space-based EO programmes globally and promote data exchange for society's benefit, and to inform decision-making to secure a prosperous and sustainable future for humankind.
 - 35 National Space Agency Members
 - 25 Associate Members





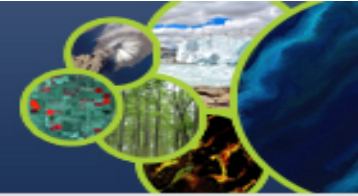
- *CEOS WGDisasters ensures the sustained coordination of disaster-related activities undertaken by the CEOS Agencies and acts as an interface between CEOS and the community of stakeholders and users involved in risk management and disaster reduction.*
- Membership open to all CEOS Agencies (Members and Associates). In addition, the WG includes experts from non-CEOS Agencies who have relevant experience to contribute to the objectives of the WGDisasters.





- Explores and demonstrates good practices related to Geosynchronous, LEO and SAR data fusion and methodologies for flood mapping, response and risk reduction at regional and local scales by focusing on multiple regional case studies (Argentina, India, Myanmar, China, Canada, United States, South Balkans).
- Improve access to and use of CEOS Member Agency data and methodologies, leveraging ongoing CEOS Analysis Ready Data standards and cloud-based CEOS Earth Analytics Interoperability Lab.
- Leads: NASA, NOAA

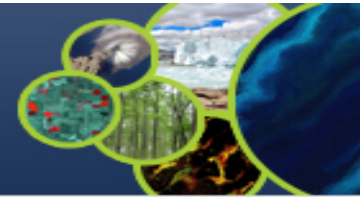




- Coastal Observations Applications Services & Tools (COAST) Ad Hoc Team
 - Bridging land and aquatic observations within CEOS, helping to integrate across multiple CEOS entities and domains, both thematic and technical.
 - Leveraging CEOS Systems, services and interoperability approaches, including the CEOS Analysis Ready Data (ARD) framework already demonstrated for terrestrial and oceanic applications.
 - Facilitating the broader utilization of Earth observations for greater societal benefits within coastal zones and enhancing CEOS engagement with external stakeholders such as GEO, IOC/GOOS, UN Environment, WMO and the UN Decade of Ocean Science for Sustainable Development (2021-2030).
 - Leads: NOAA, ISRO



CEOS COAST

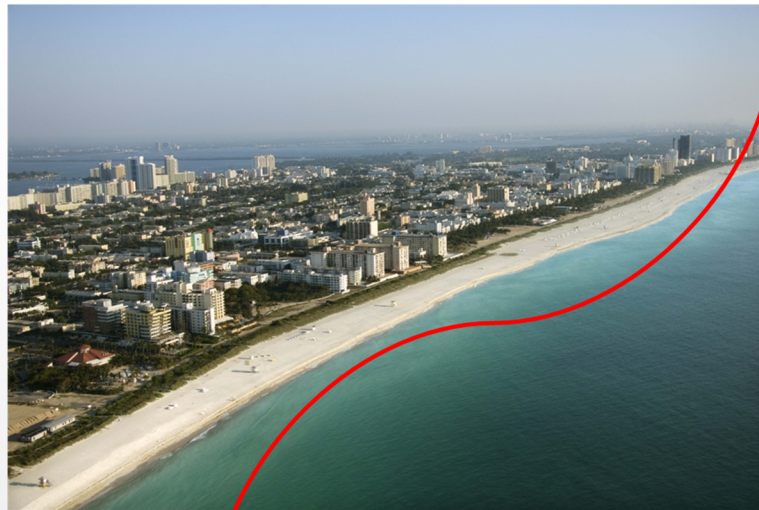


Cross-Cutting Needs:

- Analysis ready data
- Tools, products & services
- User-centric web portals

Products needed:

- Land cover/use (impervious surfaces)
- Shoreline mapping/elevation
- Precipitation and Discharge
- Sediment and Nutrient loadings
- Habitat/water quality maps
- et al.



Partners/Stakeholders

- Blue Planet
- AquaWatch
- UN Environment
- IOC/WMO

Products needed:

- Land cover/use
- Bathymetry/elevation
- Shoreline mapping
- Waves and Tides
- Flood Maps
- et al.

COAST Project Component Land to Sea Impacts (~ biological/ecological)



COAST Project Component: Sea to Land Impacts (~ physical forcing)

Ecosystems, Water Quality & Habitats

- Sediment loading (benthic habitat impacts)
- Coastal eutrophication (SDG 14.1.1. et al.)

Coastal Disasters/Hazards: Flooding & Inundation

- Large-scale coastlines: urbanized, rural/agricultural, mixed use
- Small-island states: Coral-reef lined

Contact



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www.earthobservations.org

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<https://appliedsciences.nasa.gov/what-we-do/disasters>