GEO & CEOS Flood Community Developments

Global Flood Partnership Virtual Conference 2020
David Borges
Physical Scientist
NASA Applied Sciences Disasters Program
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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.
Promote and increase use of Earth observations to address disaster risk reduction efforts and achieve Global Targets.
# 2020 – 2022 GEO Work Programme

## GEO Flagships

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<thead>
<tr>
<th>Banner</th>
<th>Project</th>
<th>GEO Flagship</th>
<th>Other</th>
<th>2020</th>
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## GEO Initiatives

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## GEO Community Activities

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## Regional GEOs

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## Foundational Tasks

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[www.earthobservations.org](http://www.earthobservations.org)
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
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 Observatory 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
• 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.
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.
• 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.
  o 35 National Space Agency Members
  o 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
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.

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

- Ecosystems, Water Quality & Habitats
- Sediment loading (benthic habitat impacts)
- Coastal eutrophication (SDG 14.1.1. et al.)

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

- Coastal Disasters/Hazards: Flooding & Inundation
  - Large-scale coastlines: urbanized, rural/agricultural, mixed use
  - Small-island states: Coral-reef lined

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.
Contact

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NASA Applied Sciences Disasters Program
david.borges@nasa.gov

www.earthobservations.org
www.ceos.org
https://appliedsciences.nasa.gov/what-we-do/disasters