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Dissemination of Global Flood Information Through NASA Disasters Program Global Initiative for Flood Forecasting and Alerting (GIFFT)

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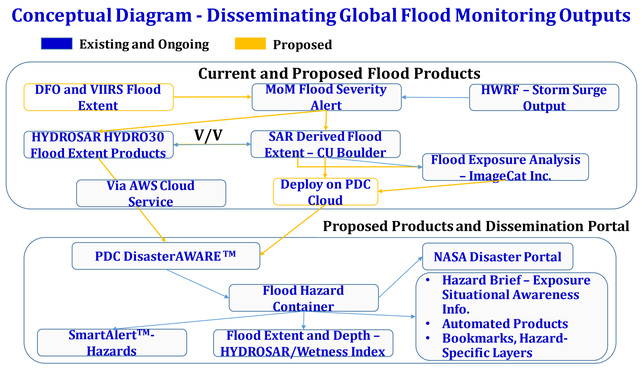
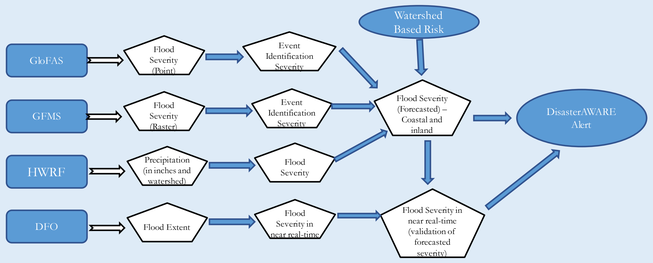
Global Initiative for Flood Forecasting and Alerting – GIFFT

The Global Initiative for Flood Forecasting and Alerting (GIFFT) is an initiative to disseminate flood products from different sensors to global stakeholders via the Pacific Disaster Center's (PDC) DisasterAWARE®, the NASA Disasters Mapping Portal and potentially other mechanisms. GIFFT will also generate an integrated product(s) using ensembled hydrologic models and Earth observation derived flood outputs to stakeholders globally. This initiative combines the results of several Disasters Program funded projects that focus on flood forecasting, flood severity estimation, post-event flood mapping, flood depth estimation and resulting flood severity using remote sensing-based flood information derived from SAR and optical imagery.



Model of Models (MoM)

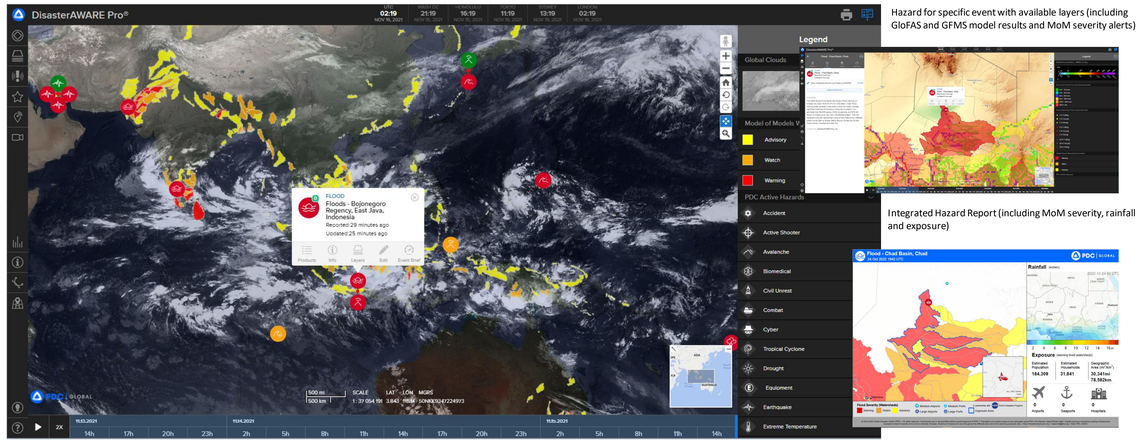


Model of Models - An ensemble model to integrate flood products from hydrologic models and Earth observation data to forecast flood severity. The figure above shows a workflow that starts with the flood models and ends with a severity score and ultimately an alert in DisasterAWARE.

- The model of models is an ***ensembled model*** that forecasts flood severity at sub-watershed level.
- It incorporates the GloFAS, GFMS, and HWRF flood models as well as validation by MODIS and VIIRS
- This allows identifying flood risk at a ***regional*** level.
- The flood severity information is used to obtain and process ***high-resolution*** Earth Observation data for determination of flood extent and assessment of societal and critical infrastructure impacts of flood
- This information is produced and then disseminated through PDC

DisasterAWARE®

Currently, PDC's DisasterAWARE platform incorporates **Model of Models (MoM)** outputs as flood "incidents," visually depicting potential floods in the context of population and infrastructure that may become affected. Automated procedures are being developed to categorize MoM outputs as DisasterAWARE "hazards," allowing for their dissemination to users along with other flood products that assess potential impacts. PDC's stakeholders include UN, DoD, FEMA and their equivalents around the world. Additionally, the DisasterAWARE platform has 2 million users worldwide and is a fully functional and sustained platform used to disseminate alerts and analytical products for 18 different hazard types. The **HydroSAR** products are not being distributed via DisasterAWARE. Under this effort, HydroSAR products will be distributed as flood hazards and products.



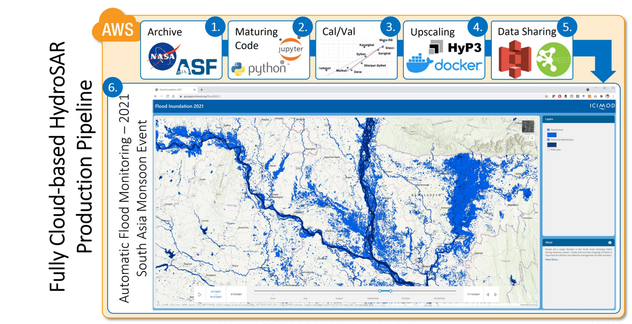
Hazard for specific event with available layers (including GloFAS and GFMS model results and MoM severity alerts)

Integrated Hazard Report (including MoM severity, rainfall and exposure)

DisasterAWARE – DisasterAWARE is a multihazard decision support platform provided by the Pacific Disaster Center (PDC). The platform is used globally by over 7K users and the Disaster Alert app more than 2M. Current capabilities (shown above) integrate MoM into a Flood Event that will be used to create Flood Alerts. Earth observation data from SAR will be integrated to provide flood geometry and depth information.

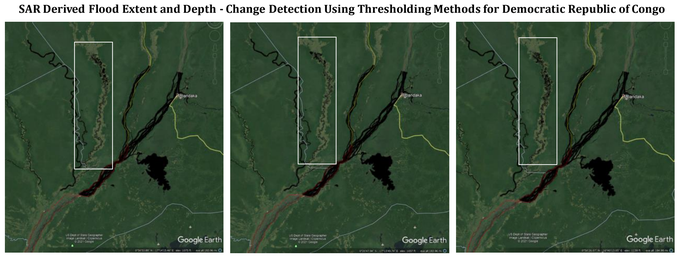
SAR Flood Extents

- **HydroSAR** provides information on post-event flood mapping, flood depth estimation and resulting flood severity, using remote sensing-based flood information derived from SAR
- Currently SAR-based surface water extent algorithms are fully implemented and validated in cloud-based platforms (see top right figure)
- Triggering of SAR flood extent product (A.37/HYDRO30) generation will use event information provided by PDC
- Water depth and extent is also being calculated using **machine learning and thresholding**. This technique and HydroSAR are being compared and cross-validated in GIFFT.
- The white box in each frame to the bottom right shows where flooding is occurring north of Lukolela, DRC.
- A series of outputs comprising of water bodies and areas with standing water were created over the period of the flood event to determine the flood extent using the change detection approach using Sentinel 1A/1B (C-band)images.



1 Integration with NASA ASF DAAC in AWS | **2&3** Code development & cal/val in AWS
4 Automation using Docker | **5&6** Data sharing via REST & ArcGIS image services

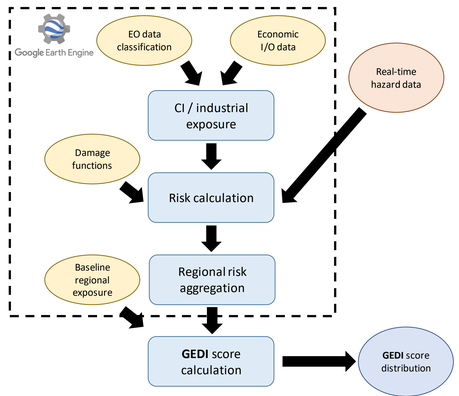
SAR Derived Flood Extent and Depth - Change Detection Using Thresholding Methods for Democratic Republic of Congo



03/03/2020 03/15/2020 03/27/2020

Global Economic Disruption Index (GEDI)

- The **GEDI** scale is designed to provide simplified qualitative estimates of the severity of a disaster with regards to the global economy.
- ***Global economic exposure data*** is first generated using classification of various EO datasets to detect areas of critical infrastructure (CI) or industrial activity. The detected areas are assigned economic value based on a global economic input/output model.
- ***Real-time disaster data*** is then applied to the exposure to estimate economic impact, and the result is aggregated to a regional level.
- The GEDI score for the disaster is calculated by comparing the pre-event and post-event values for these regional aggregates.
- The system is currently being tested using hurricane event data as input. The plan is to expand this to flood events using products derived from the Model of Models process, with eventual dissemination of GEDI results through PDC.



GEDI	*Description*	*Restoration*
I	Slight	Rapid restoration on the order of a few hours to a few days expected
II	Moderate	Economic activities typically resume in less than a week
III	Major	Economic activities are likely to rebound on the order of weeks.
IV	Severe	Economic rebound expected after months of restoration.
V	Catastrophic	Major disruption in economic activity requires years of recovery.

GEDI – A modeling framework to produce an index that characterizes economic disruption, restoration, and possible impacts to critical infrastructure (CI). The figure above describes a workflow that combines CI / industrial exposure and real-time hazard data to produce a GEDI score.

For more information, contact Margaret Glasscoe (PI): Margaret.T.Glasscoe@nasa.gov. This work was funded by the NASA Applied Science Disasters Program. For more information on DisasterAWARE®, visit: https://www.pdc.org/disasteraware Please visit the GIFFT project website: https://gift.org