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Application of Earth observation data for improved environmental and disaster monitoring in Central America

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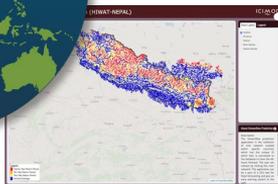
 FOCUS COUNTRIES

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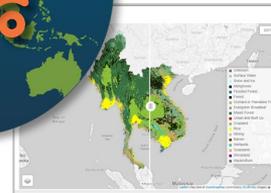
Scaling Streamflow Prediction From Nepal to the Globe



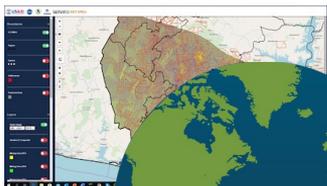
The Streamflow Prediction Tool supports official flood bulletins in Nepal, and has been adapted for other parts of the world through GEOGLOWS



Sharing Land Cover Mapping Methods from the Mekong to the Himalayas



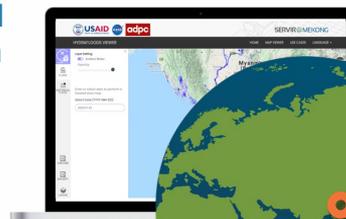
The Regional Land Cover Monitoring System (RLCMS) supports forest & agricultural mapping at the country-level while also scaling to entire regions



Teaming Up to Detect Cross-Atlantic Illegal Gold Mining from West Africa to Amazonia



Originally developed for Ghana's forest zones, a similar radar-based tracking system has been adapted for use in the Peruvian Amazon



Replicating Flood Maps Across Southeast Asia



HYDRAFloods has been replicated from Myanmar to Cambodia to prioritize food assistance in the face of floods via the World Food Programme (WFP)



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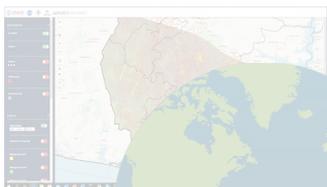
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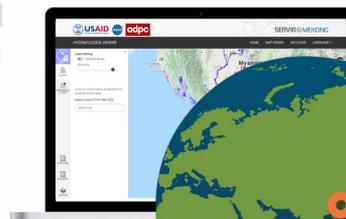
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Planning the SERVIR Hub in Central America



NASA / SICA joint statement (2019)

- Support Earth observation research and applications
- Priorities span Group on Earth Observations, Applied Sciences Program, Research & Analysis
- Explore concrete joint activities

SICA / World Bank agreement (2020)

- Provide additional support to the NASA-SICA joint statement

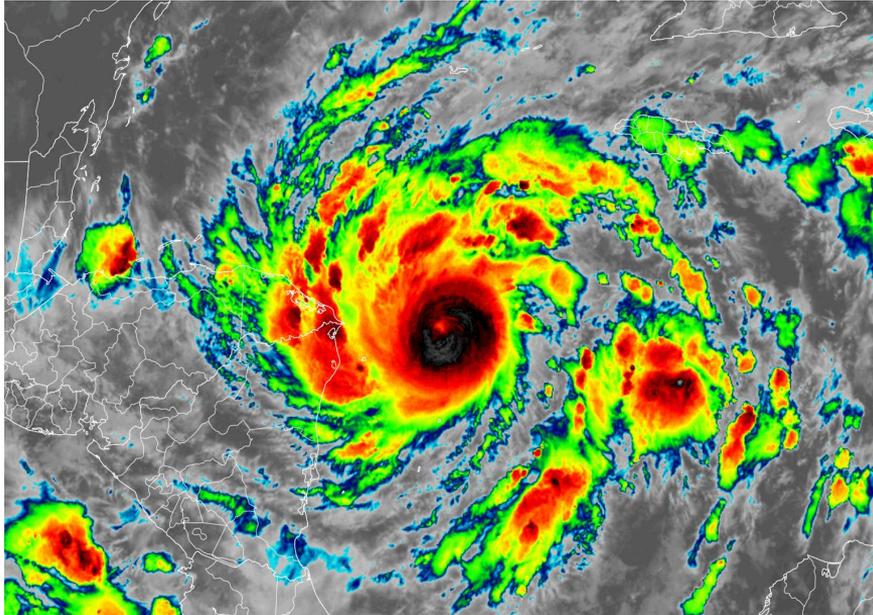
Action Towards a SERVIR Central America Hub (2021-2022)

- USAID-funded geospatial assessment
- NASA and USAID joint planning and co-design
- Supports Administration climate adaptation and resilience priorities for the region



NASA SICA joint statement | credit: [SICA](#)

Hurricanes Eta & Iota 2020 / Hurricane Julia 2022



Hurricane Eta about to make landfall | credit: [NOAA NESDIS](#)



Tropical Storm Julia from CEPREDENAC platform | credit: [CEPREDENAC](#)

CEPRENAC - Coordination Center for the Prevention of Disasters in Central America and the Dominican Republic

Provides and coordinates international cooperation and knowledge exchange, expertise, and scientific & technical advising on prevention, mitigation, response, and recovery from disasters.

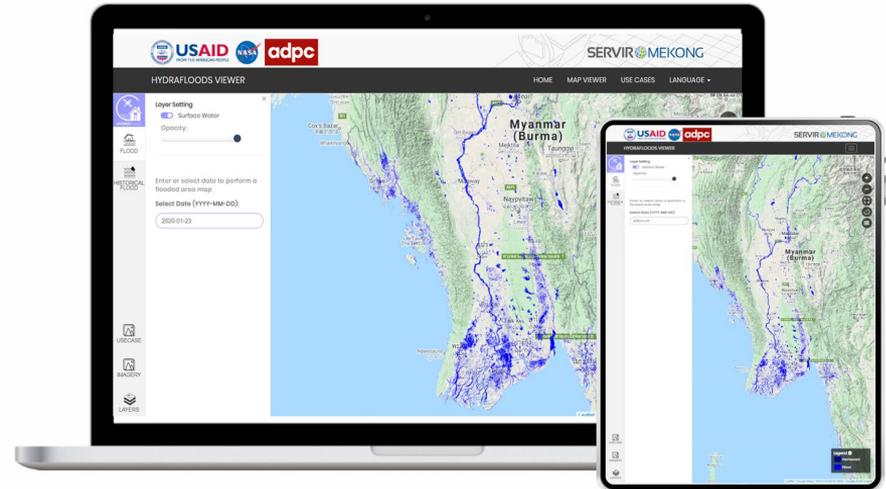
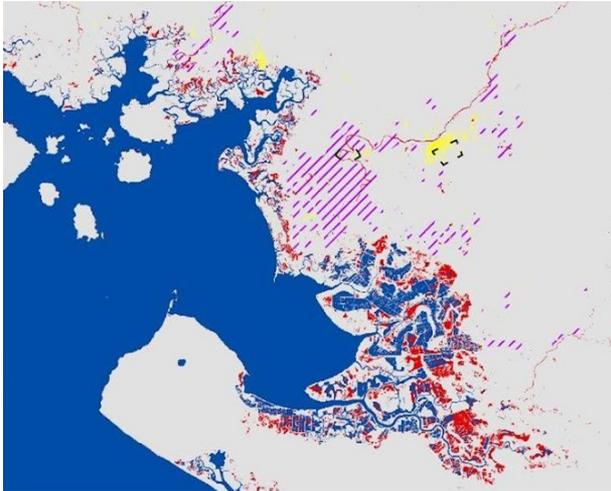
CRRH - Regional Water Resource Committee

Coordinates and facilitates projects relating to water resources issues, including institutional strengthening and transboundary resources management. Strengthens ties with global programs for meteorological surveillance, hydrological cycle, and climate change adaptation and mitigation.

Both operate through the **Central American Integration System (SICA)**

HYDrologic Remote sensing Analysis for Floods <https://servir-mekong.github.io/hydra-floods/>

- Open source - anyone can use/modify for free
- Documented to increase transparency
- Cloud-based - overcome big data challenges
- End-to-End processing - users have all the tools needed to create their own high quality surface water/flood maps



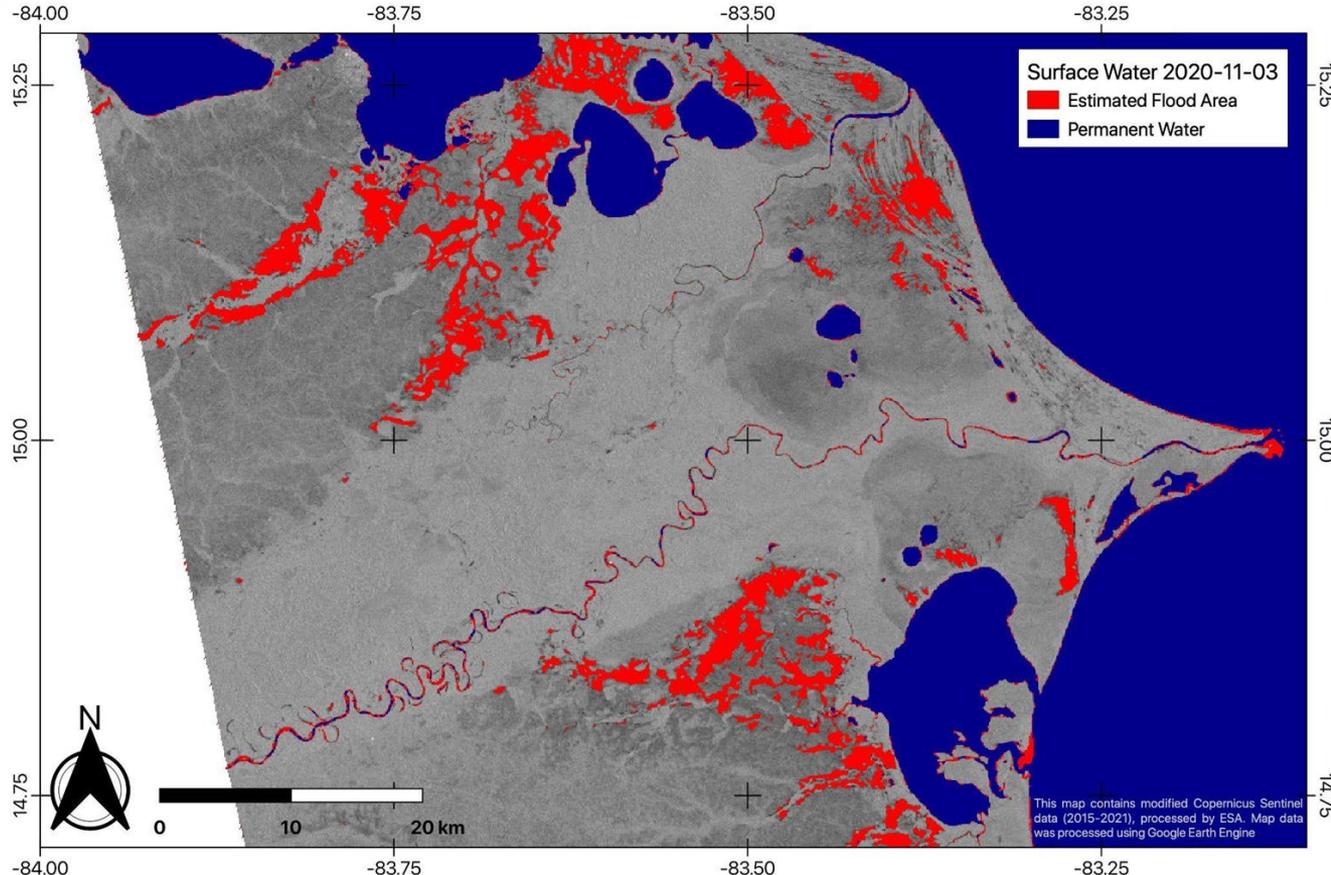
HYDRAFloods Flood mapping during Eta & Iota

- Automated SAR derived flood maps during events

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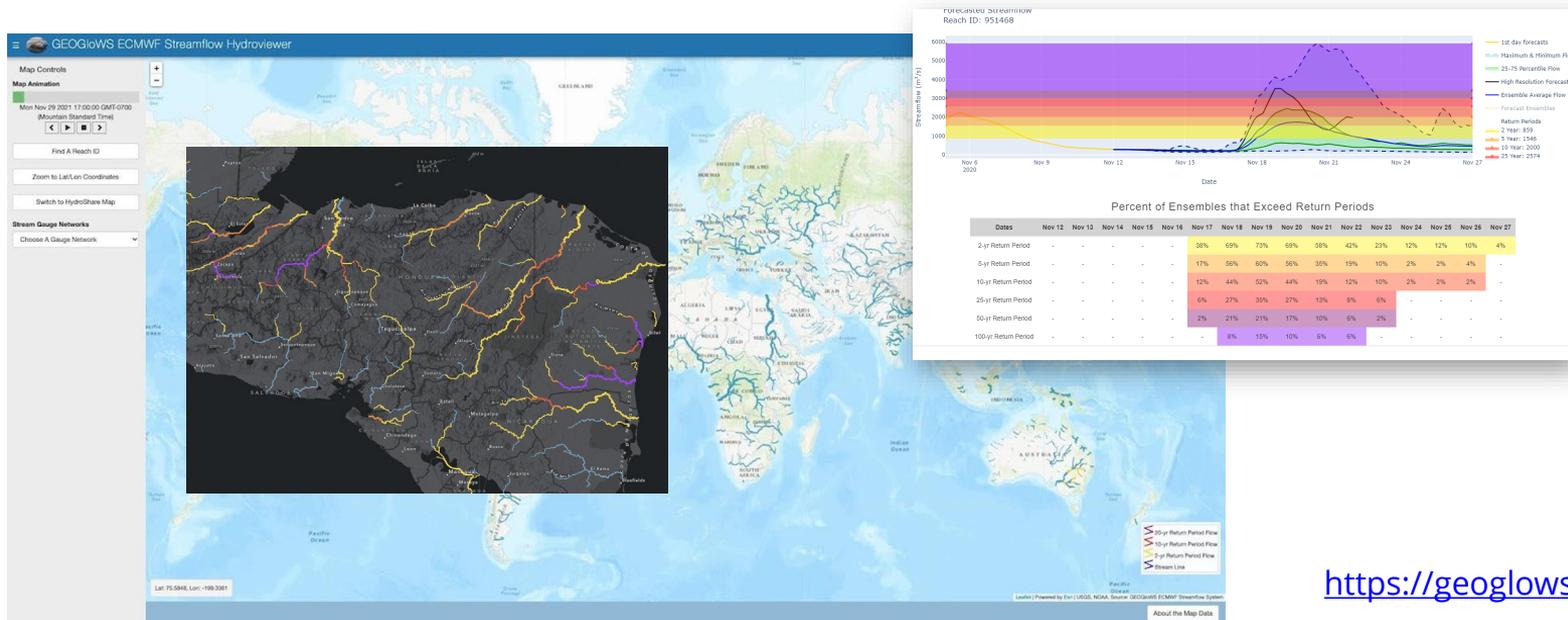
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- Operational global streamflow service
- Runoff predictions from the European Centre for Medium Range Weather Forecasts (ECMWF) routed through the Routing Application for Parallel Computation of Discharge (RAPID) model.



Central Hidroeléctrica Francisco Morazán - "El Cajón"

November 2020, Hurricanes Eta & Iota

With Eta's arrival, the water elevation increased, surpassing the 285 m maximum level of the reservoir.

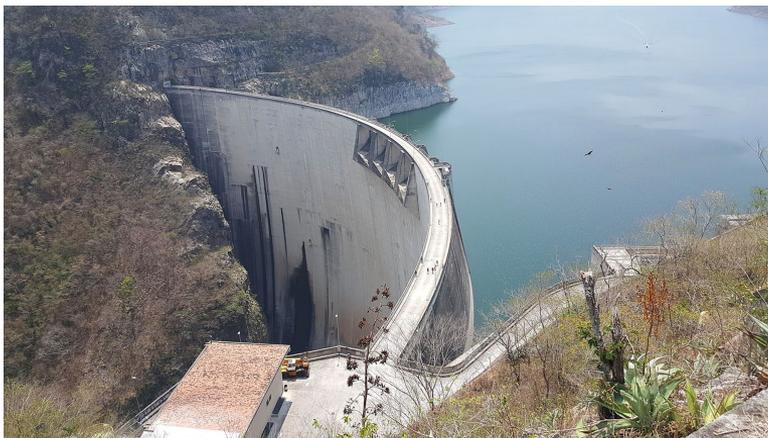
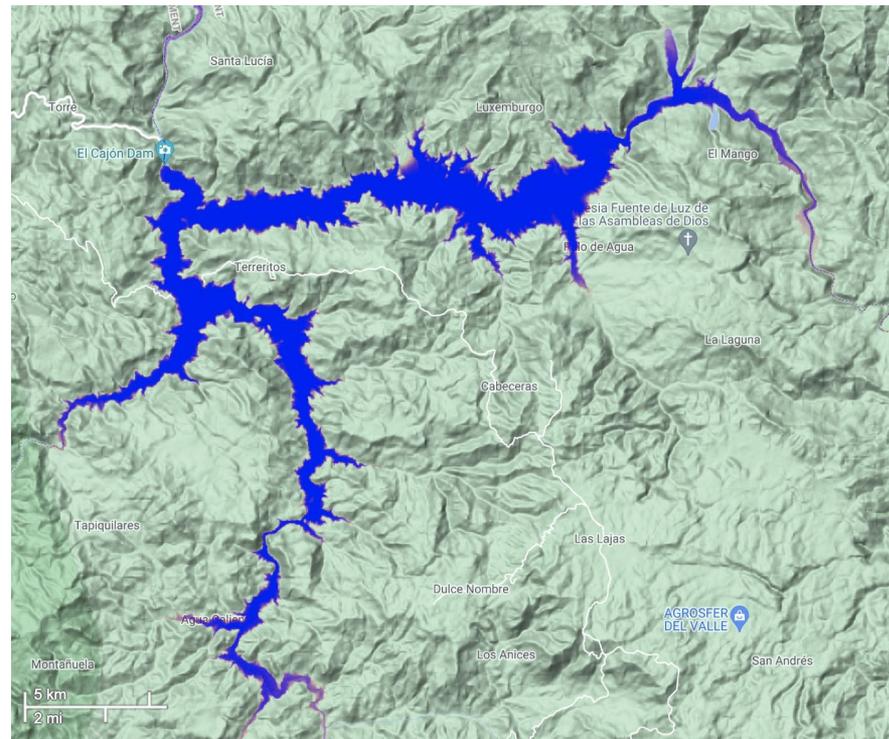


Image of El Cajón dam structure | Credit: [Wikimedia Commons](#)



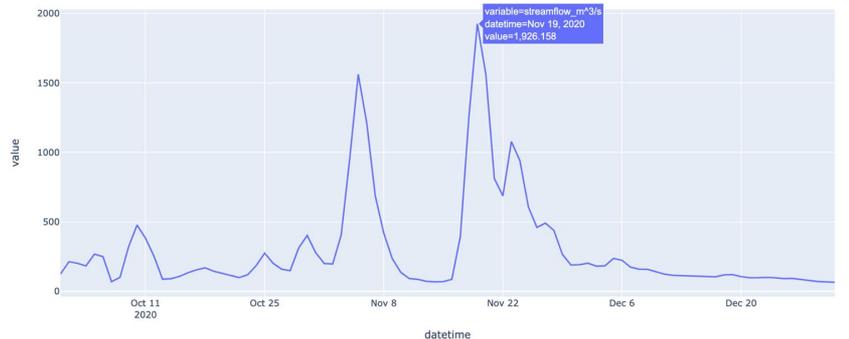
Map of reservoir extent created by El Cajón dam | Data Credit: [Google](#) / [EC JRC](#)

Informing Reservoir Operations

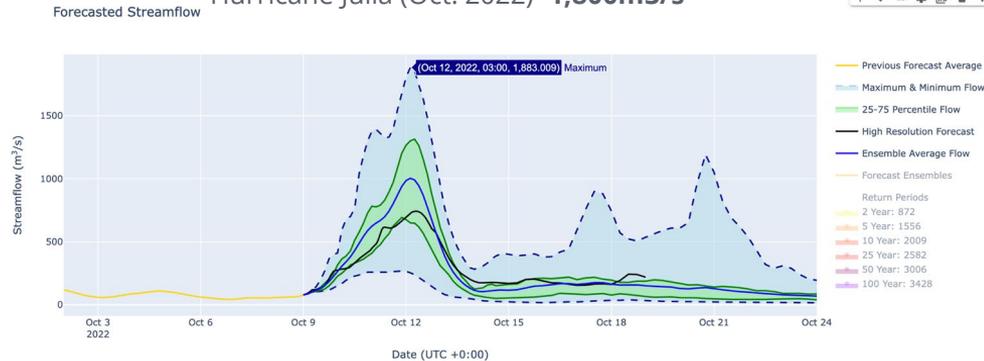
October 2022, Hurricane Julia

Analysis based on the GEOGloWS forecasts for Hurricane Julia indicated that the water levels of the El Cajon hydroelectric dam in Honduras could reach similar levels to those reached during Hurricane Iota, two years prior.

Maximum peak of the flow during Hurricanes Eta and Iota (Nov. 2020) **1,926 m³/s**



Maximum peak of the flow forecasted during the Hurricane Julia (Oct. 2022)~**1,800m³/s**



GEOGloWS Hydroviewer supports decision-making



Tropical Storm Julia from CEPREDENAC platform | credit: [CEPREDENAC](#)



Tropical Storm Julia from CEPREDENAC platform | credit: [CEPREDENAC](#)

“Use of the Hydroviewer supported the region’s hydrometeorological services, especially in watersheds without real-time monitoring and hydrological models, for decision-making for river early warning systems,” said **Berta Olmedo, CRRH’s Executive Secretary**. She also highlighted the need for more research to improve forecast results, including tapping the expertise of the region’s hydrologists.

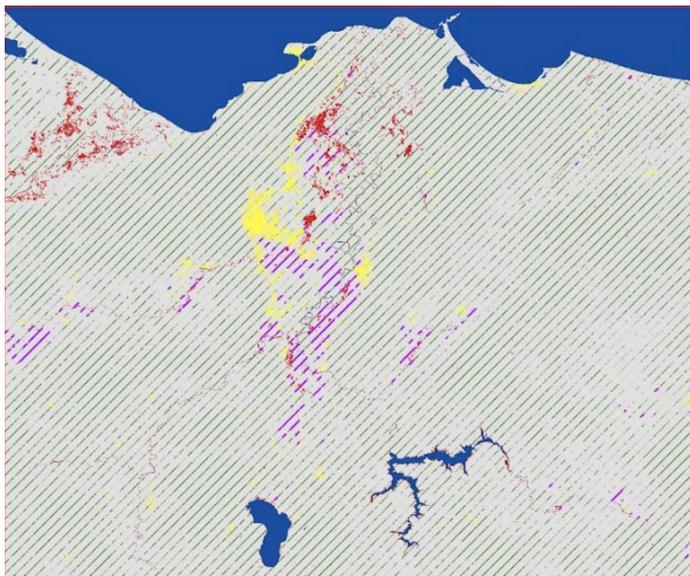
“The [El Cajon] dam situation was complex, and information was needed for quickly making decisions. Had the dam burst, literally hundreds of thousands of people would have been affected. The information provided by NASA, from GEOGloWS, from HYDRAFloods, and from the other systems was essential to the timely decision-making which likely saved lives,” said **Claudia Herrera, CEPREDENAC’s Executive Secretary**

<https://www.climatelinks.org/blog/connecting-space-village-reduce-flood-impacts>

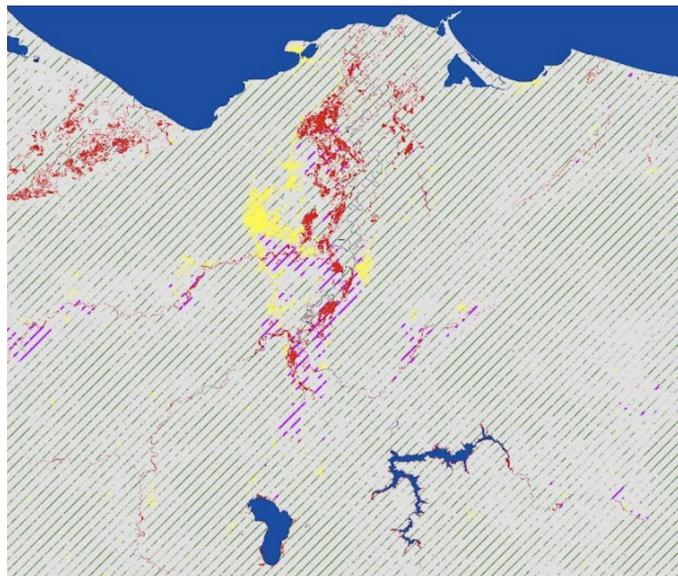
NASA DEVELOP project (Fall 2021)

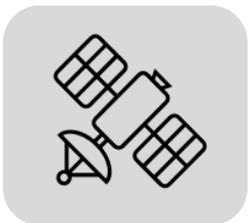
- Analyzed historical surface water extents in Central America using HYDRAFloods
- Case study analysis for Hurricanes Eta and Iota
- Developed a code tutorial for stakeholders to replicate

During Eta/Iota: Oct. 31 - Nov. 18, 2020



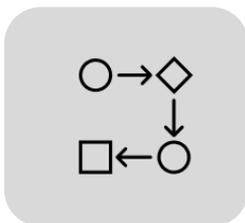
After Eta/Iota: Nov. 18 - Dec. 2, 2020





HYDRAFloods was replicated to Central America, with caveats:

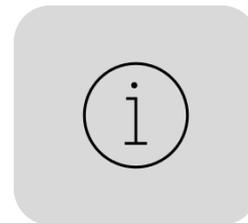
- High cloud cover brought on by Hurricanes Eta and Iota occluded optical data, leading to need to use SAR data
- Sentinel-1 SAR overpasses during Eta and Iota did not coincide with peak flooding (independent of HYDRAFloods) → affected estimates of affected areas



Interest by national and regional disaster management agencies in integrating HYDRAFloods into their workflows.



Focus in Central America was largely on evaluating agricultural impacts of flooding.

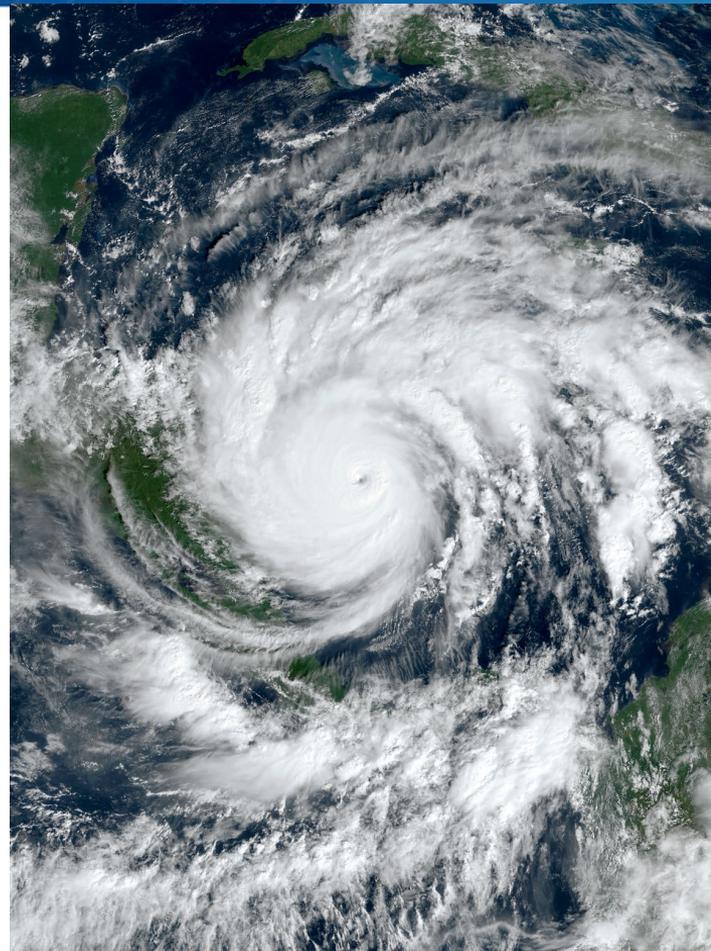


GEOGloWS streamflow forecasts provided reliable information and supported avoiding severe socio-economic losses and damages in the Sula Valley, Honduras.

Continued engagement with stakeholders

(e.g., CEPREDENAC, CRRH, SICA General Secretariat) to better prepare for future hurricanes

- Adjustment of outputs (bias correction)
- Understand specific actions and decisions in flood risk reduction to production and flows of information
- Build capacity and enable stakeholders to take action during events



Thank you for your attention!

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