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# Lessons learned from replicating services for flood prediction and monitoring in Asia to the assessment of hurricane impacts in Central America

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# The SERVIR Network



USAID Washington  
NASA Headquarters

Science Coordination Office  
NASA / MSFC

SERVIR Amazonia  
CIAT

SERVIR West Africa  
CILSS / AGRHYMET

SERVIR Eastern &  
Southern Africa  
RCMRD

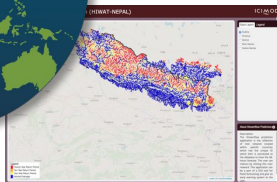
SERVIR Himalaya  
ICIMOD

SERVIR Mekong  
ADPC

 FOCUS COUNTRIES  ADDITIONAL REACH



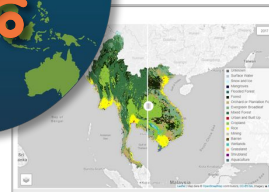
## Scaling Streamflow Prediction From Nepal to the Globe



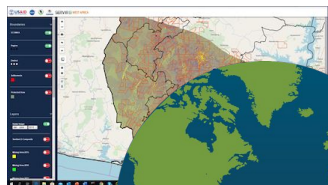
The Streamflow Prediction Tool supports official flood bulletins in Nepal, and has been adapted for other parts of the world through GEOGLOWS



## Sharing Land Cover Mapping Methods from the Mekong to the Himalayas



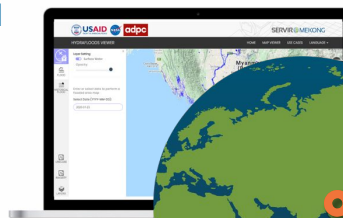
The Regional Land Cover Monitoring System (RLCMS) supports forest & agricultural mapping at the country-level while also scaling to entire regions



## 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

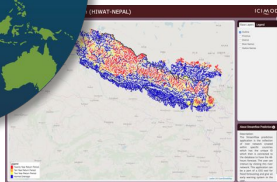


HYDRAFloods has been replicated from Myanmar to Cambodia to prioritize food assistance in the face of floods via the World Food Programme (WFP)

# SERVIR's Global Network Enables Scaling, Sharing & Replicating



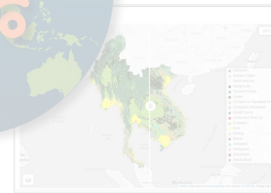
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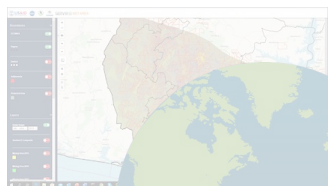
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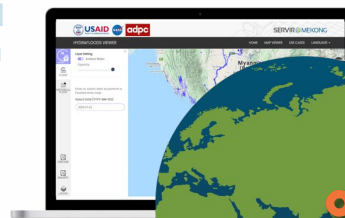
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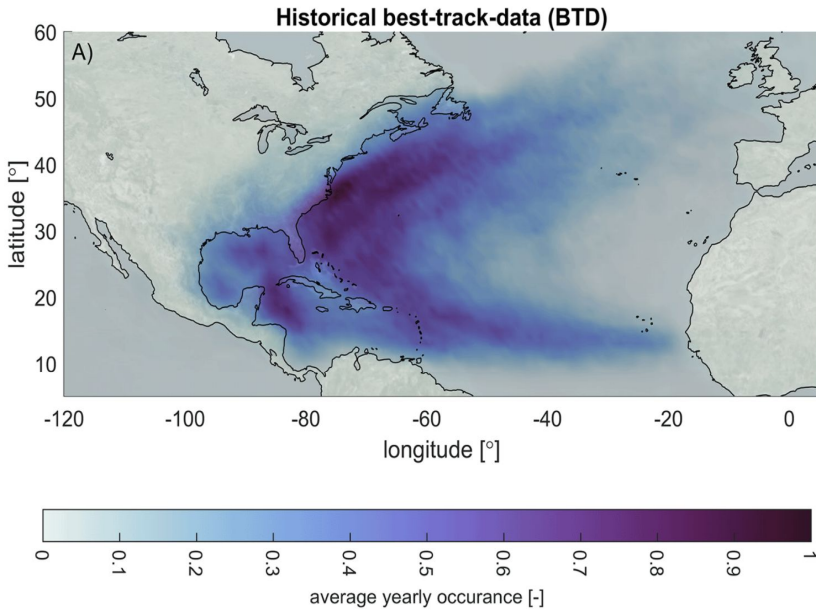
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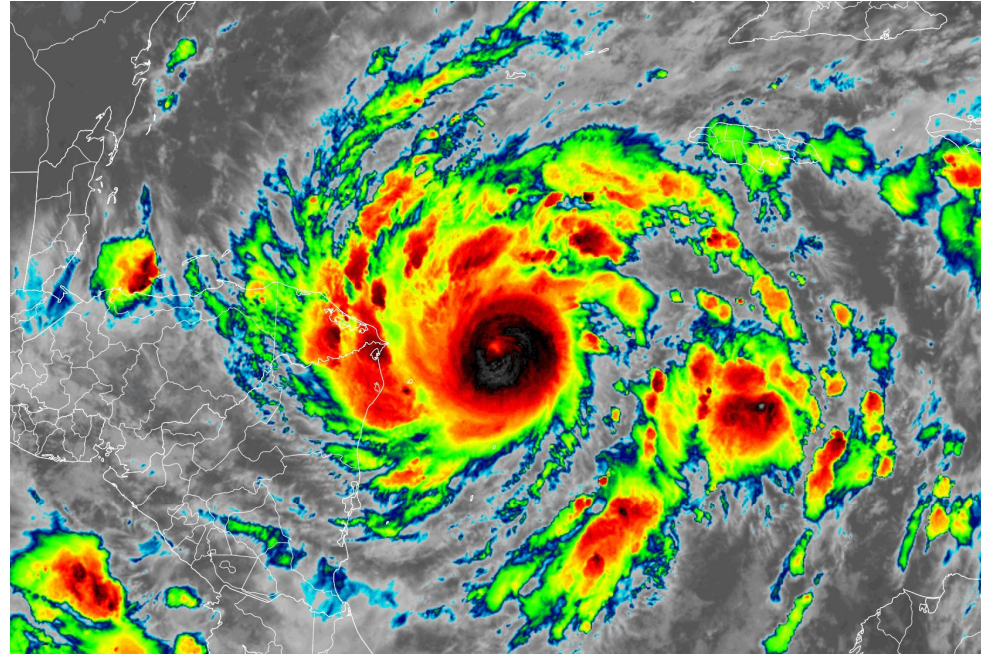
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# Hurricanes Eta & Iota



Average yearly occurrence of hurricane track based on International Best Track Archive for Climate Stewardship| Credit:Figure modified from [Nederhoff et al., 2021](#)



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

## **CEPREDENAC - 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**

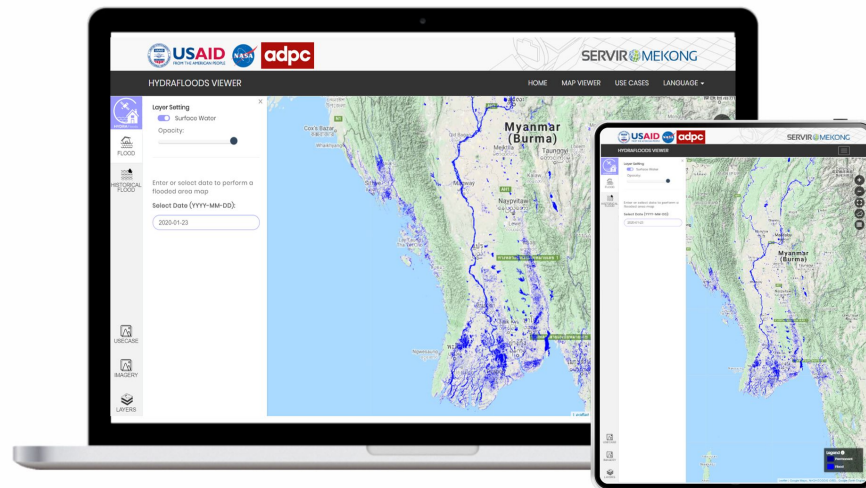
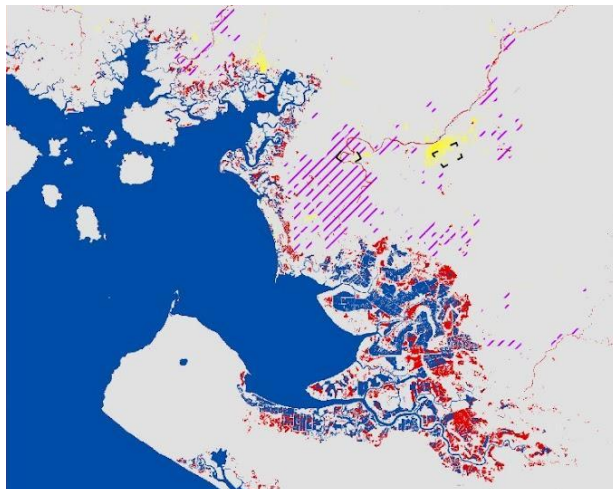
Coordinates and facilitates projects relating to water resources issues, including institutional strengthening and transboundary resources management. Strengthens ties with global programs for meteorological surveillance, hydrological cycle, and climate change adaptation and mitigation.

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



## HYDrologic Remote sensing Analysis for 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





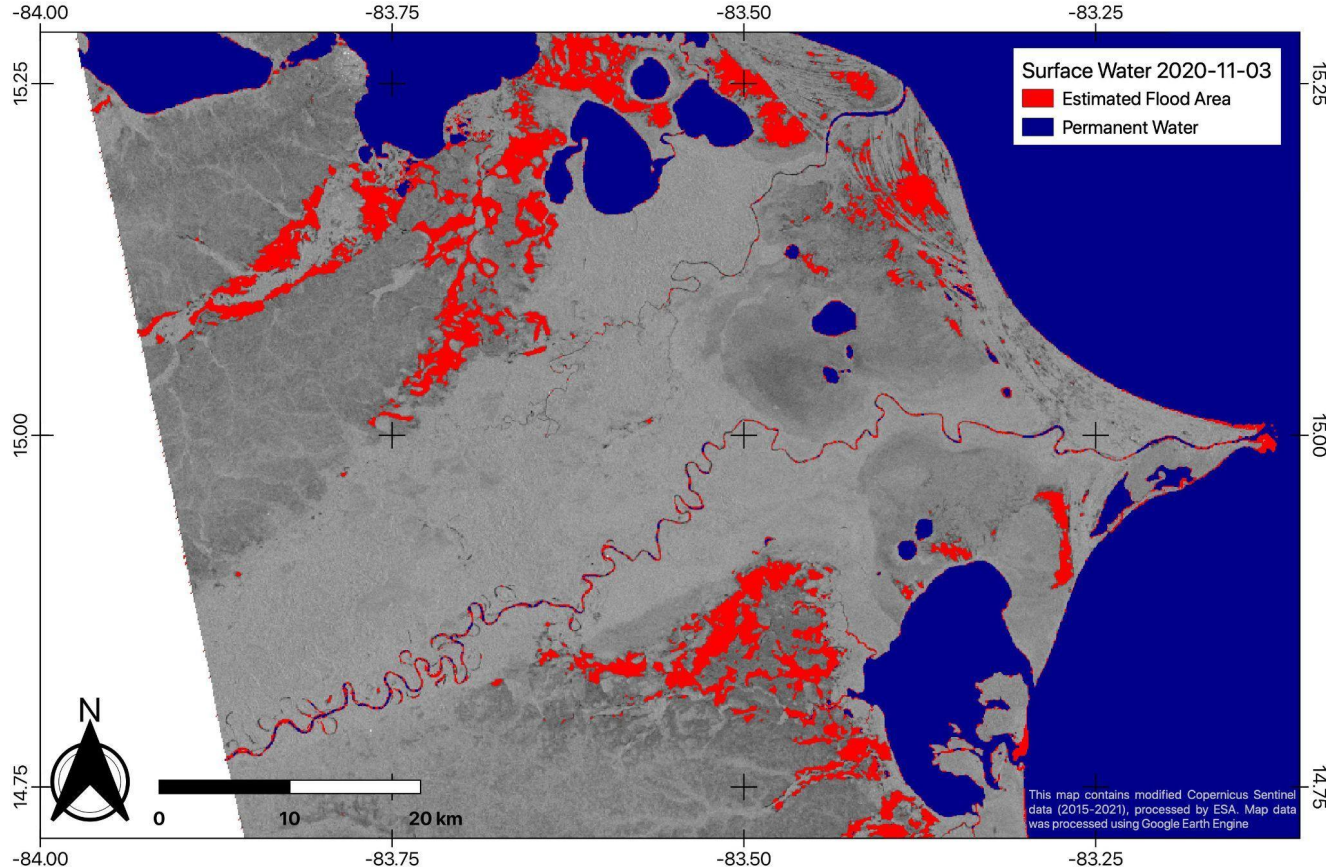
# Flood mapping

- Automated SAR derived flood maps during events

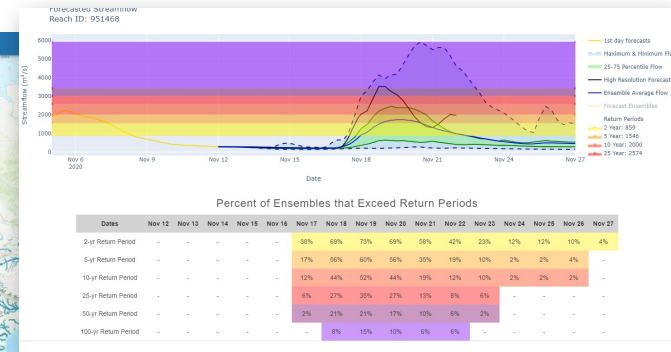
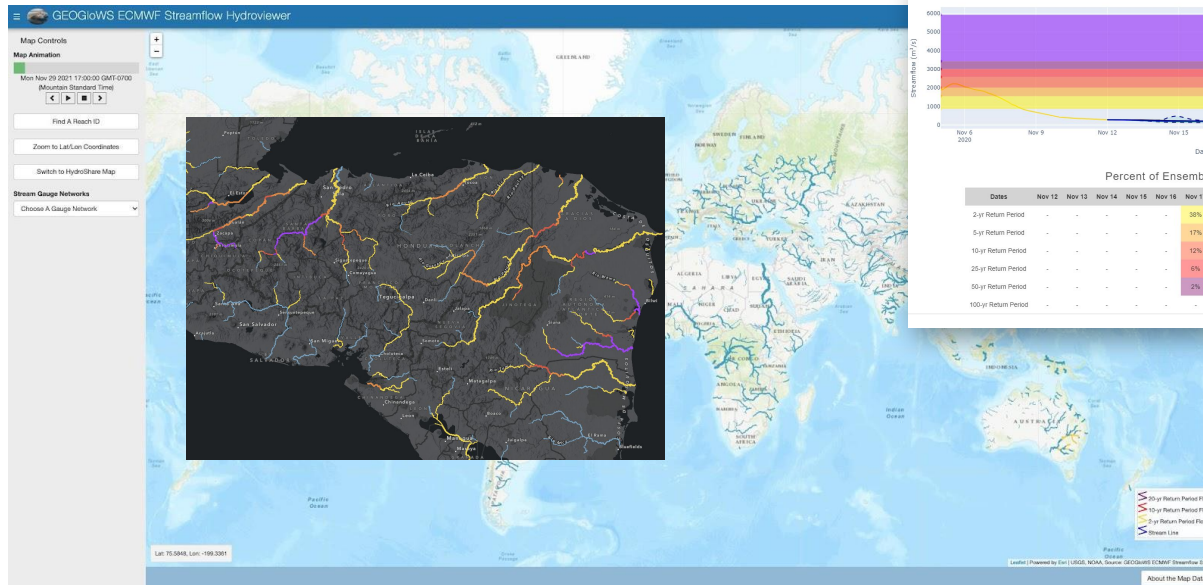
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- Operational global streamflow service
- Runoff predictions from the European Centre for Medium Range Weather Forecasts (ECMWF) routed through the Routing Application for Parallel Computation of Discharge (RAPID) model.



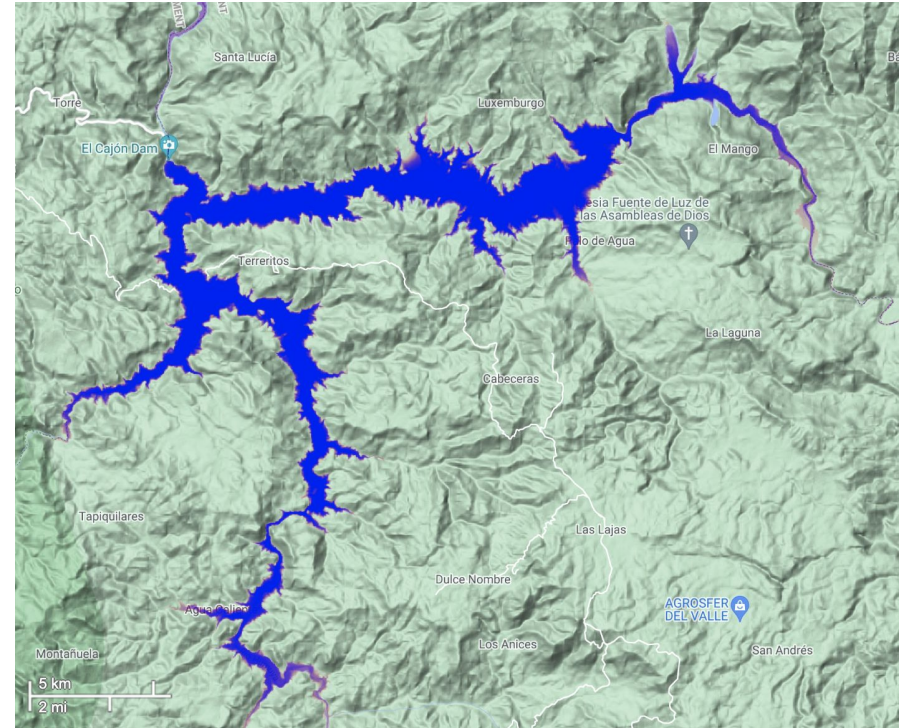


## Central Hidroeléctrica Francisco Morazán - “El Cajón”

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



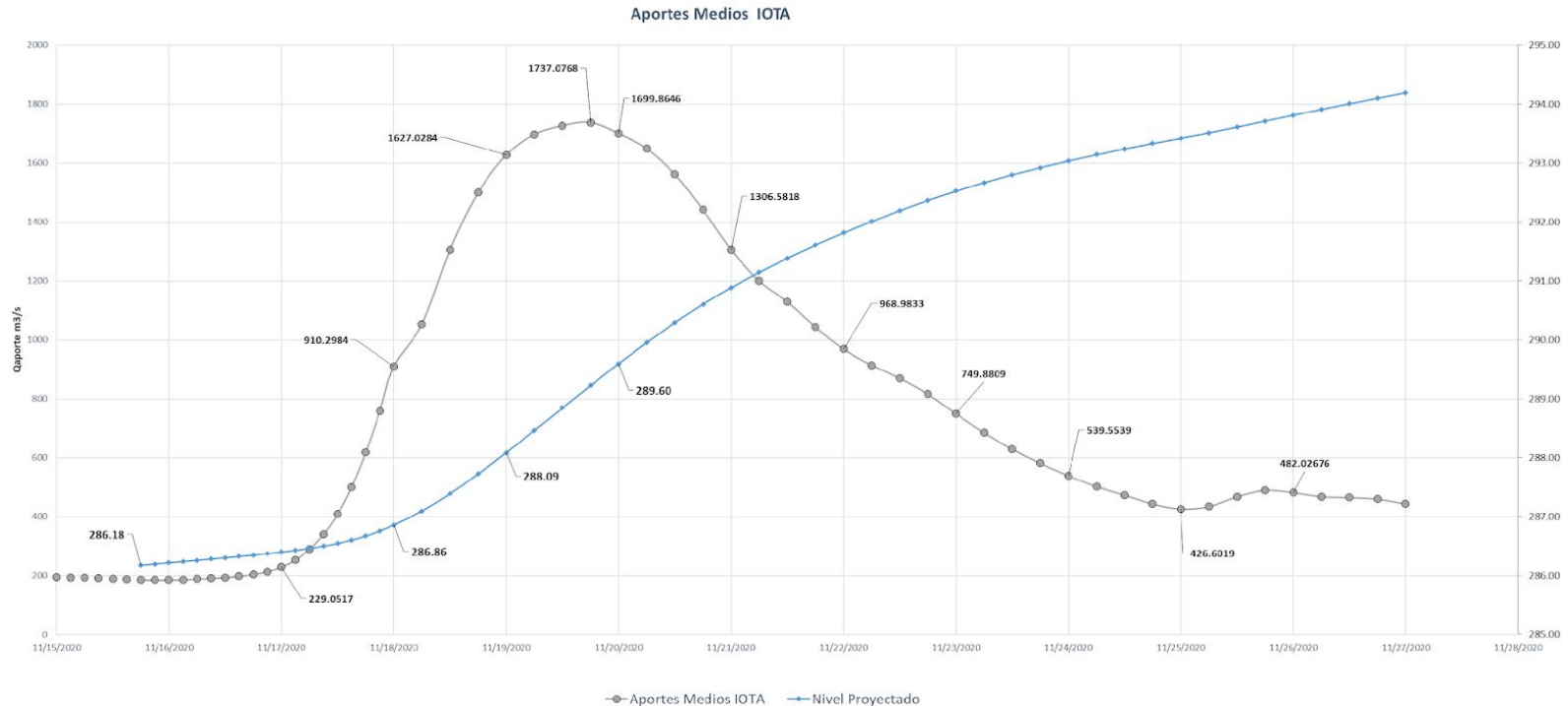
Image of El Cajón dam structure | Credit: [Wikimedia Commons](#)



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

# Informing Reservoir Operations

- November 12 – Analysis and Projections based on GEOGloWS forecast for IOTA indicate that reservoir capacity is not enough.





*"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.

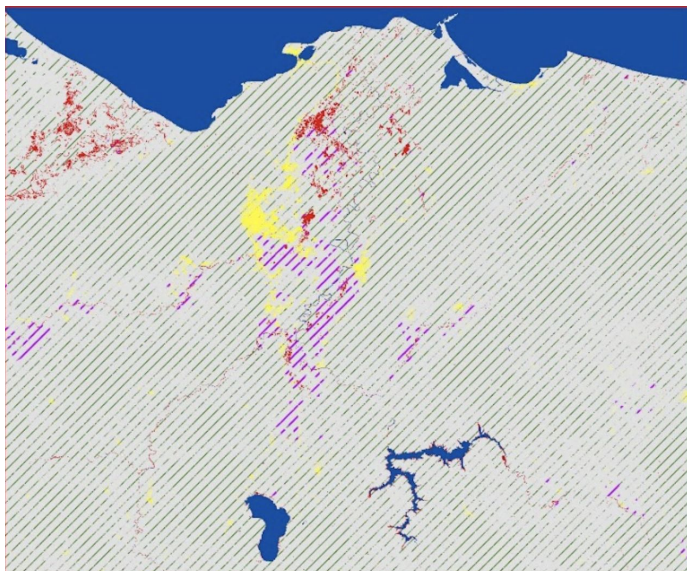
*"The [El Cajon] dam situation was complex, and information was needed for quickly making decisions. Had the dam burst, literally hundreds of thousands of people would have been affected. The information provided by NASA, from GEOGloWS, from HYDRAFloods, and from the other systems was essential to the 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>

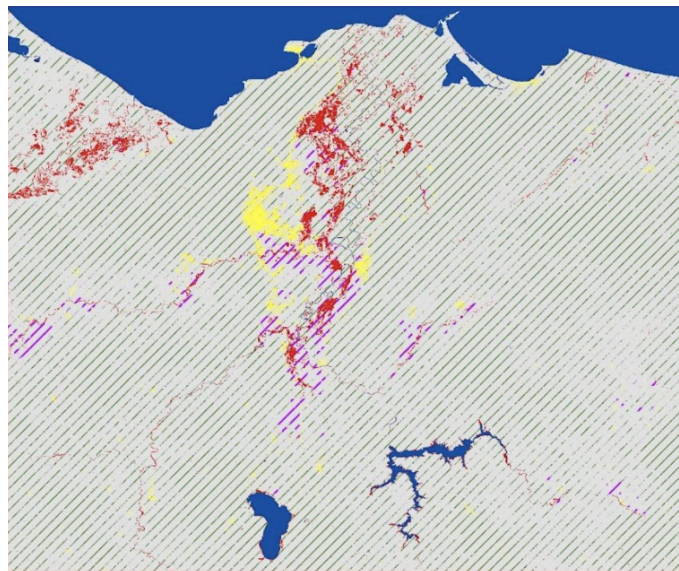
## NASA DEVELOP Project

- Analyzed historical surface water extents in Central America
- 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

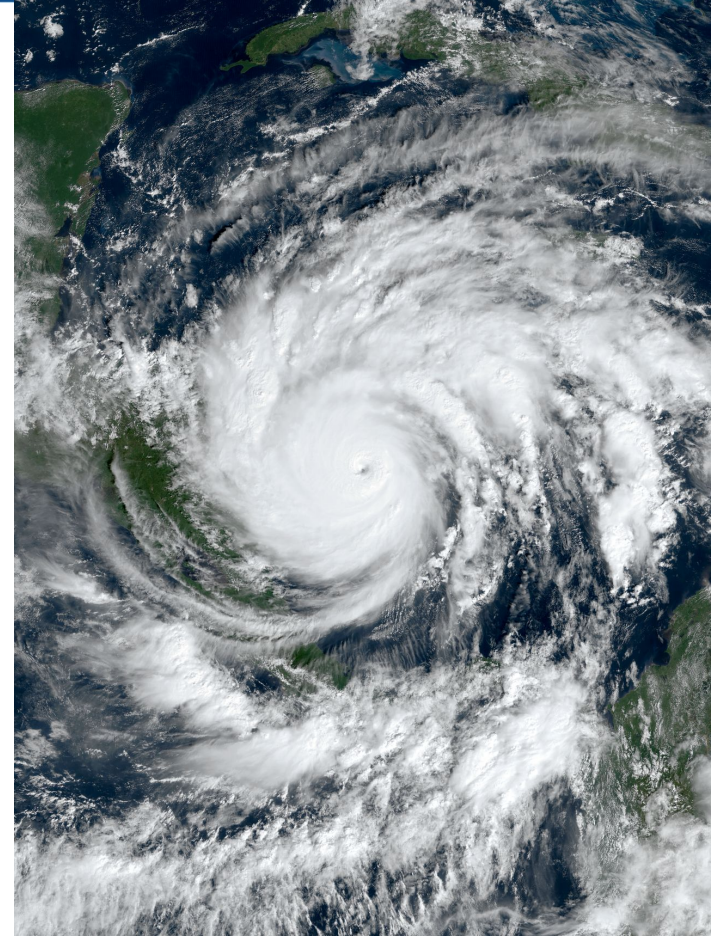


- HYDRAFloods replicated to Central America, with caveats:
  - High cloud cover brought on by Hurricanes Eta and Iota occluded optical data, leading to need to use SAR data
  - Sentinel-1 SAR overpasses during Eta and Iota did not coincide with peak flooding (independent of HYDRAFloods) → affected estimates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

- 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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