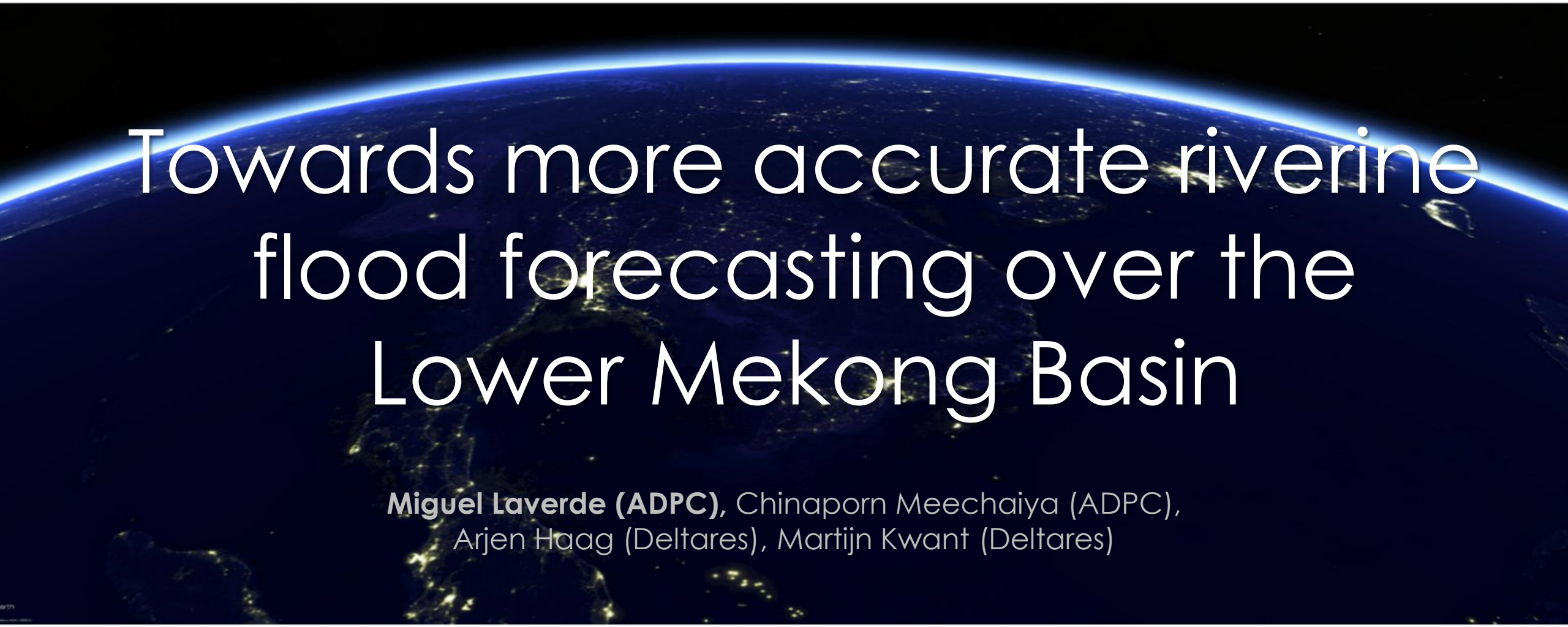
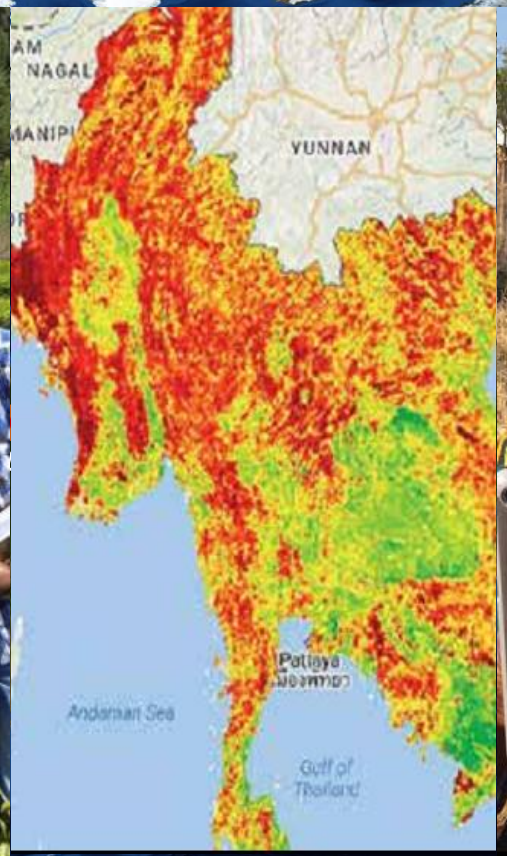


Towards more accurate riverine flood forecasting over the Lower Mekong Basin

Miguel Laverde (ADPC), Chinaporn Meechaiya (ADPC), Arjen Haag (Deltares), Martijn Kwant (Deltares)

CONNECTING SPACE TO VILLAGE

SERVIR Hub Network



CIAT CILSS RCMRD ICIMOD adpc

adpc

Intergovernmental organization

Building Capacity for Resilience

Consortium:

Spatial Informatics Group

Bangkok, Thailand

SEI Stockholm Environment Institute

Deltares

Enabling Delta Life

Thematic areas

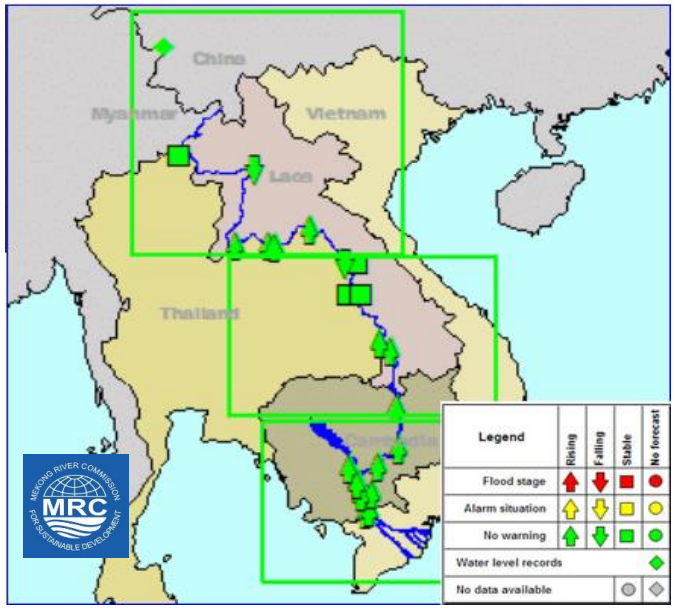
WEATHER AND CLIMATE

WATER RESOURCES AND DISASTERS

LAND COVER / LAND USE AND ECOSYSTEMS

AGRICULTURE AND FOOD SECURITY

Supporting a better riverine and flash flood forecasting for Lower Mekong Region



- The **MRC Flood Early Warning System (MRC-FEWS)** is a modular hydrological- hydraulic model created to provide short and medium-term early warnings flood updates for each member countries.
  - Dry season: weekly forecast
  - Flood season: Daily forecast

Objectives:

- Improve the accuracy of the NRT satellite-based rainfall product for **Short-term** flood riverine forecast.
- Incorporate the state of the art bias corrected CHIRPS-GEFS for **Medium-term** flood riverine forecast.

Short-term riverine forecast:

Operational bias correction tool for the MRC FEWS system

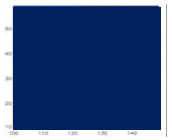
Characteristics:

- Python based tool (Open access)
- Working with multiple bias correction methods
- Adjusted to work with MRC daily information
- Working operationally or date range based
- Evaluate the performance based on R, RMSE and BIAS

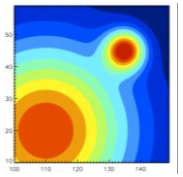
Available

https://github.com/Servir-Mekong/GPM-BICO

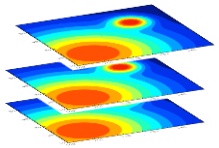
Bias correction schemes:



1. **Uniform Distribution Transformation (DT) (**Bower, 2004**)**

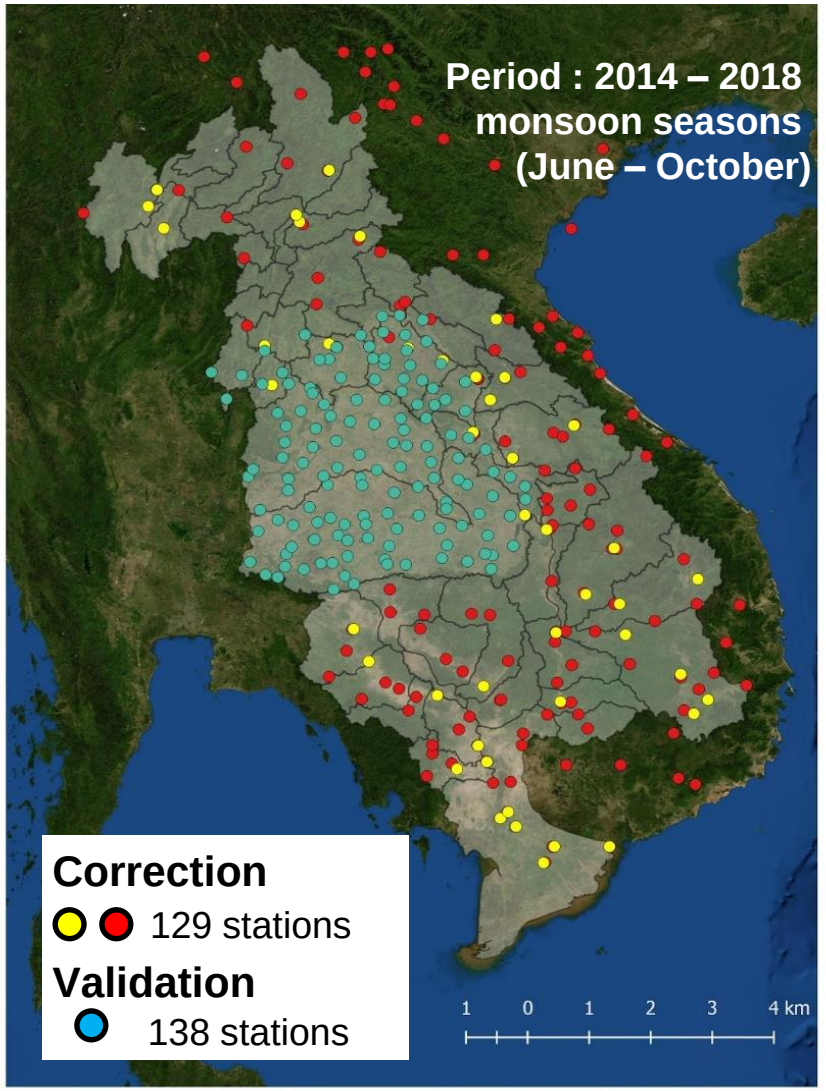


2. **Spatial Bias corrector (SB):** (Immerzeel (2010)



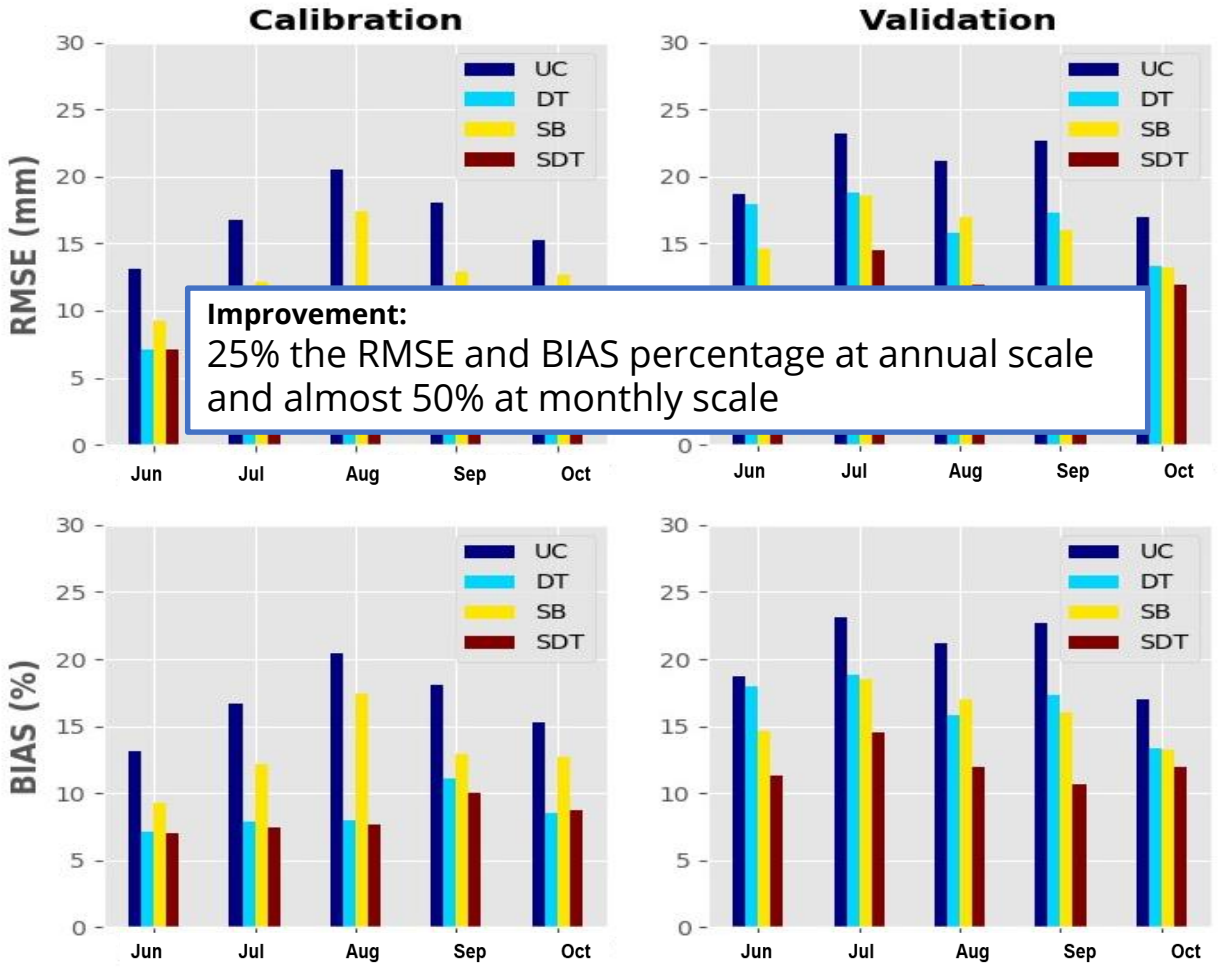
3. **Spatiotemporal Distribution Transformation**
4. **Gamma Quantile Mapping (V 1.3)**

Performance of GPM-BICO

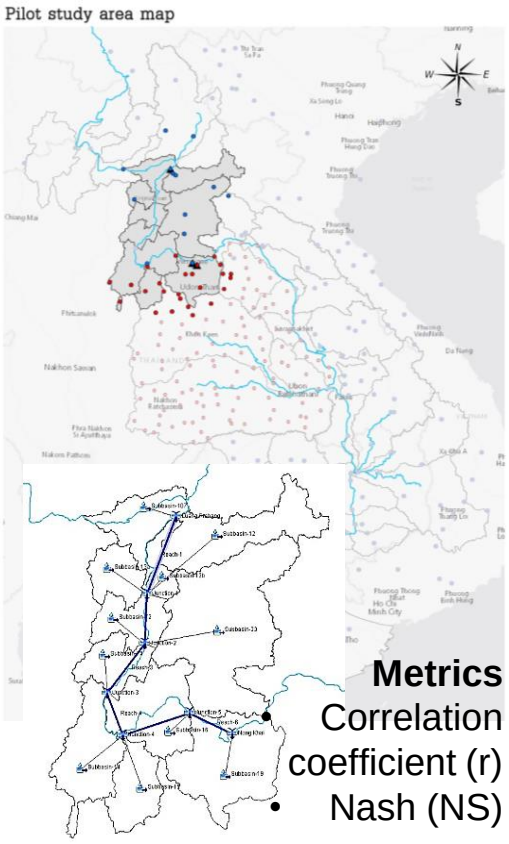


Results:

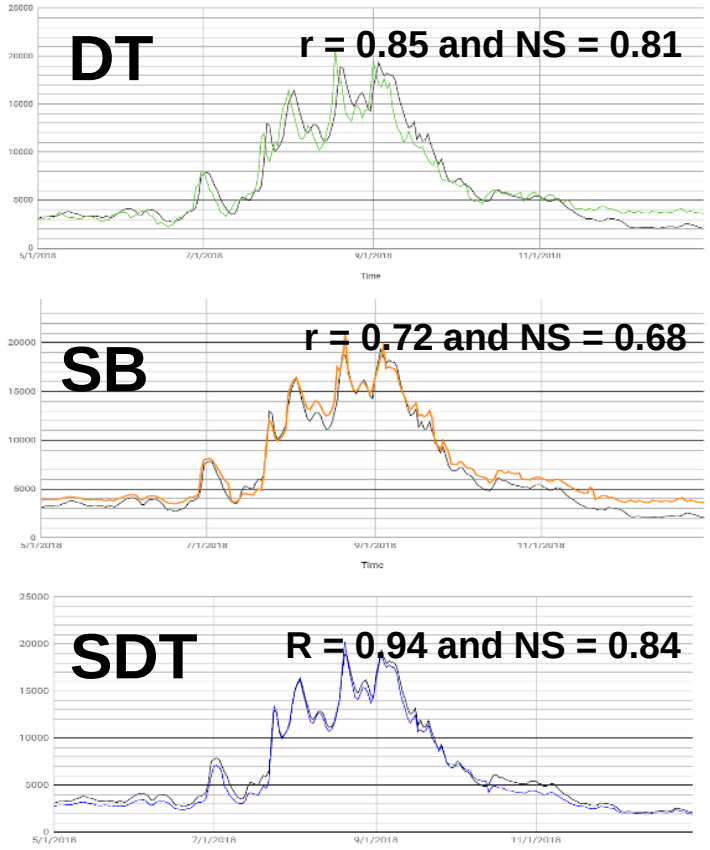
Hydrological impact



Improvement:
25% the RMSE and BIAS percentage at annual scale and almost 50% at monthly scale



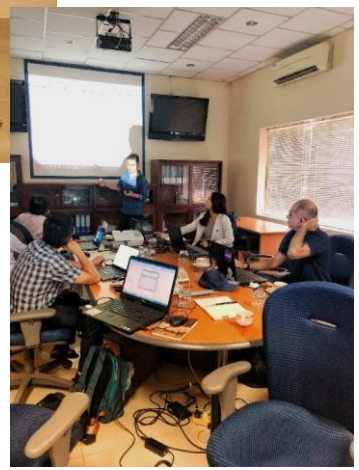
Metrics
- Correlation coefficient (r)
- Nash (NS)



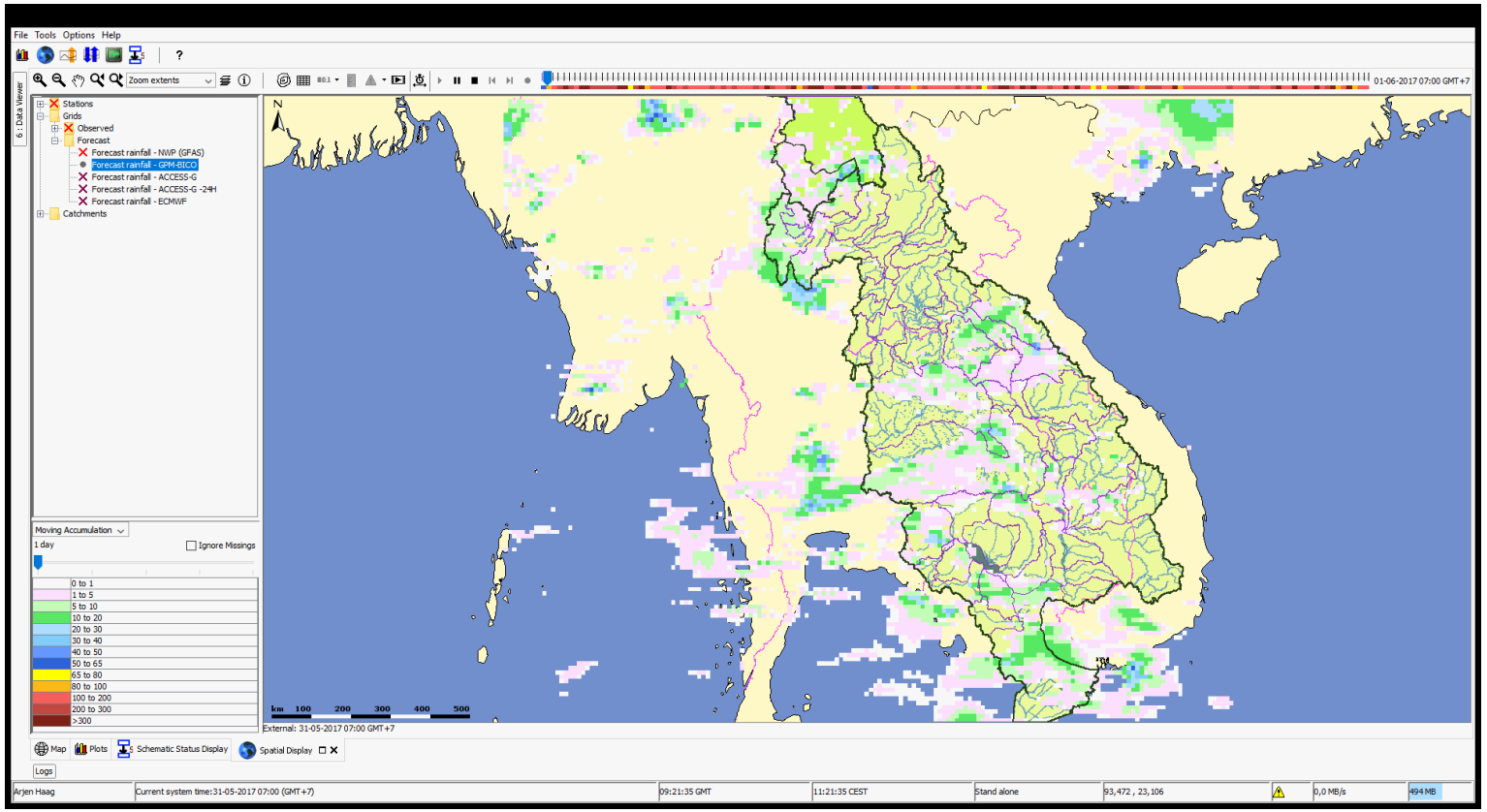
GPM-BICO into FEWS:

Technical training GPM-BICO

The Regional Flood Management and Mitigation Centre (RFMMC)



27 May 2019,
Phnom Penh,
Cambodia

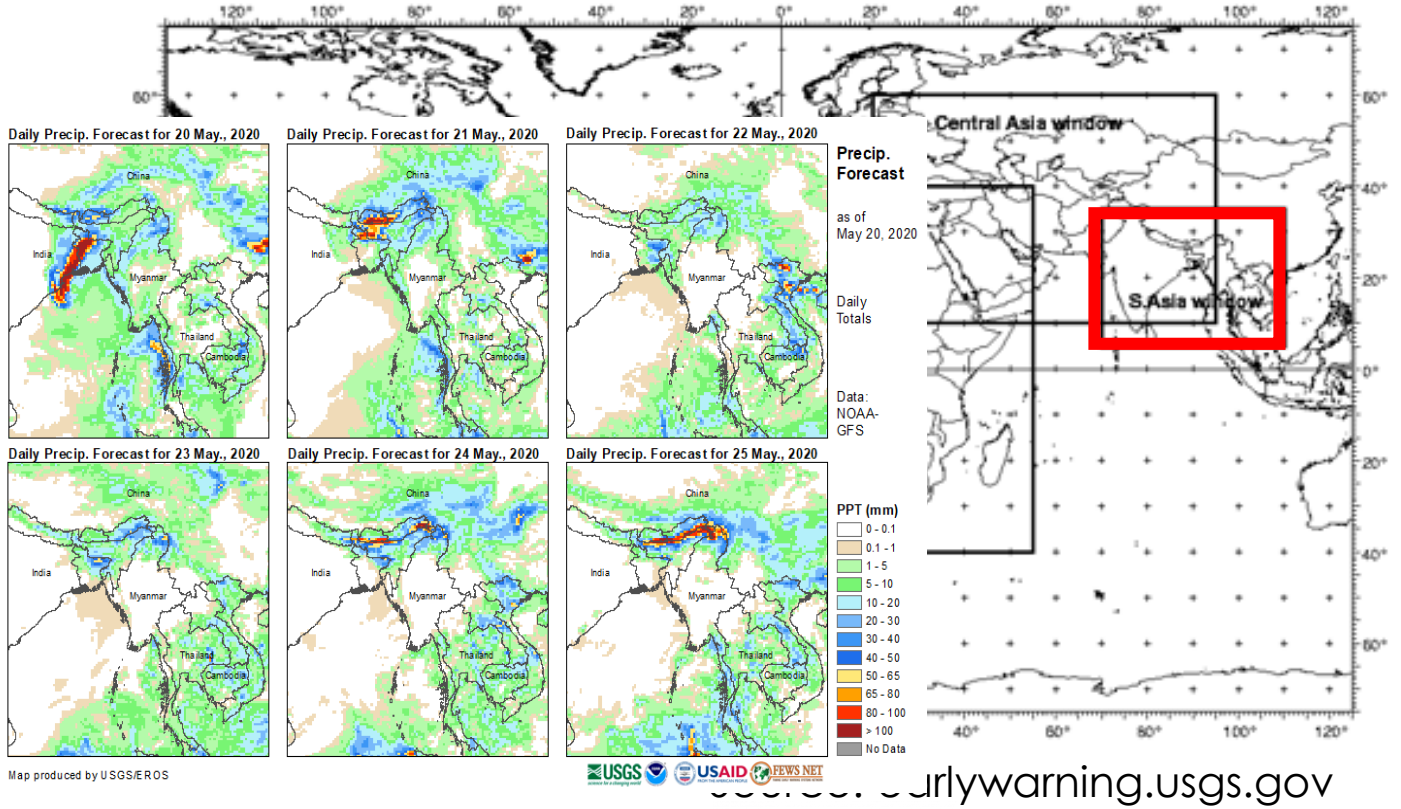


Medium-term riverine forecast:

NOAA Daily GFS Forecast Data

The Global Forecast System (GFS) precipitation data are provided on a daily basis by the NOAA Climate Prediction Center.

- 7 day forecasts of precipitation
- 0.25 degree resolution



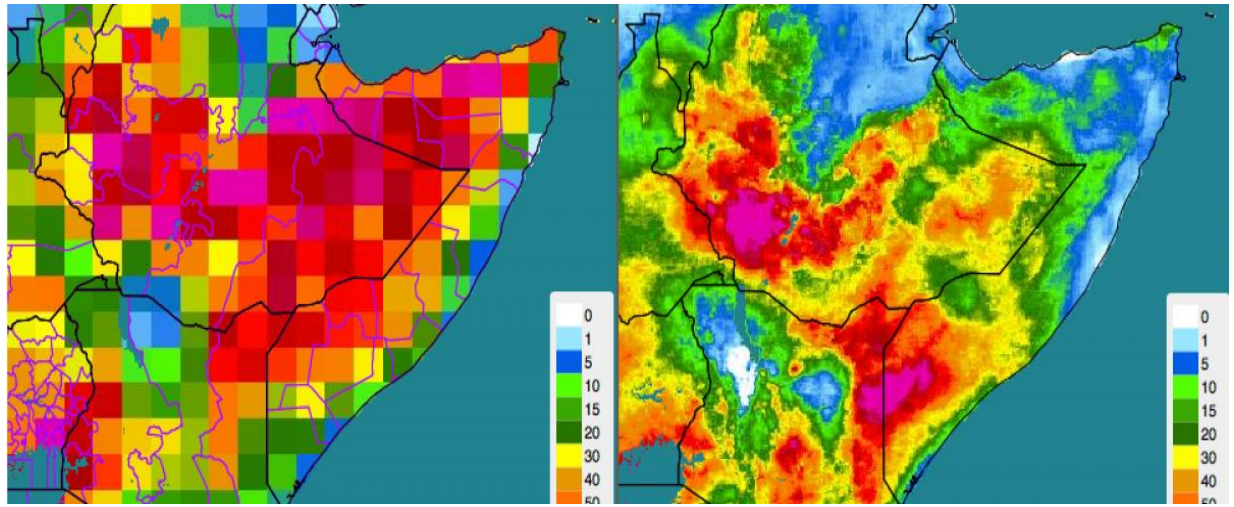
earlywarning.usgs.gov

State of the art bias corrected rainfall forecast product: CHIRPS-GEFS

Bias-corrected and downscaled version of NCEP Global Ensemble Forecast System precipitation forecasts.

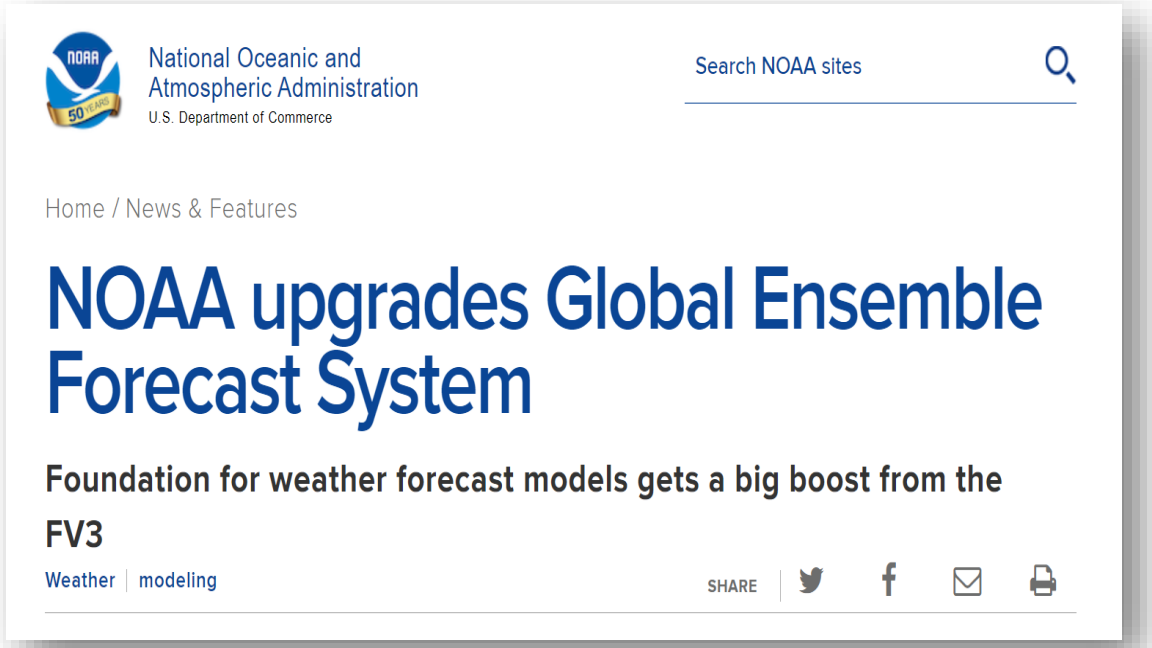
- **Daily 5-day, 10-day, 15-day Forecasts**
- **5 km resolution**

GEFS **CHIRPS-GEFS**



Source
https://nasaharvest.org

CHIRPS-GEFS version 2.0



National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Search NOAA sites

Home / News & Features

NOAA upgrades Global Ensemble Forecast System

Foundation for weather forecast models gets a big boost from the FV3

Weather | modeling

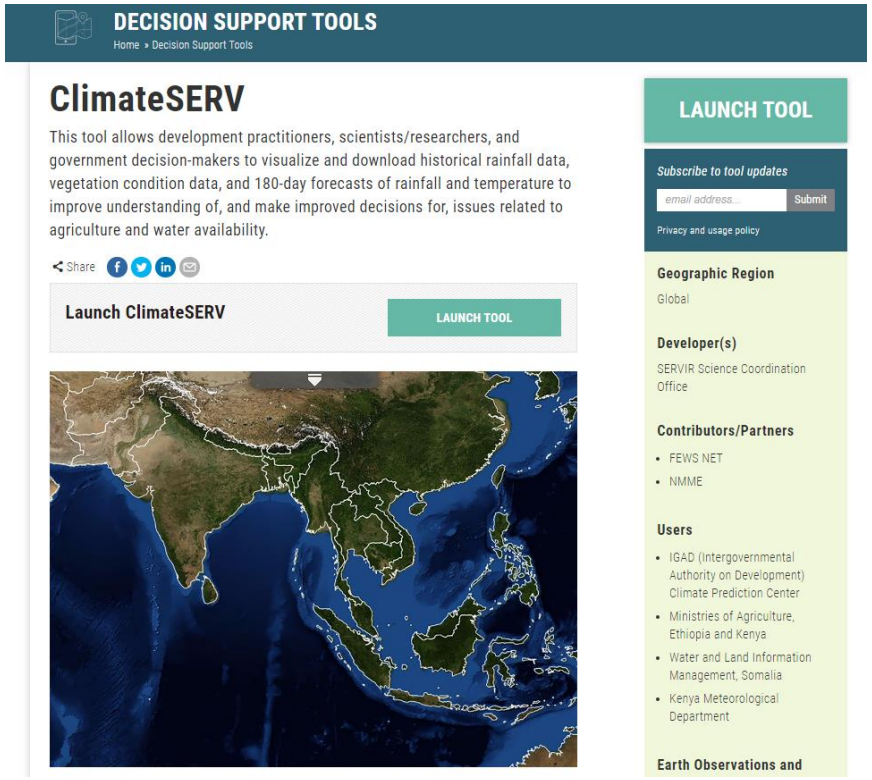
SHARE

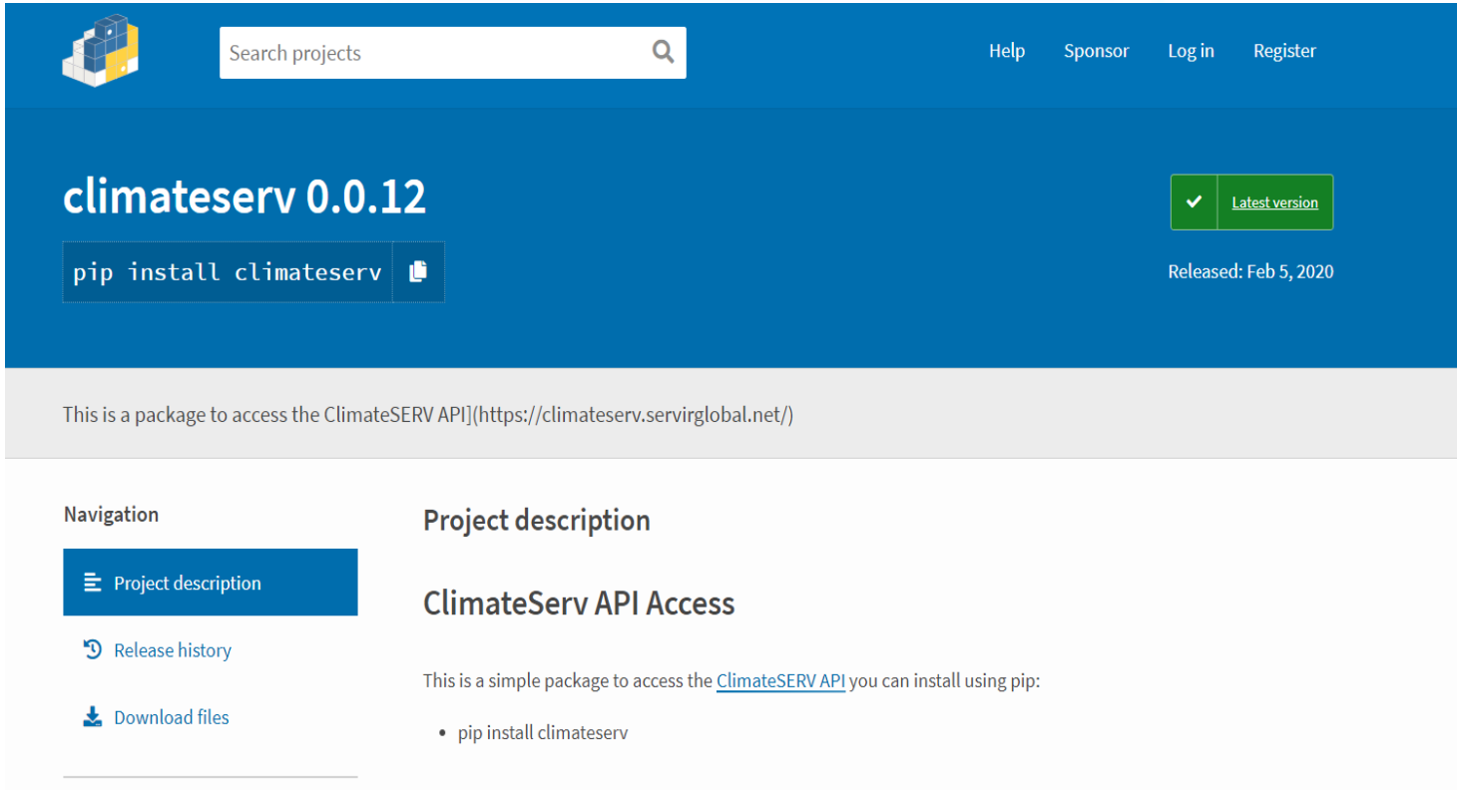
https://www.chc.ucsb.edu/data/chirps-gefs

Daily simulations 15 days rainfall forecast
(Before 5 days latency)

October 1st, 2020 to present are currently available

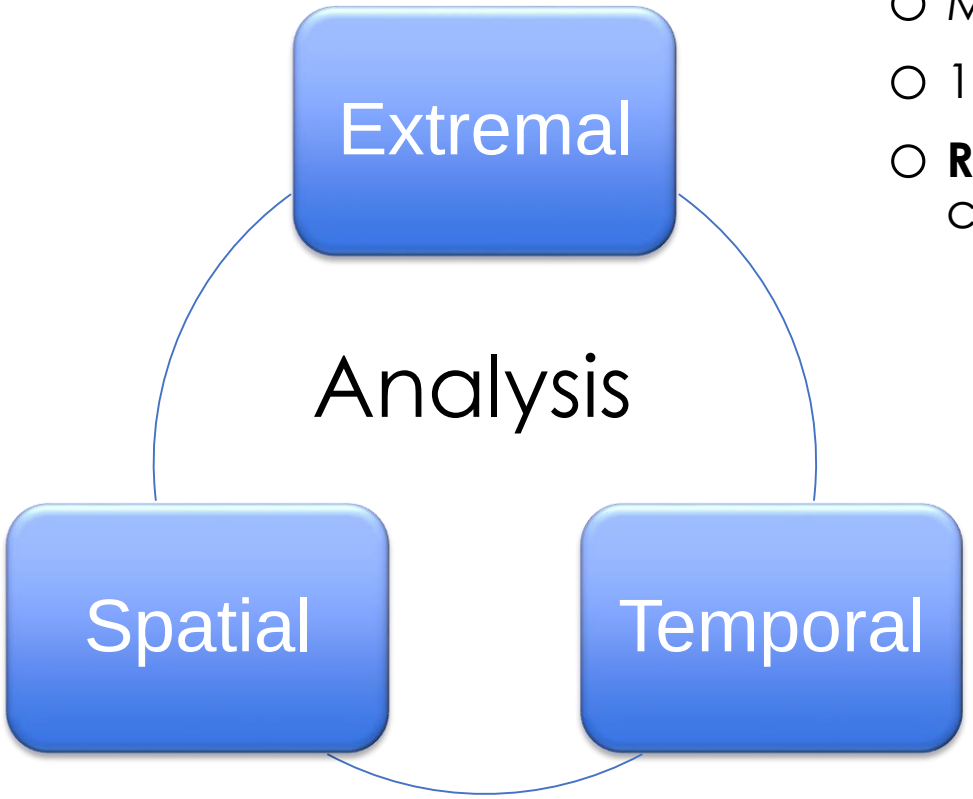
CHIRPS-GEFS in SERVIR-MEKONG





Available in:
https://climateserv.servirglobal.net/

Performance of CHIRPS-GEFS and GFS



- Monsoon seasons **2017-2019** (Jun to October)
- 1 – 6 days forecast (0.25 degrees)
- **Reference data** GPM-IMERG Final version bias corrected

ERROR METRICS

Standard metrics

- Root Mean Square Error
- Bias
- Correlation coefficient

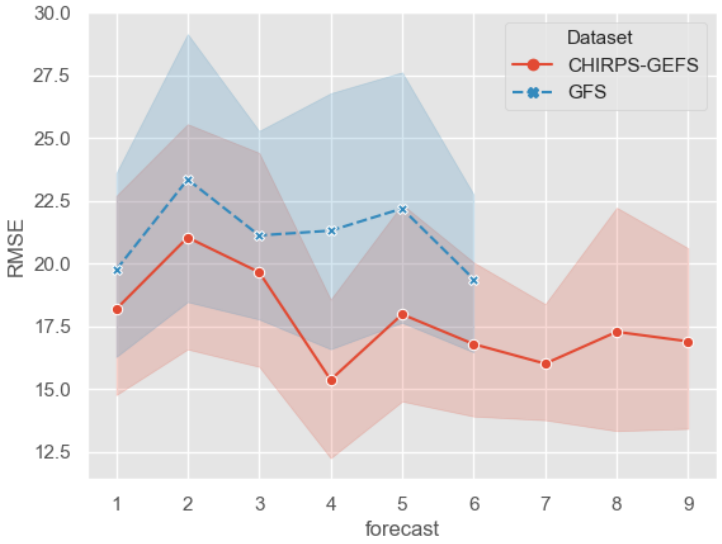
Categorical metrics

- POD
- FAR
- CSI

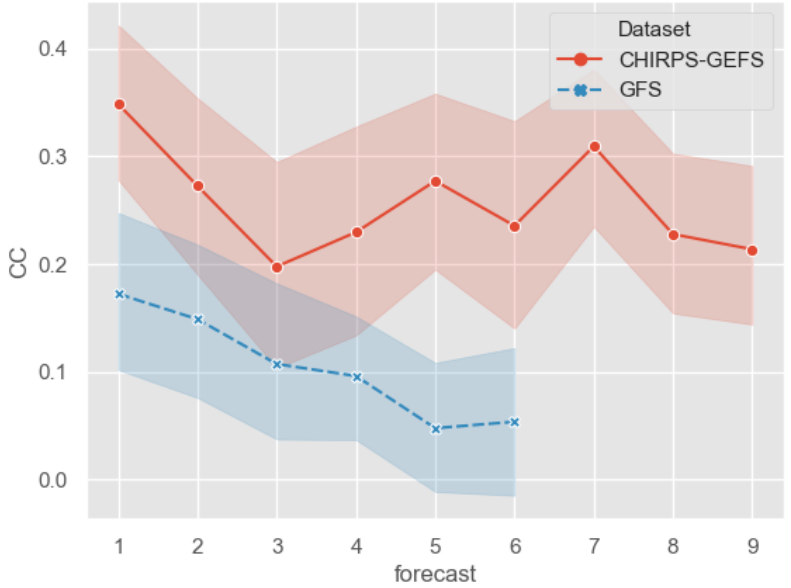
CHIRPS-GEFS v1 10 days forecast

Temporal analysis

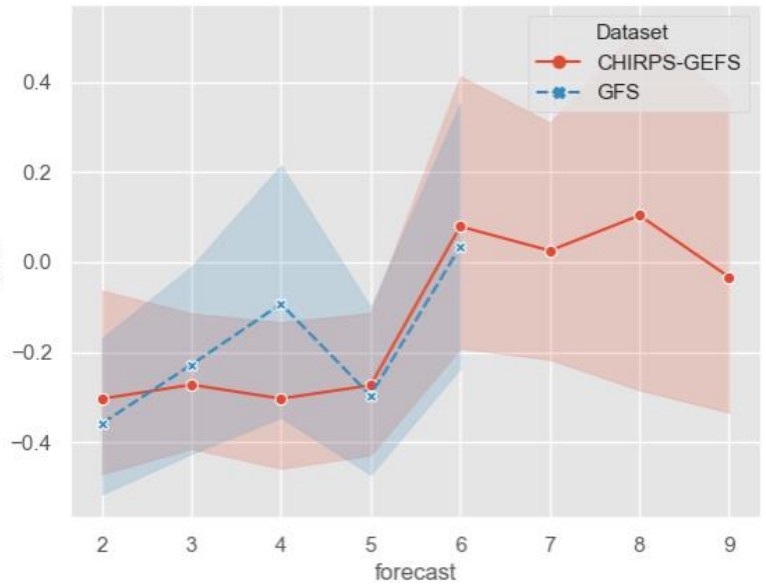
RMSE



Correlation coefficient

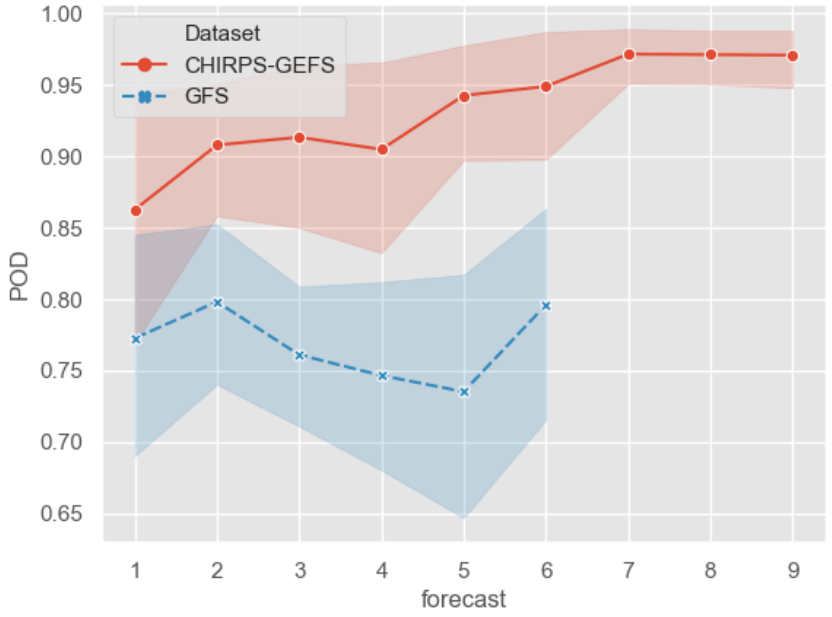


BIAS

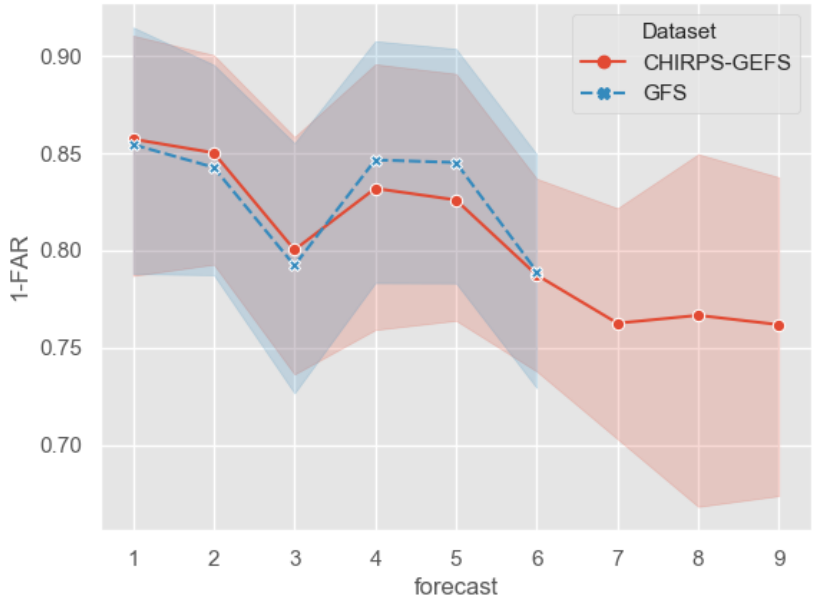


Temporal analysis

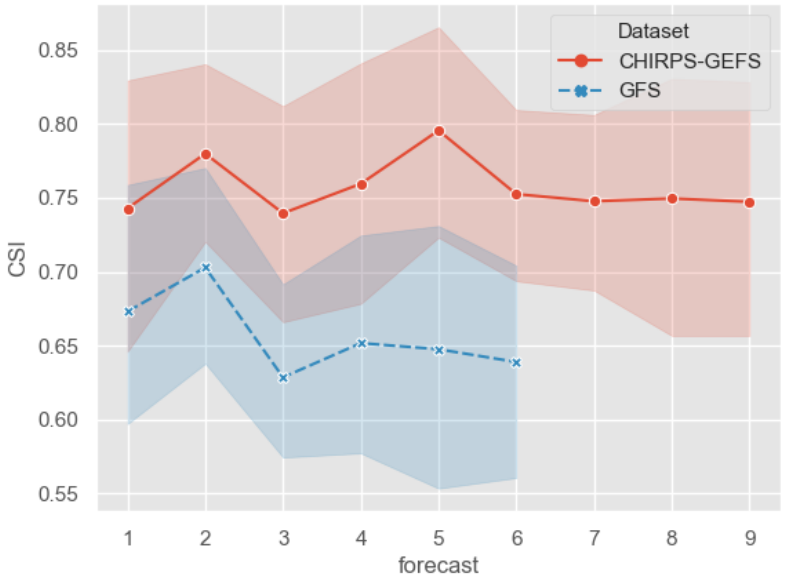
POD



1 - FAR



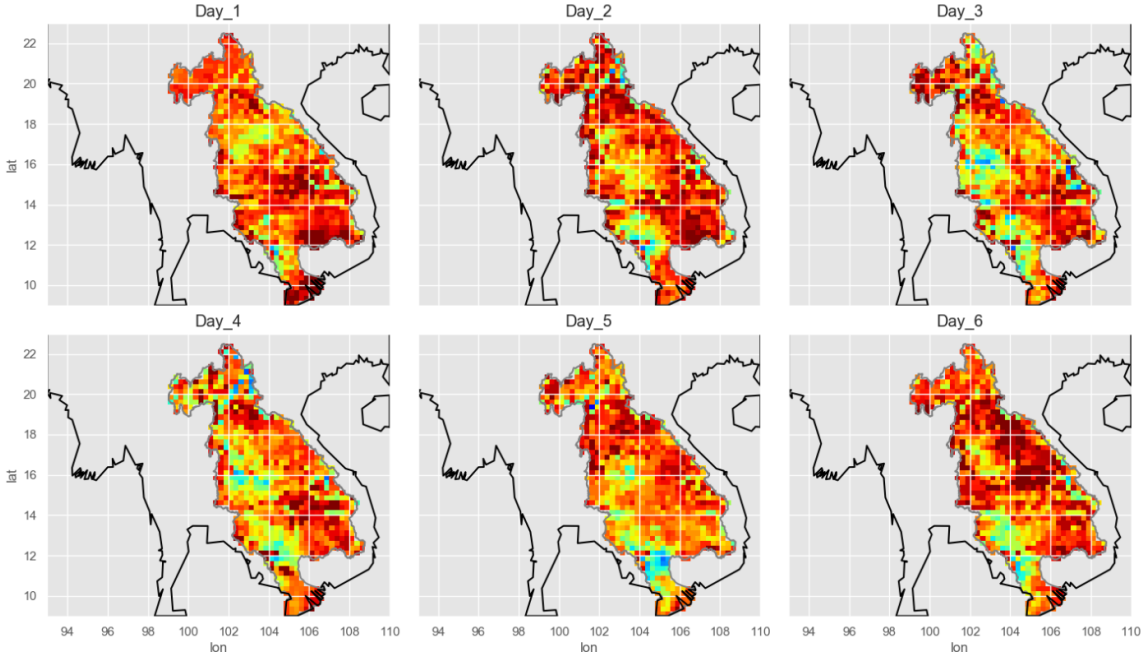
CSI



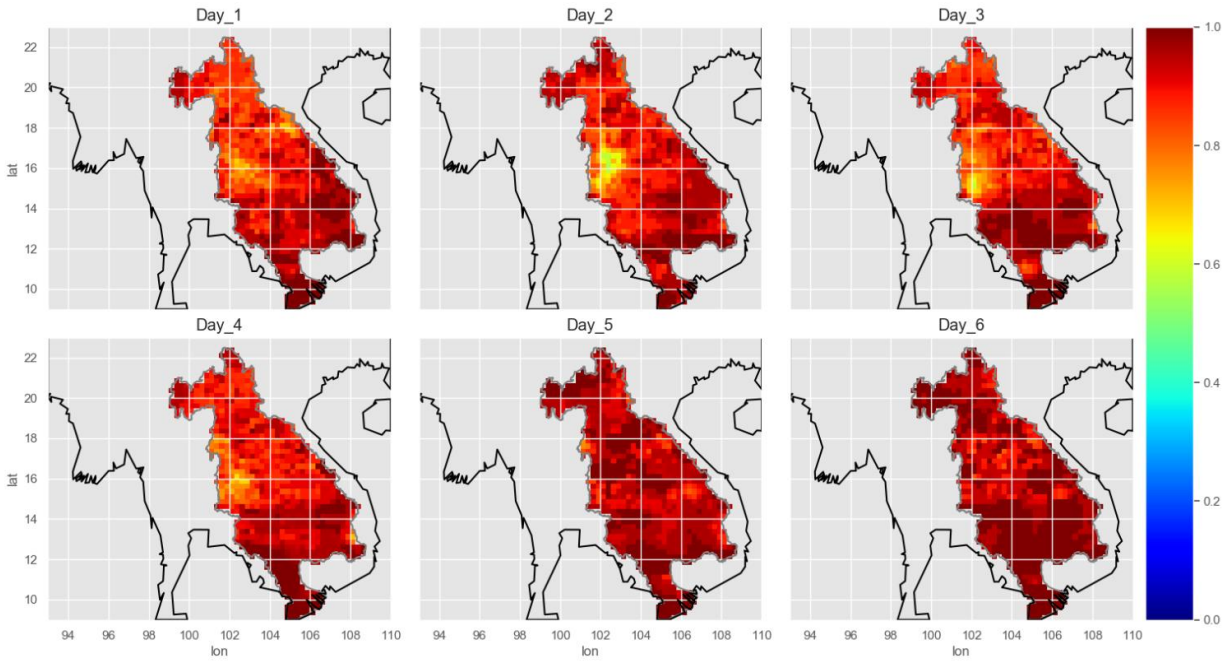
Spatial analysis

POD

GFS



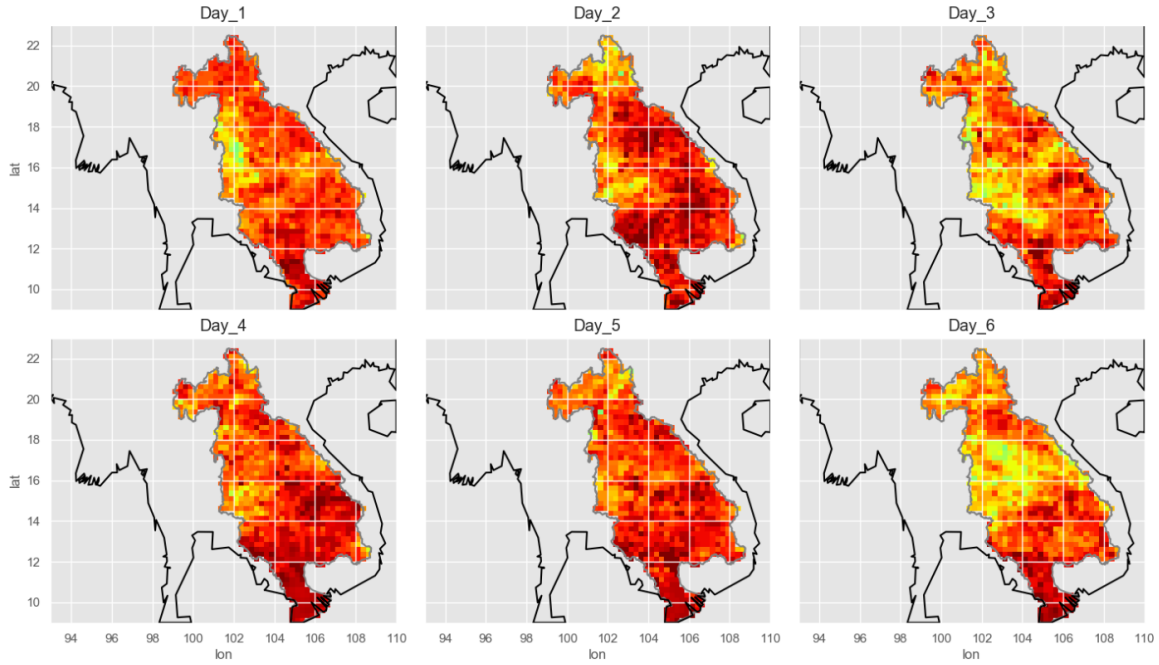
CHIRPS-GEFS



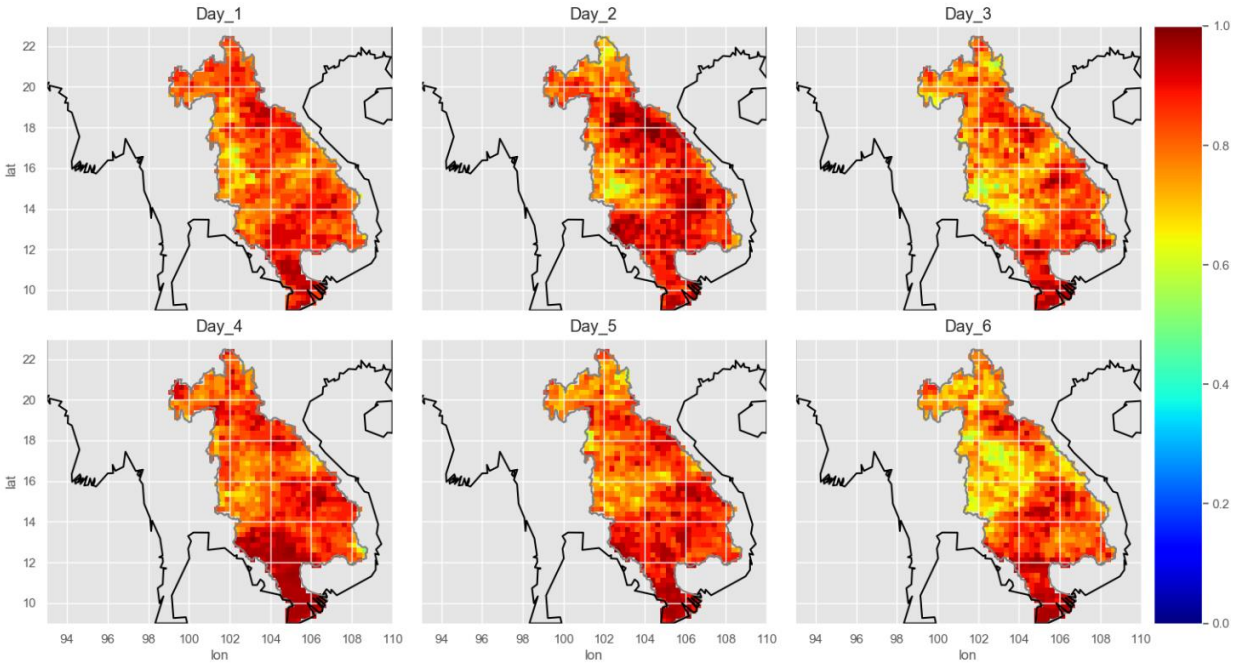
Spatial analysis

1-FAR

GFS

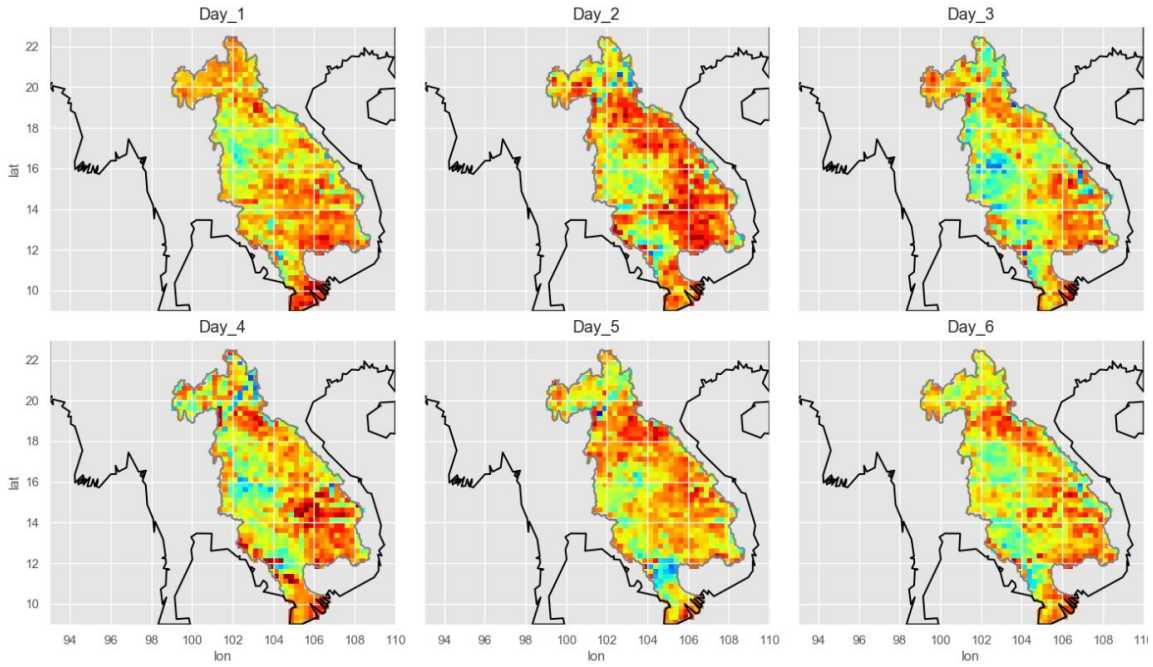


CHIRPS-GEFS

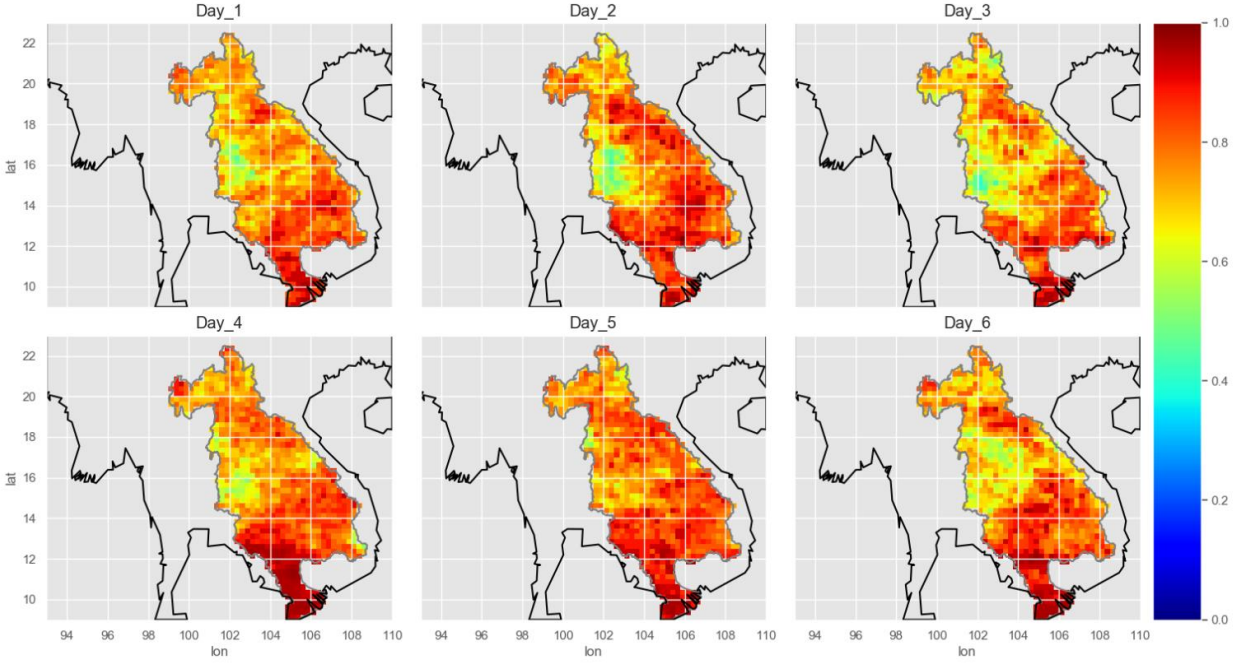


Spatial analysis CSI

GFS

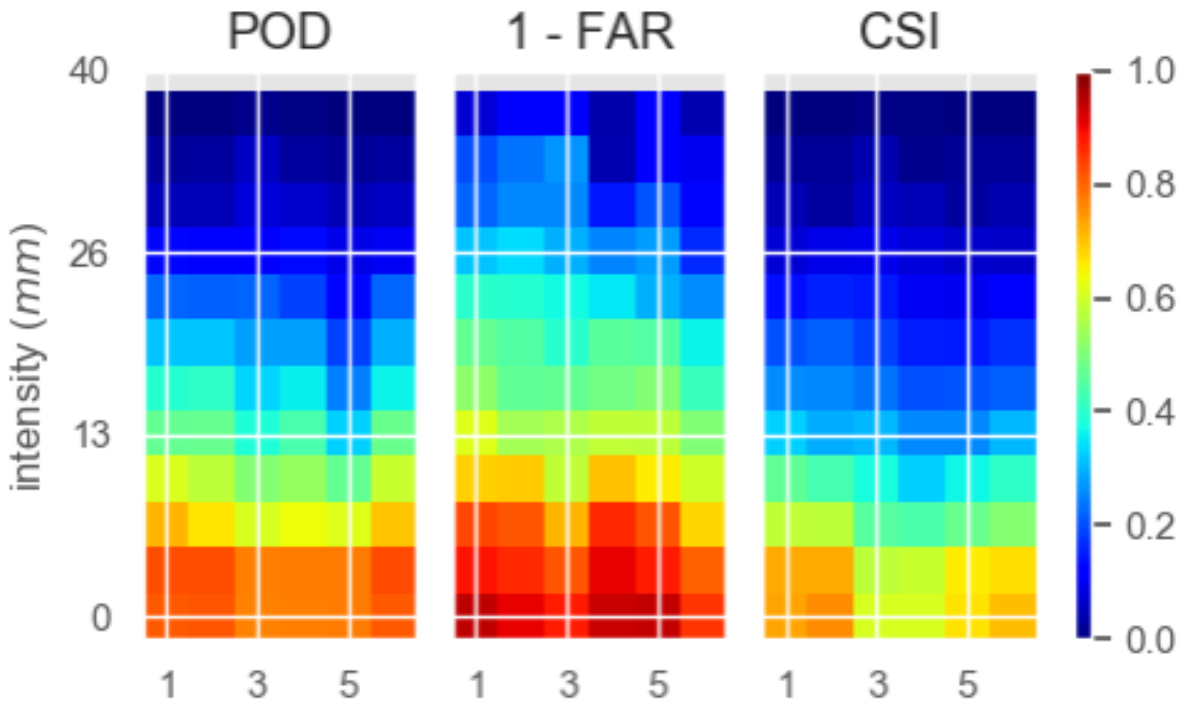


CHIRPS-GEFS

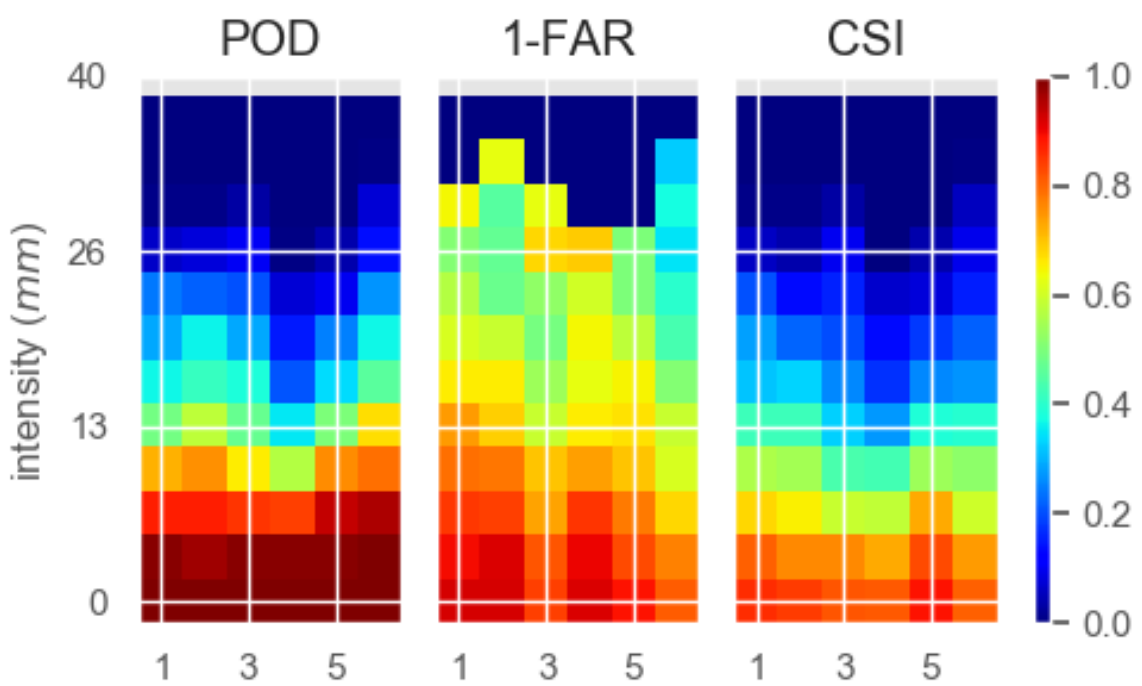


Results: Extremal

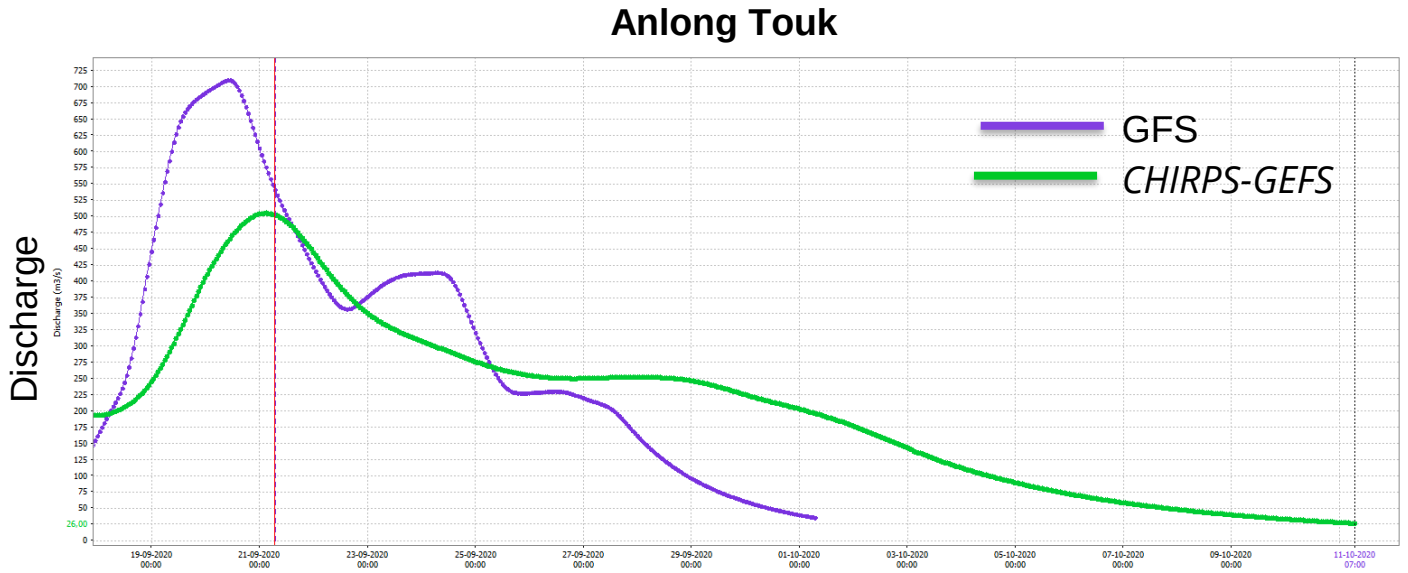
GFS



CHIRPS-GEFS



CHIRPS-GEFS into FEWS

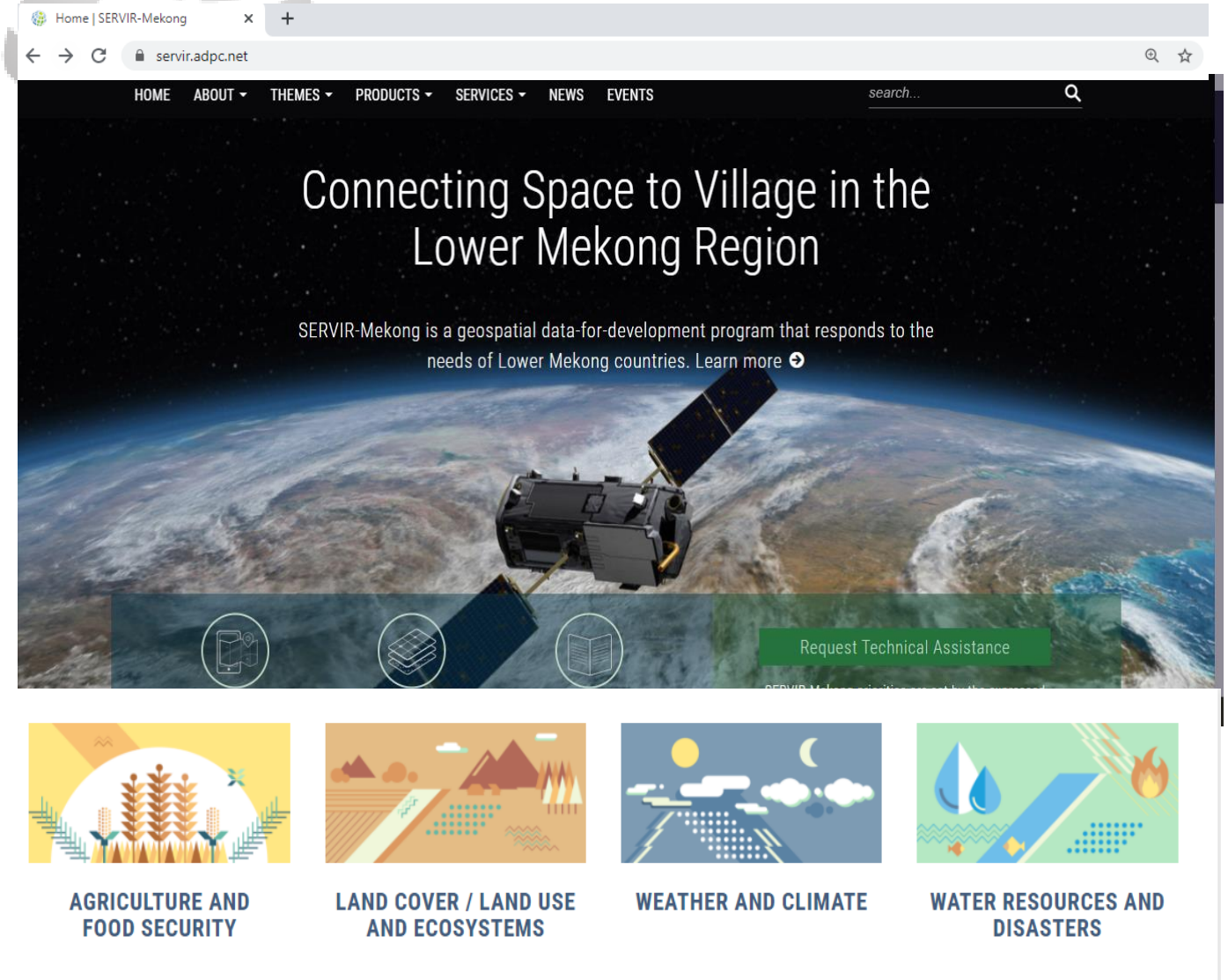


Summary

- SERVIR-Mekong supports MRC in accessing the latest technology for near-real-time (NRT) monitoring and rainfall forecast prediction for the FEWS system
- Results for bias correction GPM-BICO tool showed a reduction up to 50% of the bias and RMSE errors in NRT IMERG data. Results in the hydrological model suggested that this reduction considerable improved the streamflow forecast.
- CHIRPS-GEFS rainfall forecast provides a high resolution daily forecast information up to 15 days with 5 km spatial resolution
- In comparison with the GFS, CHIRPS-GEFS displayed the lowest temporal and spatial error with a longer forecast during monsoon seasons
- This encouraged MRC to implement GPM-BICO and CHIRPS-GEFS into their Flood Forecasting System in an operational setting to improve the lead time and accuracy of riverine Flood Early Warning in the Lower Mekong Basin.

USAID NASA adpc

SERVIR MEKONG



Decision Support Tools

These high quality user-tailored decision support tools and applications have been developed to address on-the-ground issues, empowering decision-makers to act locally on climate-sensitive challenges such as disasters, agriculture, water management, ecosystem protection and land use.

Live

Regional Land Cover Monitoring System

Live

Surface Water Mapping Tool

Surface water distribution changes

Live

Regional Drought and Crop Yield Information System

Live

Satellite Radar-derived Virtual Rain and Stream Gauge Data Service

Live

Eco-Dash

Changes to vegetation can have a significant impact on health, resilience

Live

ClimateSERV

This tool allows development practitioners, scientists/researchers

Live

Reservoir Mapping Tool

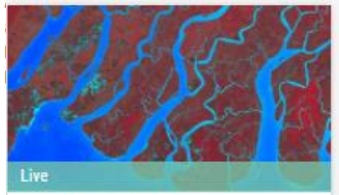
Live

Historical Flood Analysis Tool

Live

GEM GENDER EQUALITY MONITORING PLATFORM

Gender Equality Monitoring (GEM) Platform

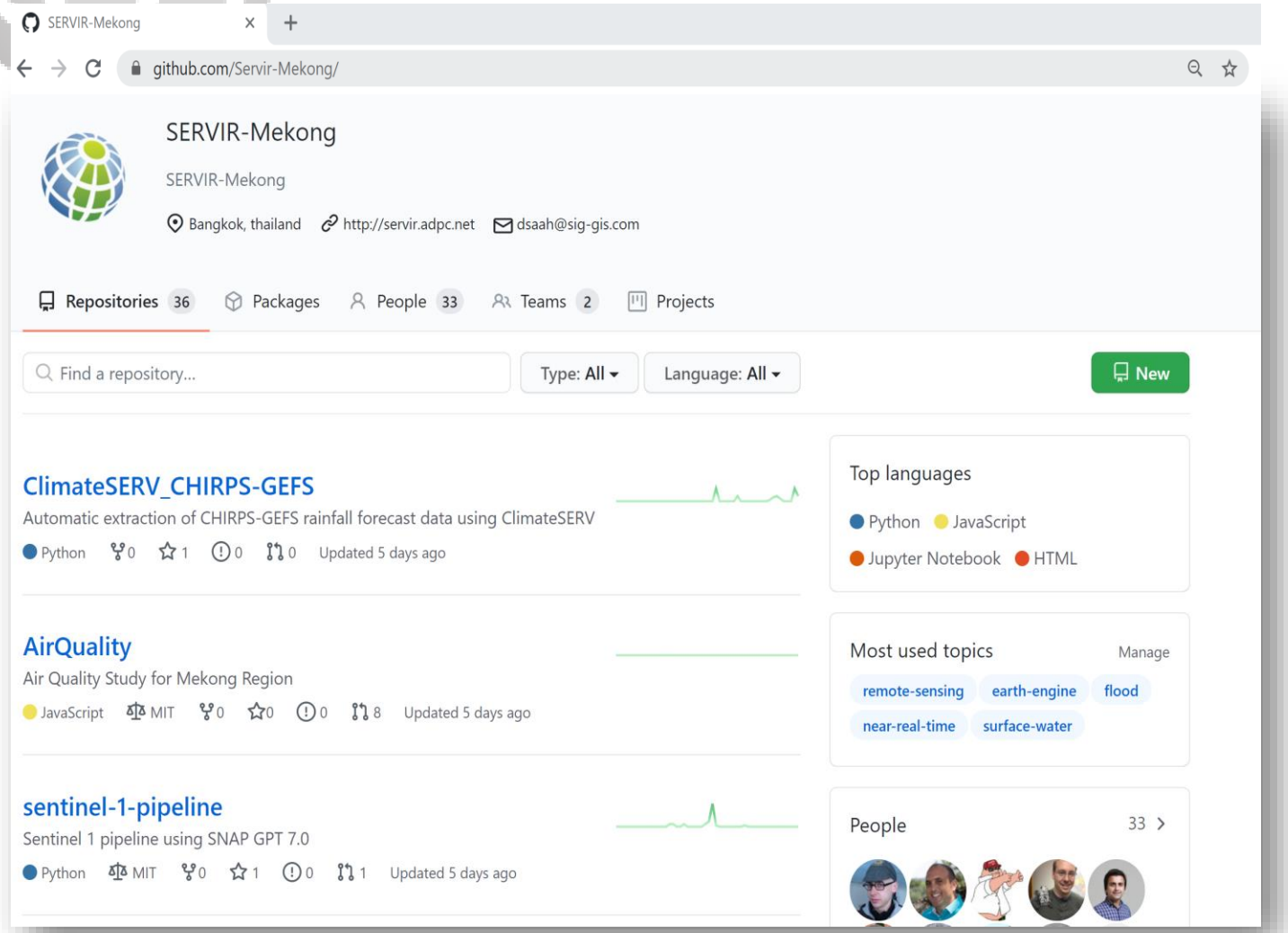


Live

Dancing Rivers

In Production

Supporting Water Resources Management (SWARM)



https://github.com/Servir-Mekong/

SERVIR MEKONG

www. servir.adpc.net

miguel.Barajas@adpc.net

chinaporn.m@adpc.net

arjen.Haag@deltares.nl

martijn.kwant@deltares.nl

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