COLLEGE OF SCIENCE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Evaluating Flood Forecasting System Performance in Cambodia

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Objectives

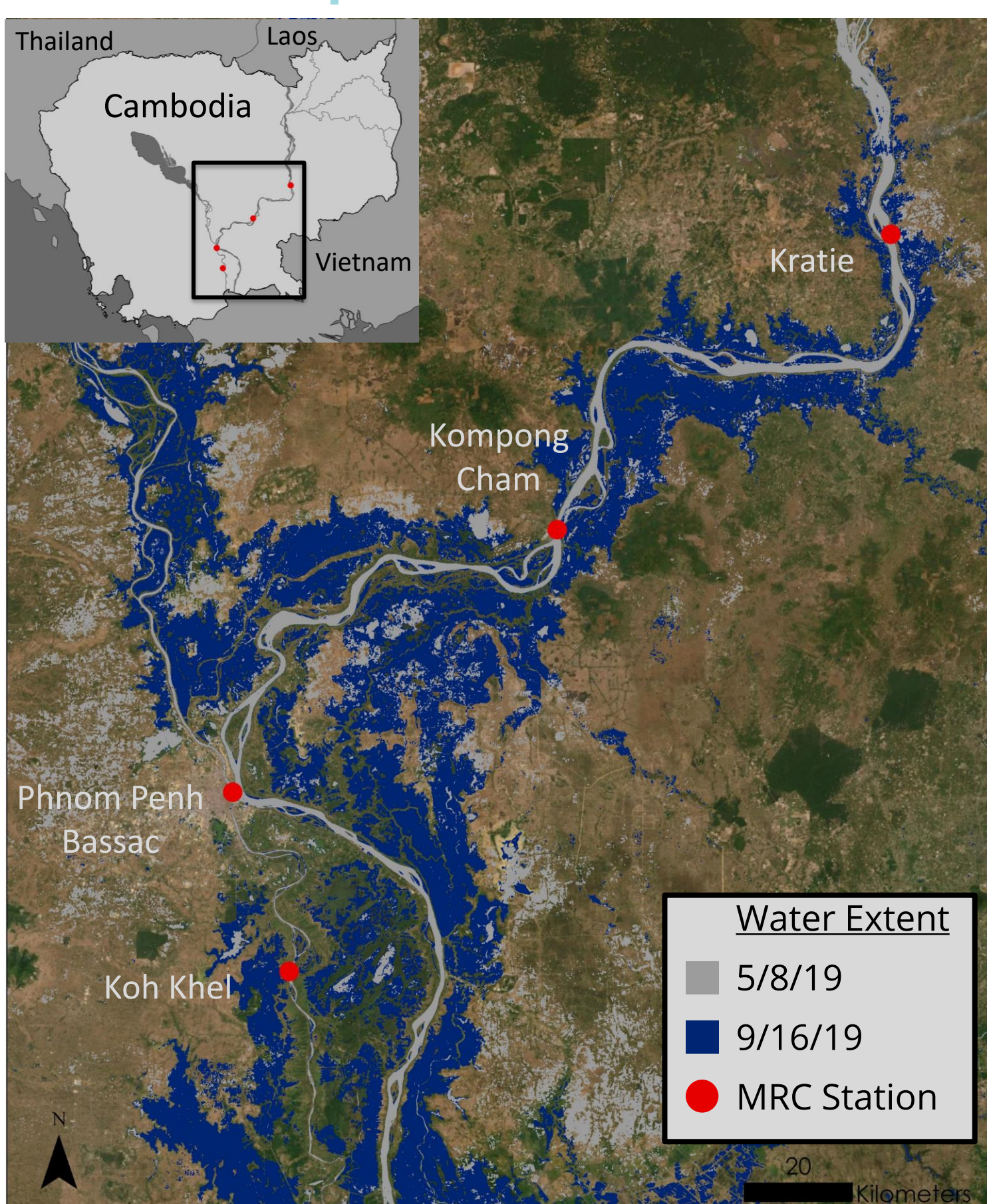Understand differences in performance
- of global, regional, and national flood forecasting systems
- at various forecast lead times
- between different station locations in Cambodia

Overview

Every year, Cambodia experiences flooding as a result of monsoon rains and typhoons. Flood forecasting systems are designed to enable people to mitigate economic and social impacts from these events. However, in order for forecasts to be used effectively, an assessment of their accuracy is needed. This study demonstrates the performance of regional and global flood forecasting systems over the 2019 flood season. To do this, we assess the flood forecast accuracy at different forecast lead times and gauge locations in Cambodia. We then compare the flood forecast performance to satellite-based flood maps produced by the Hydrological Remote Sensing Analysis of Floods (HYDRAFloods) tool currently being co-developed by SERVIR-Mekong in collaboration with the Myanmar Department of Disaster Management. This assessment of the flood forecasting systems' performance and comparison to flood extents helps (1) provide valuable information to forecasters and disaster managers as they make improvements to their models, and (2) provides support to forecast users as they evaluate the strengths and weaknesses of different systems for taking action.

Forecast Performance
Root Mean Square Error at Kratie

Lead Time (days)	GloFAS	SPT	MRC	MOWRAM
1	1.51	3.82	0.16	0.39
5	1.46	3.02	1.06	0.86
15	2.05	1.98	-	-
30	2.95	-	-	-

RMSE at 2 Day Lead Time

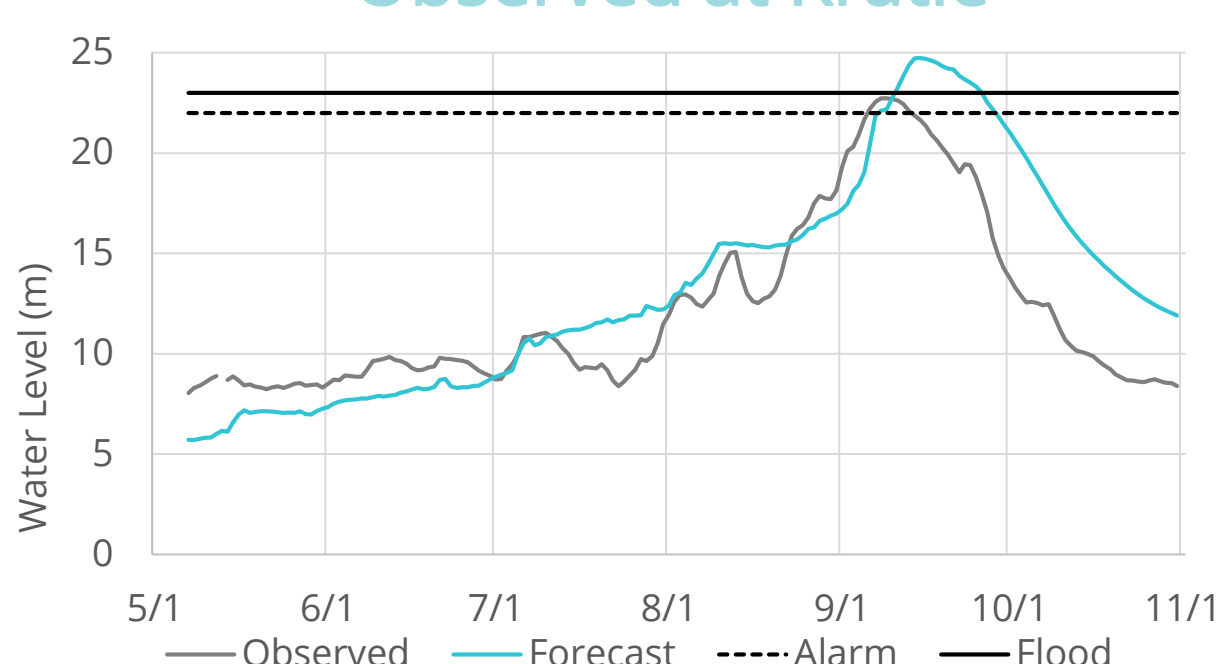| Station	GloFAS	SPT	MRC	MOWRAM
Kratie	1.50	3.62	0.38	0.56
Komp. Cham	1.75	3.19	0.20	0.34
Phnom Penh	1.57 / 7.83	1.67	0.13	0.18
Koh Khel	3.61	3.03	0.11	0.10

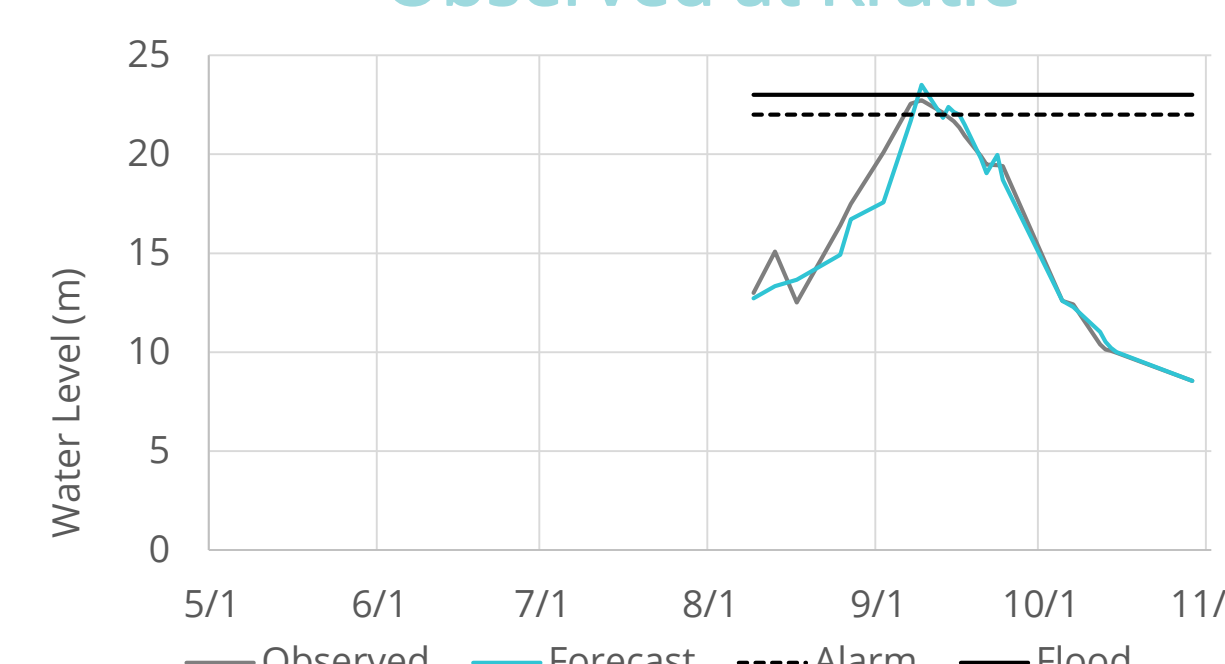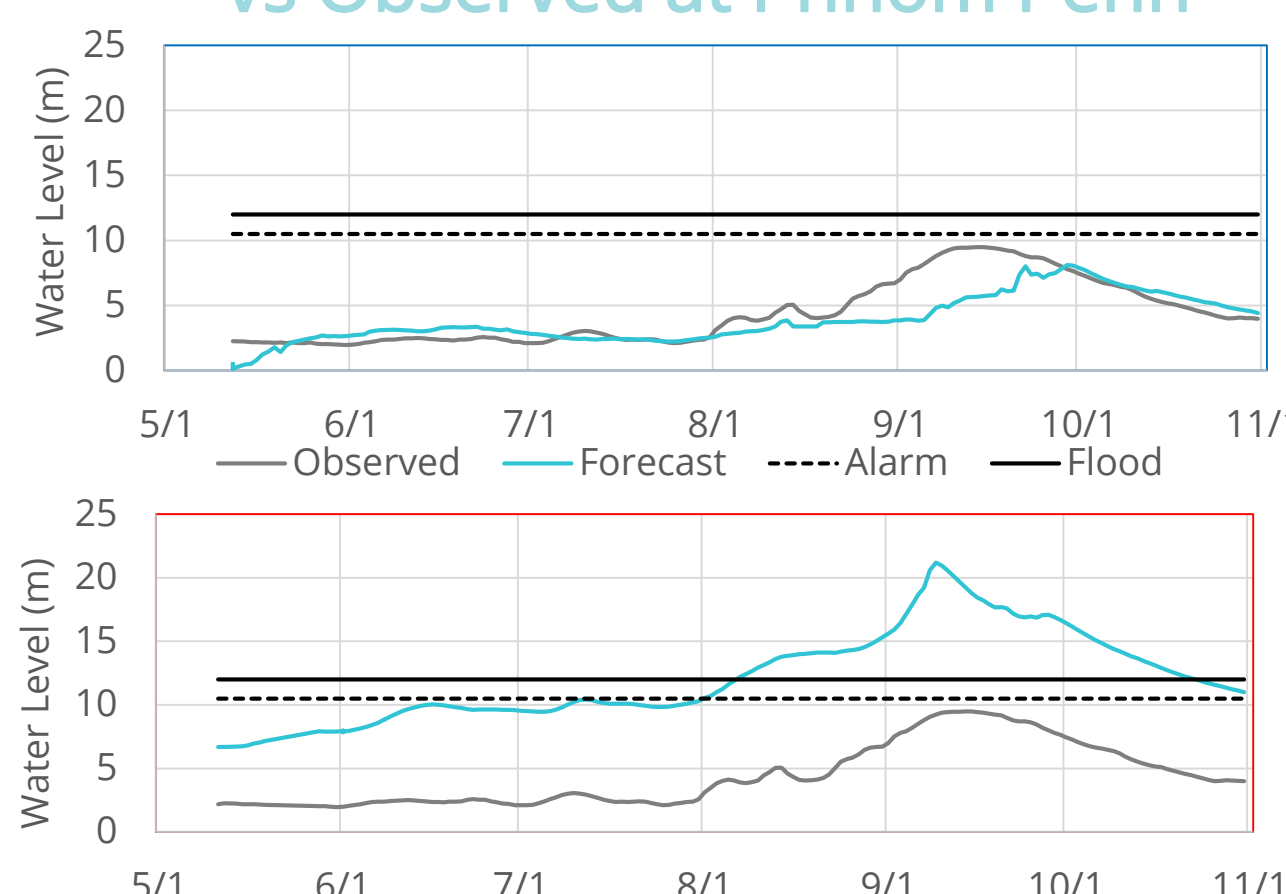### GloFAS 5 Day Mean Forecast vs Observed at Kratie
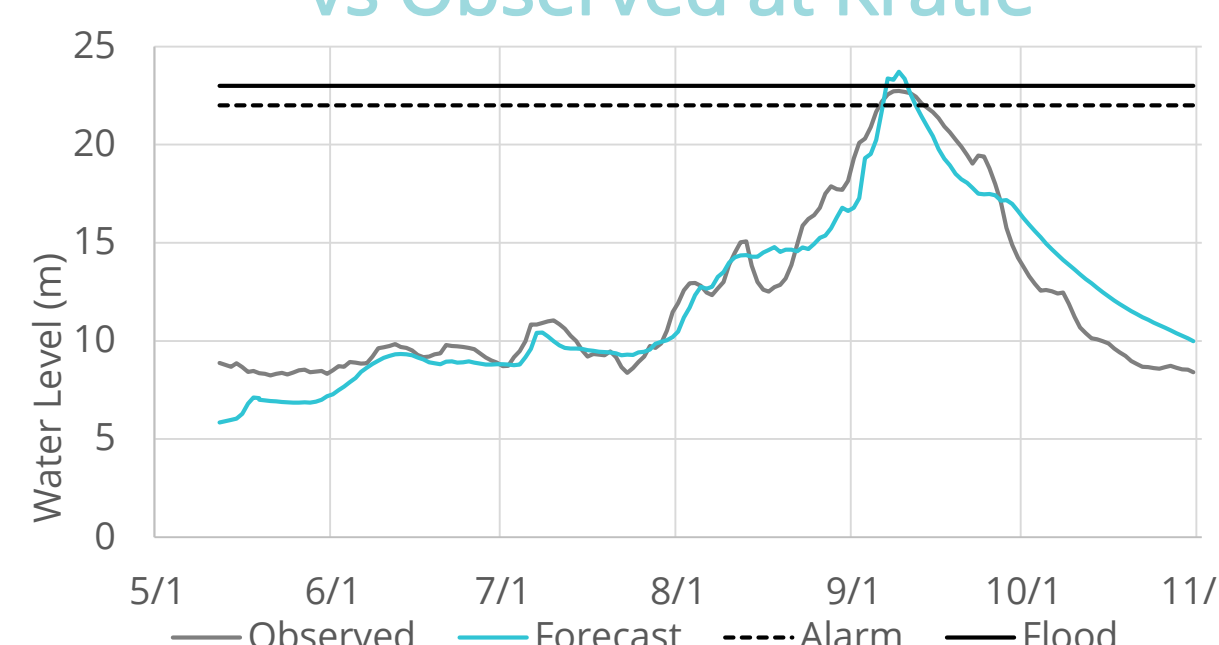
MRC 5 Day Forecast vs Observed at Kratie
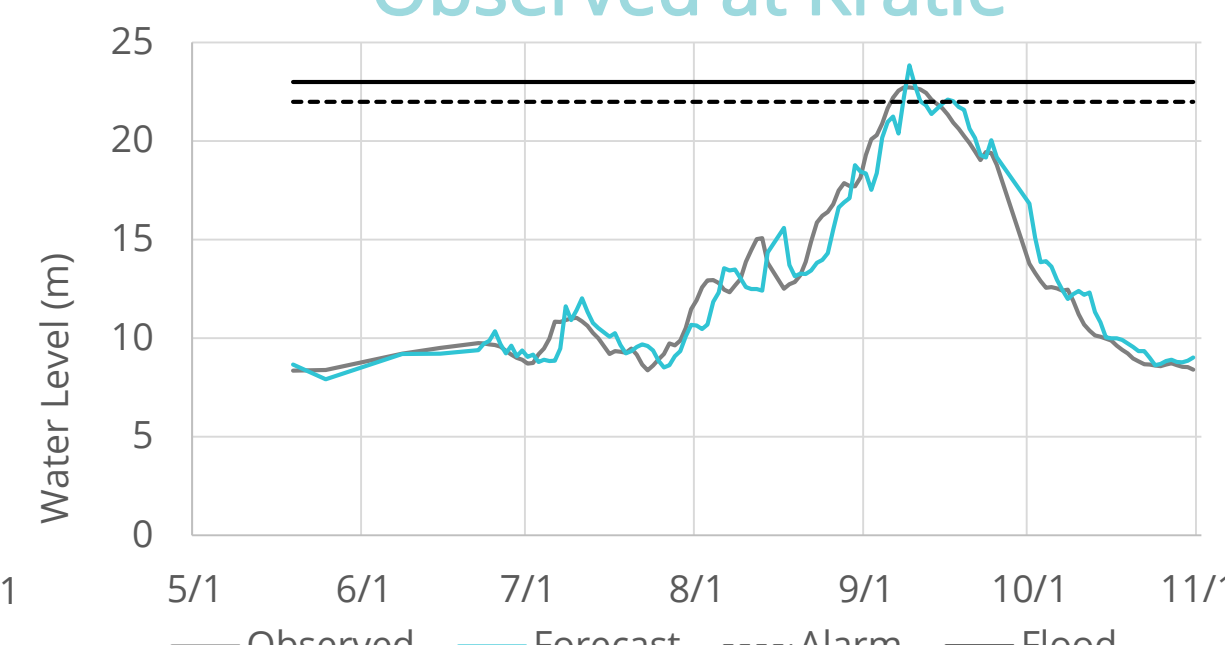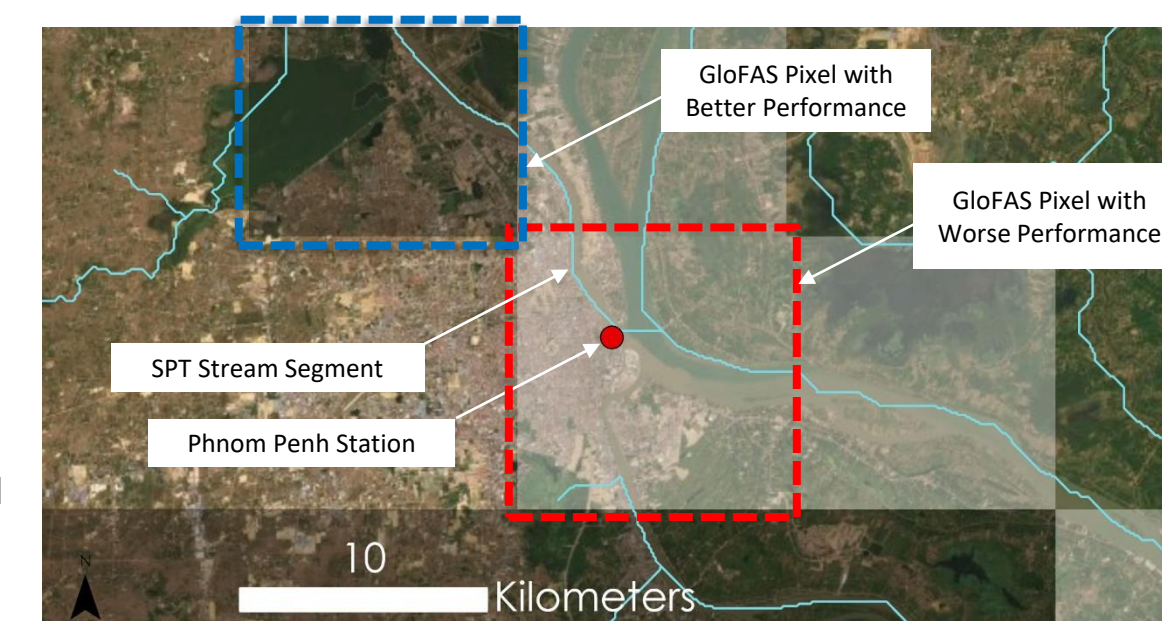

SPT 5 Day Mean Forecast vs Observed at Kratie

MOWRAM 5 Day Forecast vs Observed at Kratie

Flood Map

Water Extent
- 5/8/19
- 9/16/19
- MRC Station

Basemap: Esri, Digital Globe, GeoEye, Earthstar Geographics, CNES/Airbus

GloFAS 5 Day Mean Forecast vs Observed at Phnom Penh

GloFAS Pixel at Phnom Penh

GloFAS Pixel with Better Performance
GloFAS Pixel with Worse Performance
SPT Stream Segment
Phnom Penh Station

The coarse resolution of GloFAS (shown above) offers a potential explanation for the poor performance at Phnom Penh using the red pixel.

HYDRAFloods flood maps (left) generated in Google Earth Engine from Sentinel 1 synthetic aperture radar data show the water extent around the peak water level time. Although none of the stations observed water levels crossing the flood threshold during the 2019 flood season, areas around the river were inundated.

Acronyms
MOWRAM: Cambodia Ministry of Water Resources & Meteorology (National)
MRC: Mekong River Commission (Regional)
SPT: Streamflow Prediction Tool (Regional/Global)
GloFAS: Global Flood Awareness System (Global)

Conclusions

- Regional and national level systems far outperform global systems at all lead times and all locations, but can only provide outlooks up to the next 5 days
- Performance varies widely between stations for global systems, but very little for regional and national systems
- Although no flood events occurred in the 2019 flood season according to water level thresholds, satellite based flood maps indicate large areas of flooding

Acknowledgements

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