

# Ganga Basin Analysis for flood and Drought using CHyM model



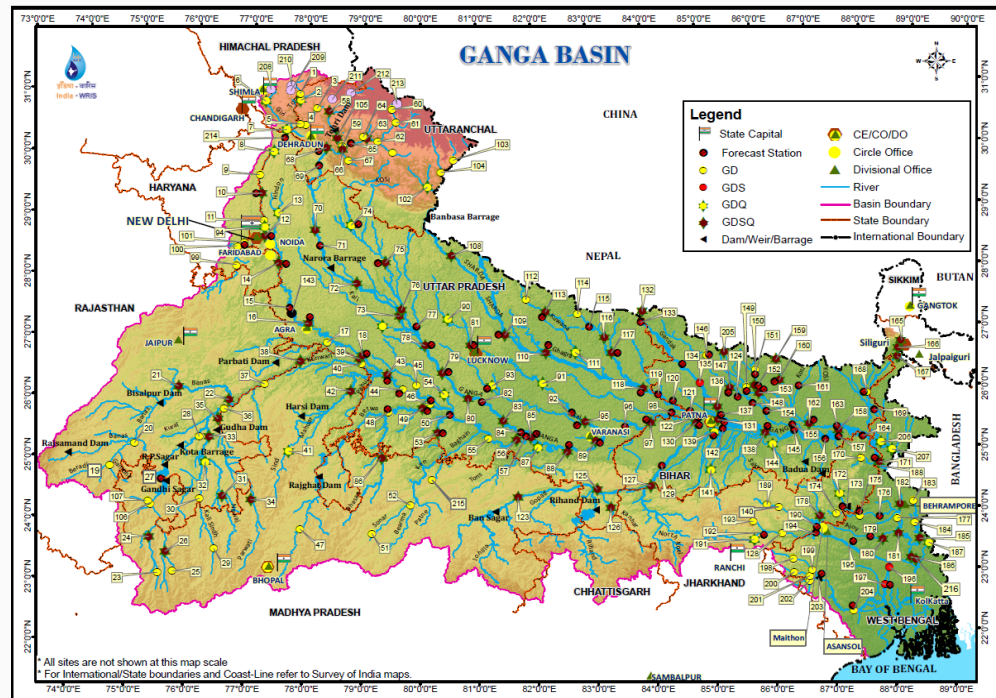
**Md Saquib Saharwardi & Saadi Zulfaqar**

*Fourth Workshop on Water Resources in Developing Countries: Hydroclimate Modeling and Analysis Tools, 12-23 June 2017, ICTP Trieste, Italy*

# Introduction



The **third largest** river in the world by discharge!



- The **Ganga basin** outspreads in India, Tibet , Nepal and Bangladesh (10,86,000 Sq.km.)
- 26% of the total geographical area of India.
- Length- 2525 km
- Average annual rainfall- 110 Cm

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# Objectives

**To analyze the performance of model for simulating Ganga basin.**

**To compare the drought and flood year using model parameters.**

# Data

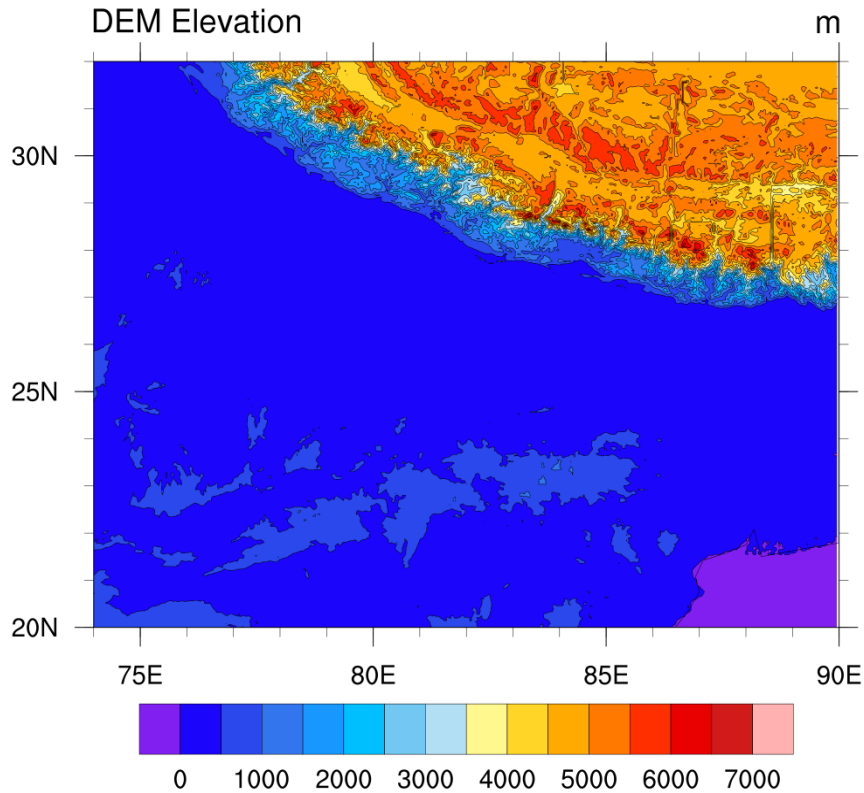
**PERSIANN**

**ERA- Interim**

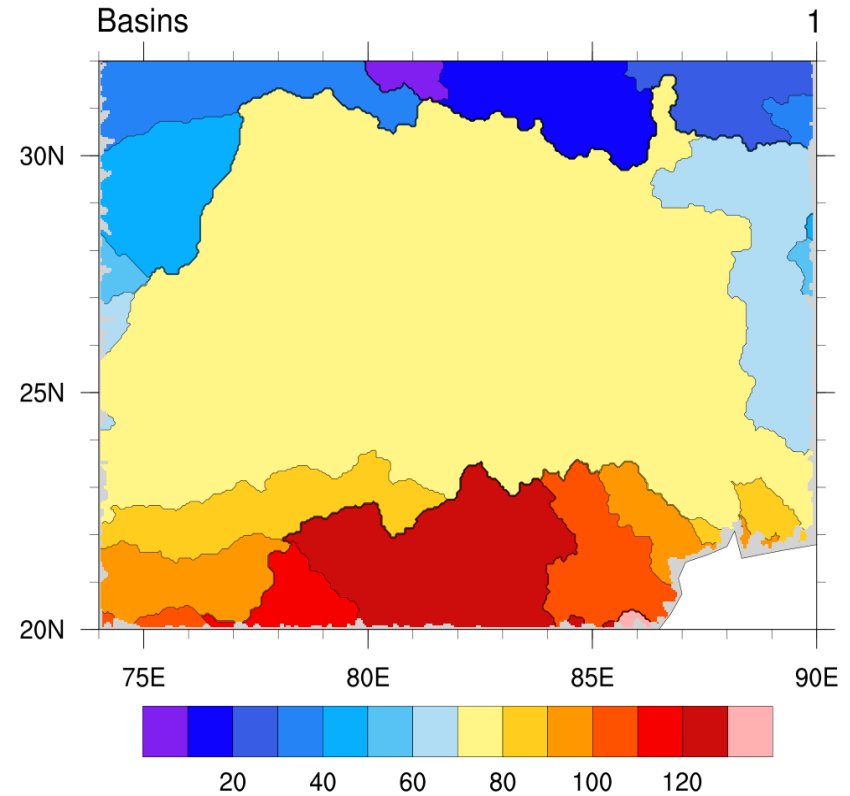
**RegCM**

# Static Fields

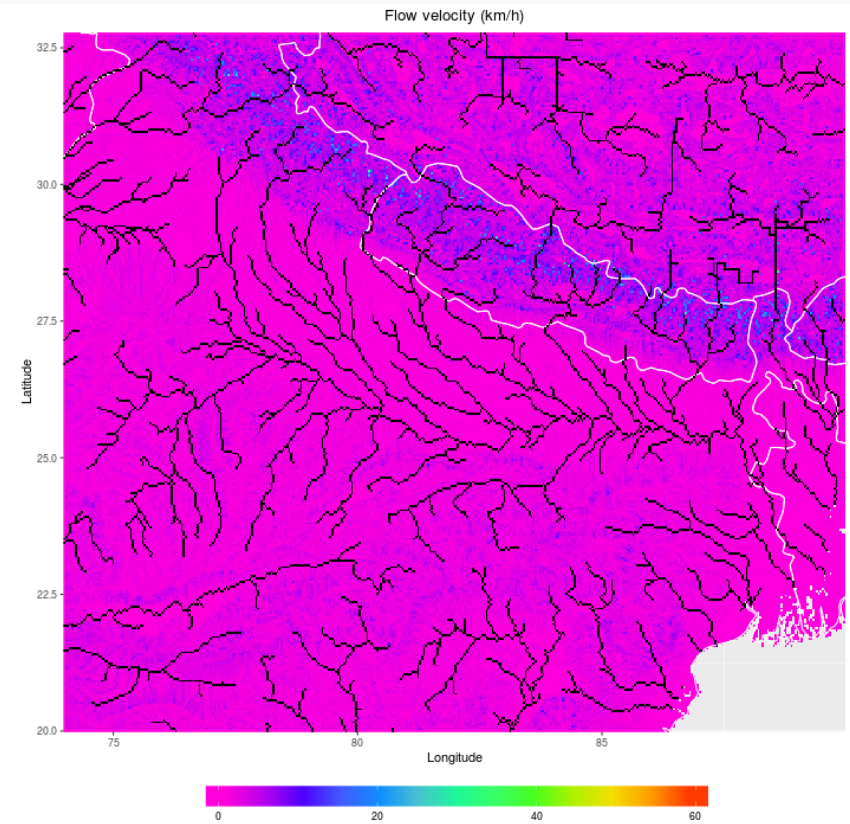
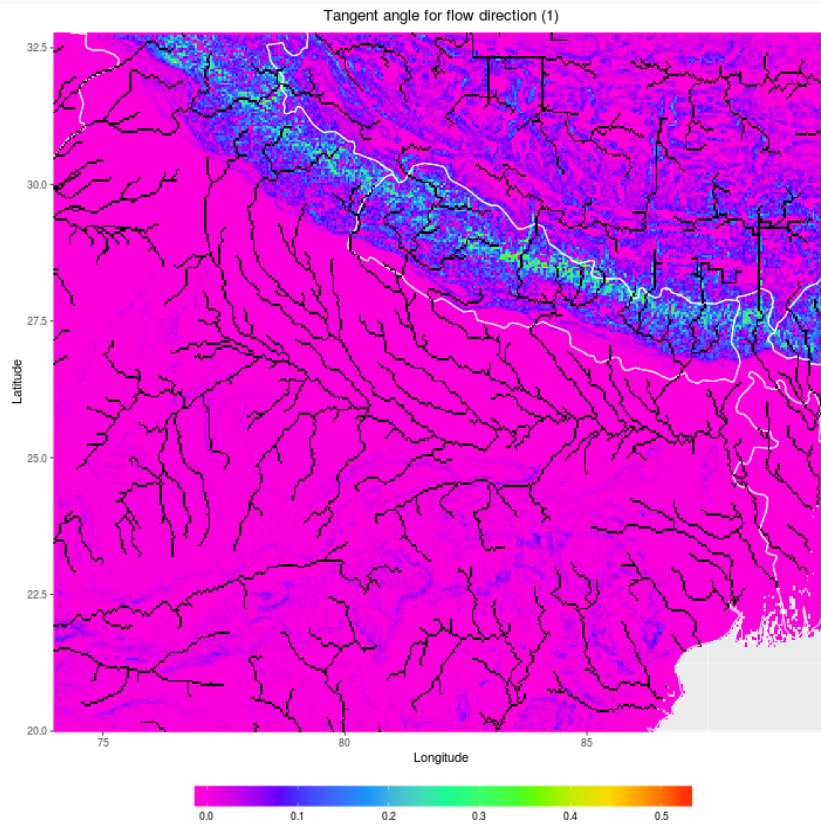
## Digital Elevation Model



## Basins



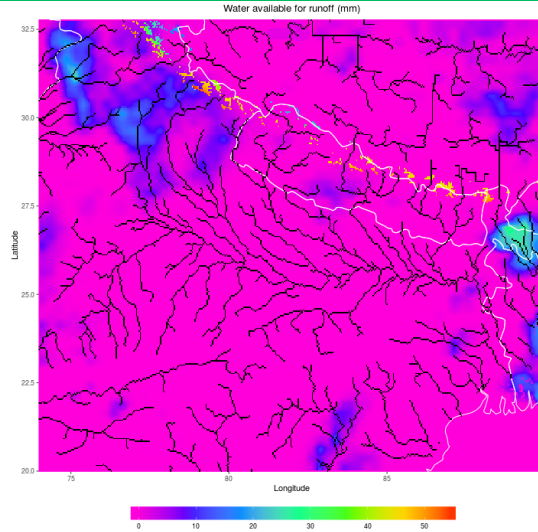
# Slope and Velocity



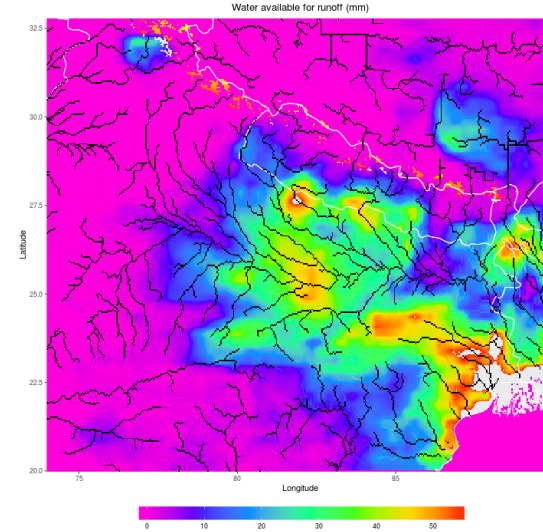
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# Water Available for run-off (JJAS)

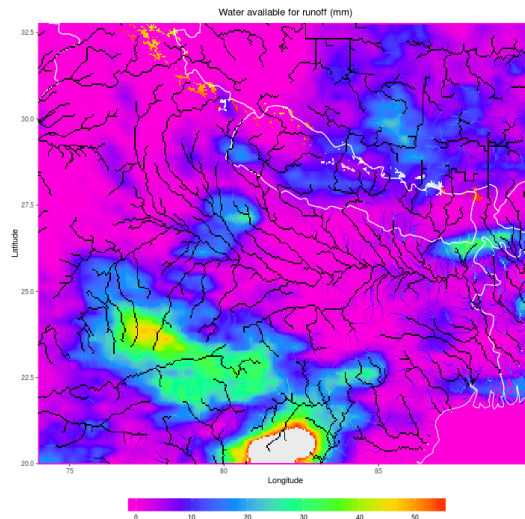
**JUNE**



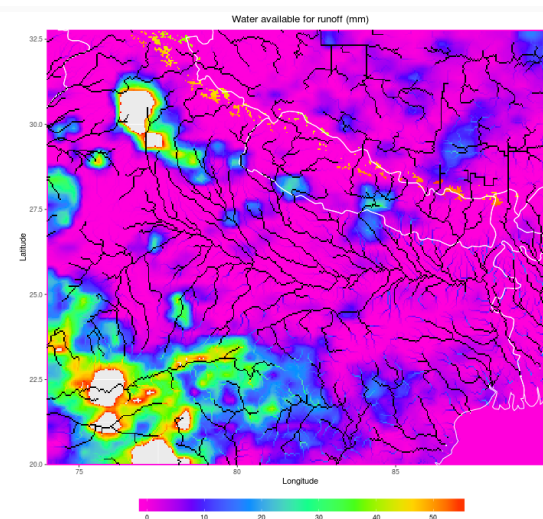
**JULY**



**AUGUST**

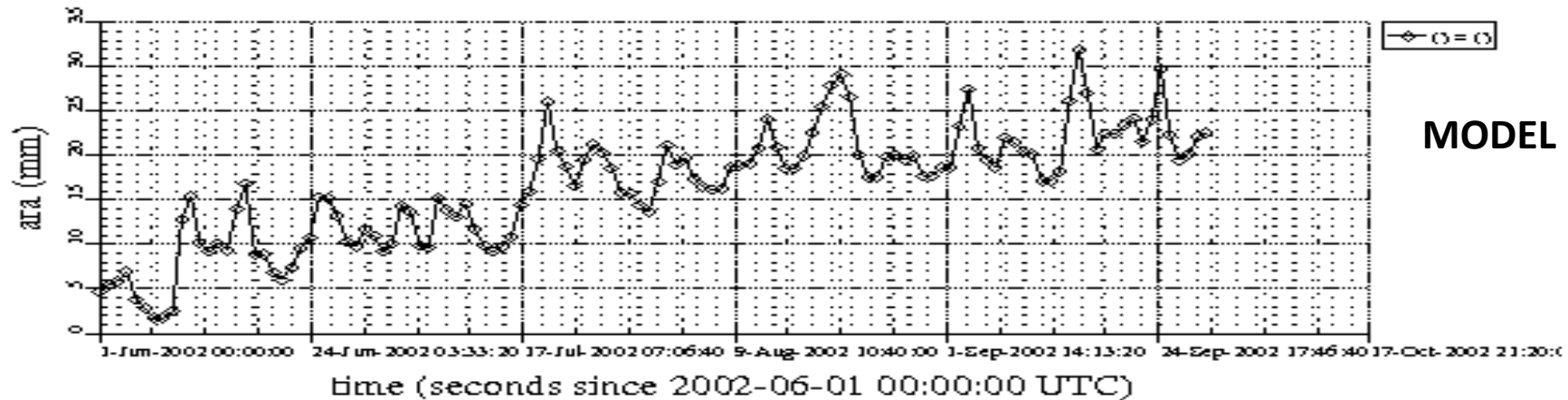


**SEPTEMBER**

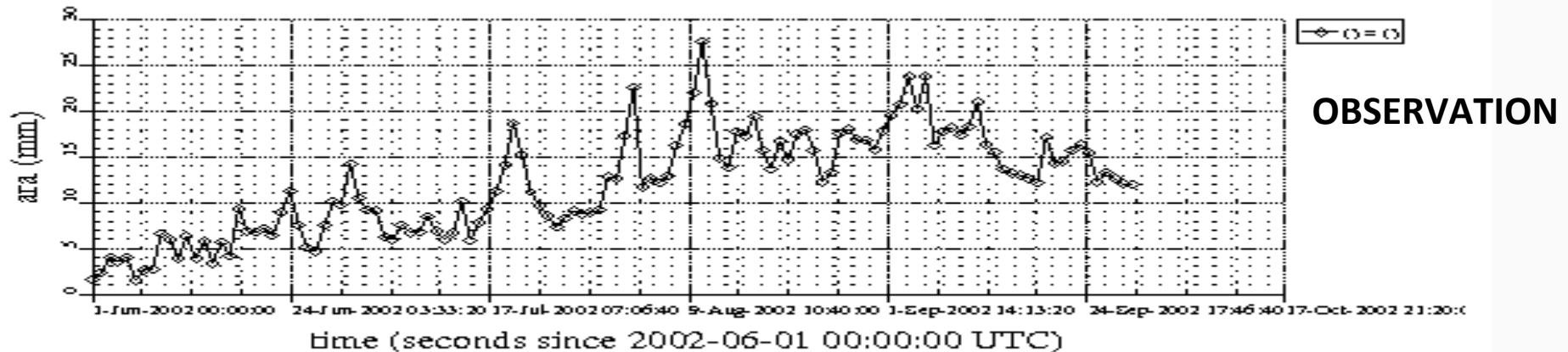


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# Water Available for run-off (JJAS)



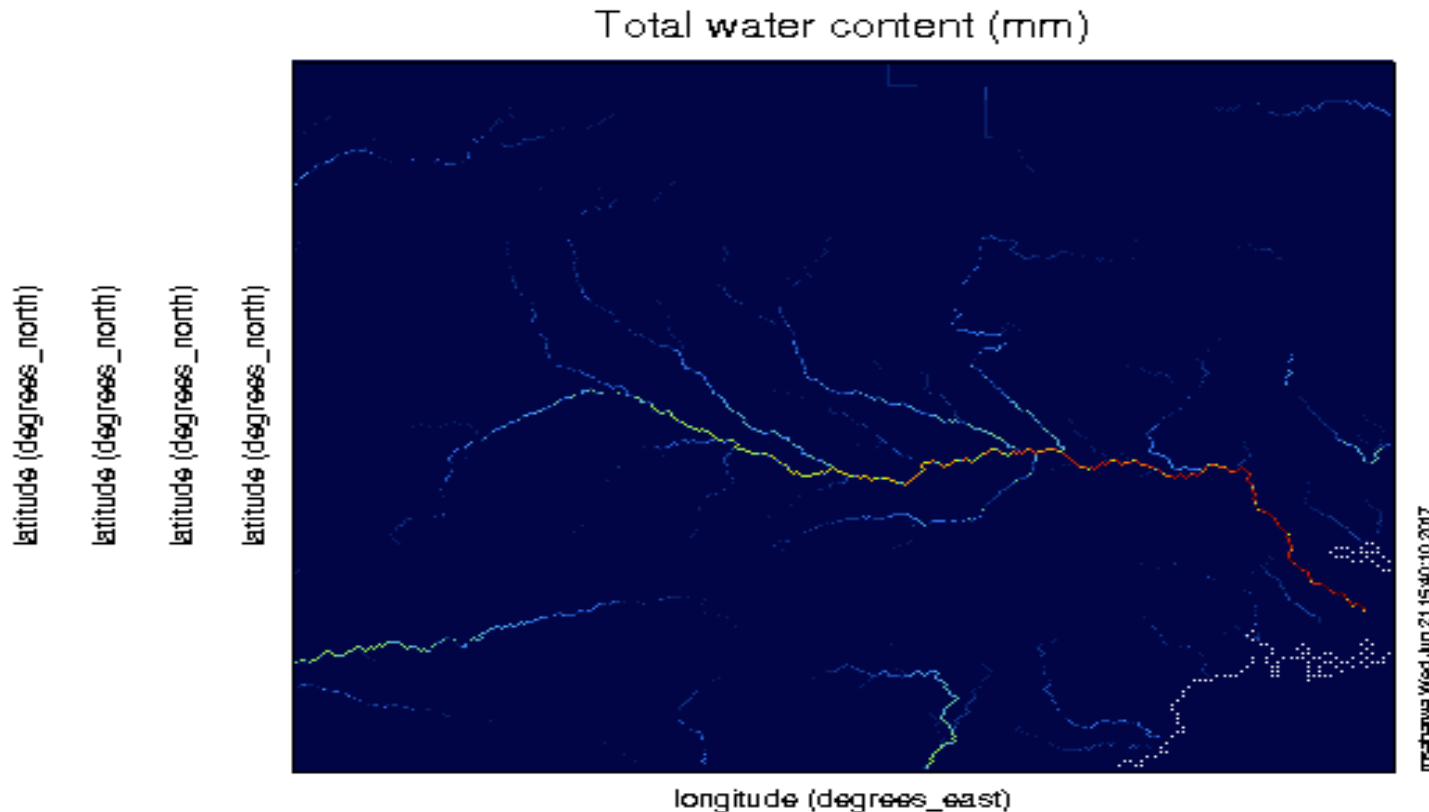
## Water available for runoff from Exercise with CHyM Po



## Water available for runoff from Exercise with CHyM Po



# Total Water Content(JJAS)



Exercise with CHyM Po

Range of Total water content: 0 to 1.28033e+09 mm

Range of longitude: 74 to 89.96 degrees\_east

Range of latitude: 20 to 32.76 degrees\_north

Current Time: 9.2016e+06 seconds since 2002-06-01 00:00:00 UTC

Frame 4 in File persiann\_2002\_jjas.nc

# Case Study

## 1988 – Flood



## 2002– Drought

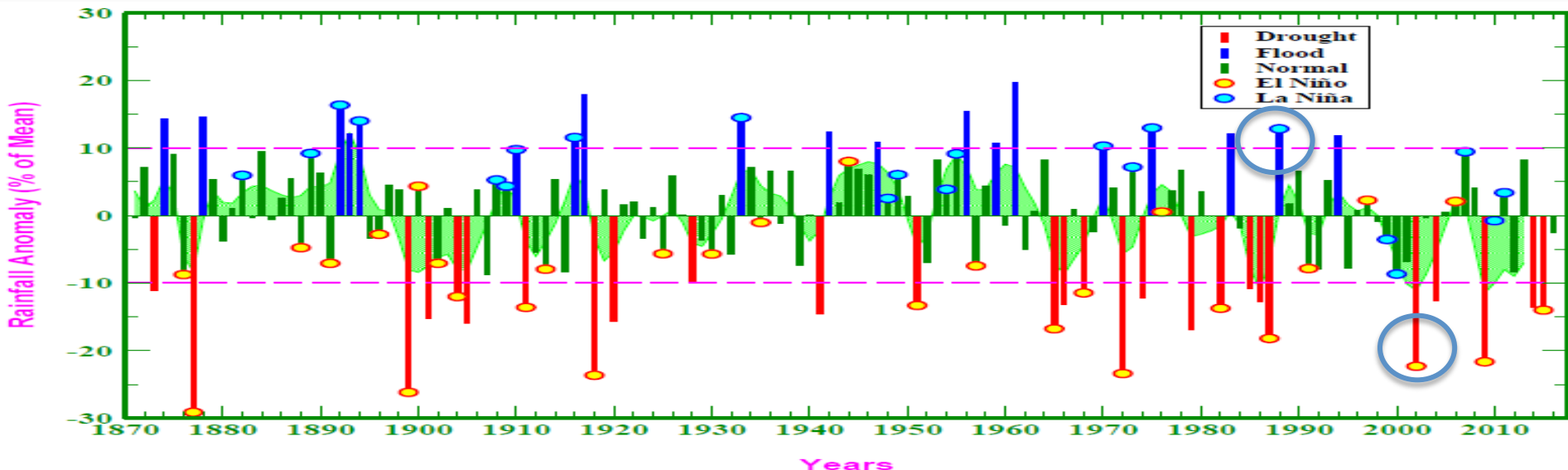


### Flood

**±1000** death toll.  
**±9,000** affected villages and towns.  
**±100,000** evacuated.

### Drought

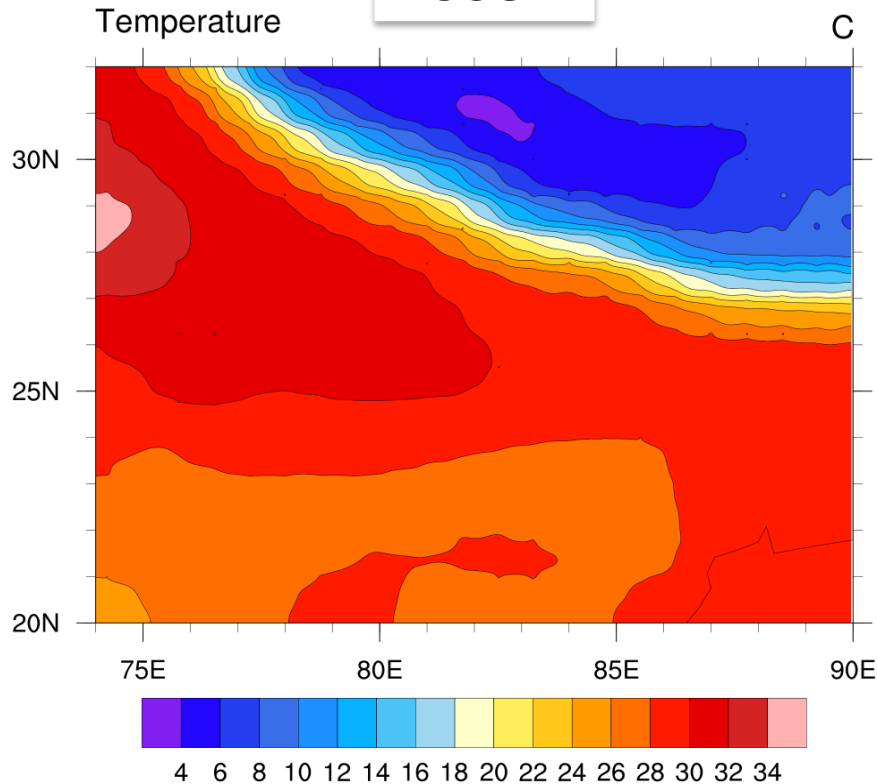
**Third largest drought** in 100 years.  
**56% below normal rainfall** = July.  
**Two-thirds** districts = Poor rainfall.



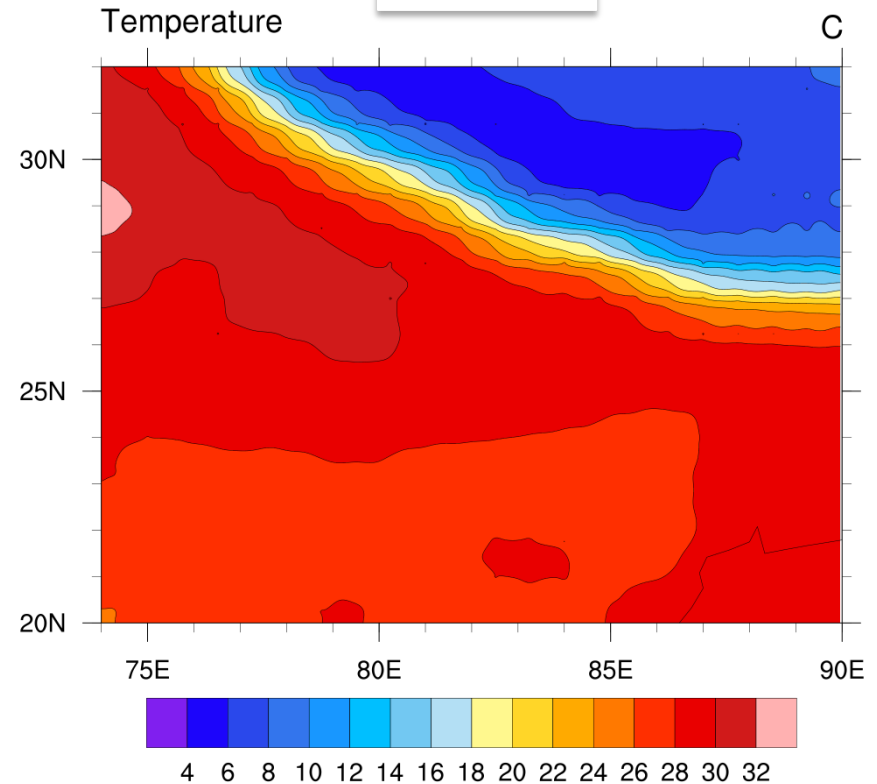
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# Summer Monsoon Season (JJAS) Temperature

**DROUGHT**



**FLOOD**



# Rain Input in JJAS Season

## DROUGHT

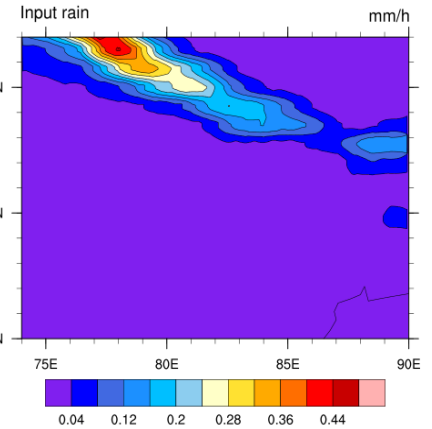
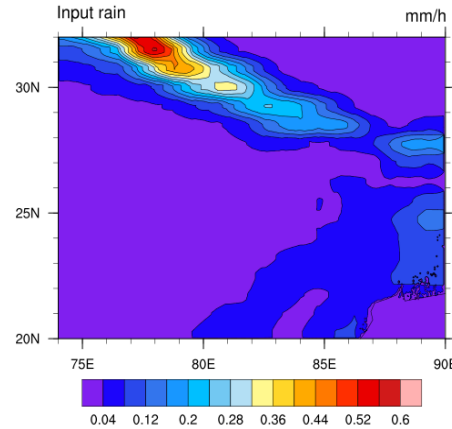
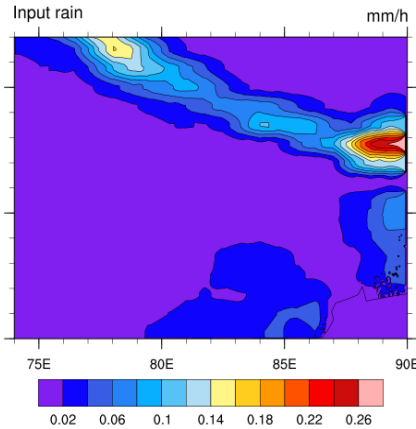
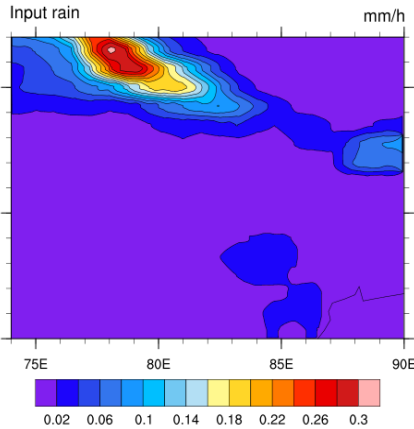
## FLOOD

JUNE

JULY

JUNE

JULY

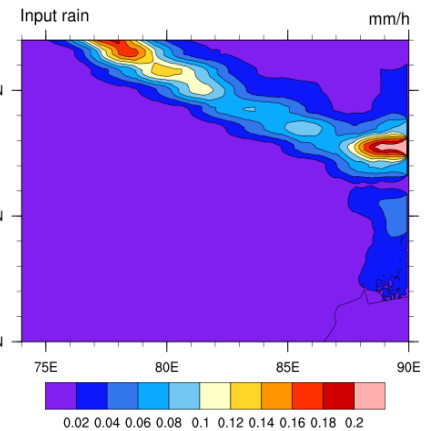
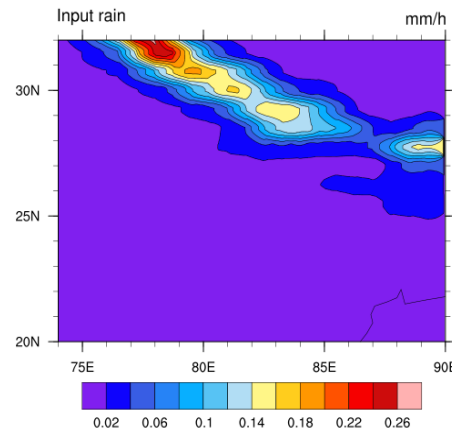
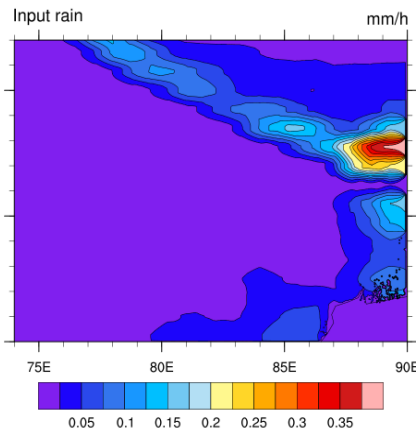
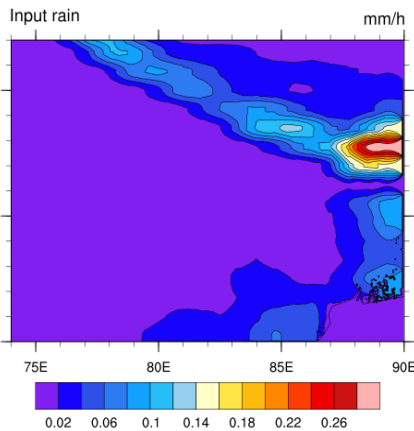


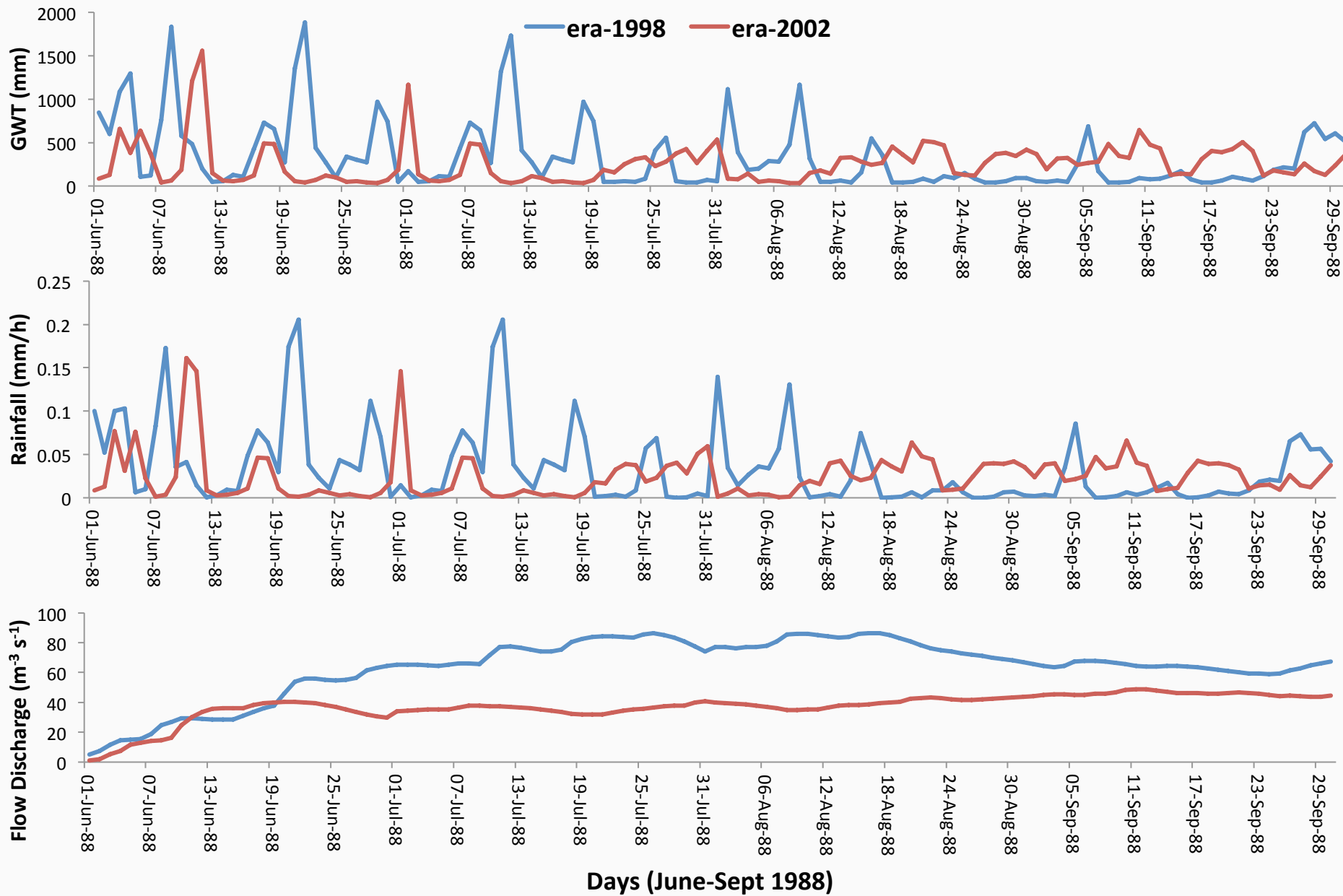
AUGUST

SEPTEMBER

AUGUST

SEPTEMBER





# Summary

- **Model static fields performed well over Ganga Basin.**
- **Model is able to differentiate between Observation (PERSIANN) and Model (RegCM) data for various parameters.**
- **Model differentiated well drought and flood year.**

**TERIMA KASIH**

**धन्यवाद**

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The Abdus Salam  
**International Centre  
for Theoretical Physics**