Assessment of Land-use/ Land-cover LULC and Climate change Impacts on Stream Flows and future precipitation in the Lower Srepok River Basin

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INTRODUCTION

- Srepok's catchment are undergoing rapid and intensive development, much of it based on agriculture.
- Hydropower development in the Srepok has been extensive, with five dams currently operating and two more proposed.
- In addition, there are large numbers of irrigation and water supply reservoirs throughout the catchment, as well as significant (although depleted) groundwater reserves.

(IWRP)

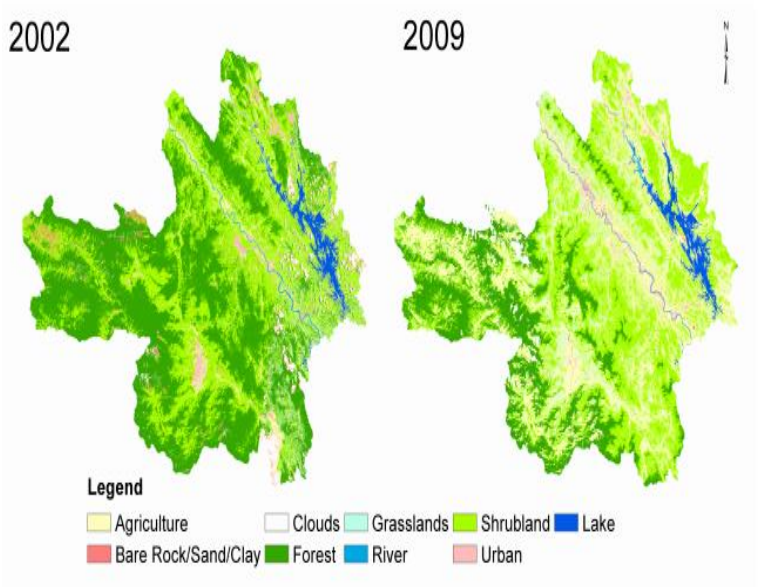
INTRODUCTION

- More than 11000 people coming from 9 ethnic groups in Cambodia are lower riparian.
- Riparian communities are dependent on fishing, lowland rice cultivation and collection of non-timber forests for their livelihoods.
- Major development of hydro-power project on upstream becomes difficult for riparian to make their ends meet.

(International Rivers)

LULC Change on precipitation and Runoff

Soil and Water Assessment Tool (SWAT) is applied to Yen Bai province, Vietnam for co-relation between precipitation, land cover and run-off. Soil erosion was the important finding in both scenarios which greatly affect the run-off. (Nguyen, Le, Pham, & Kappas, 2016)



LULC Change on precipitation and Runoff

Effects of LULC on run-off depth in the sub-basins of Ho Chi Minh City having Impervious Strata shared high CN values and high run-off contribution in comparison to other sub-basins. Co-relation co-efficient between run-off and CN with R^2 of 0.99 illustrates the strong co-relation between these two variables.(Dang & Kumar, 2017)

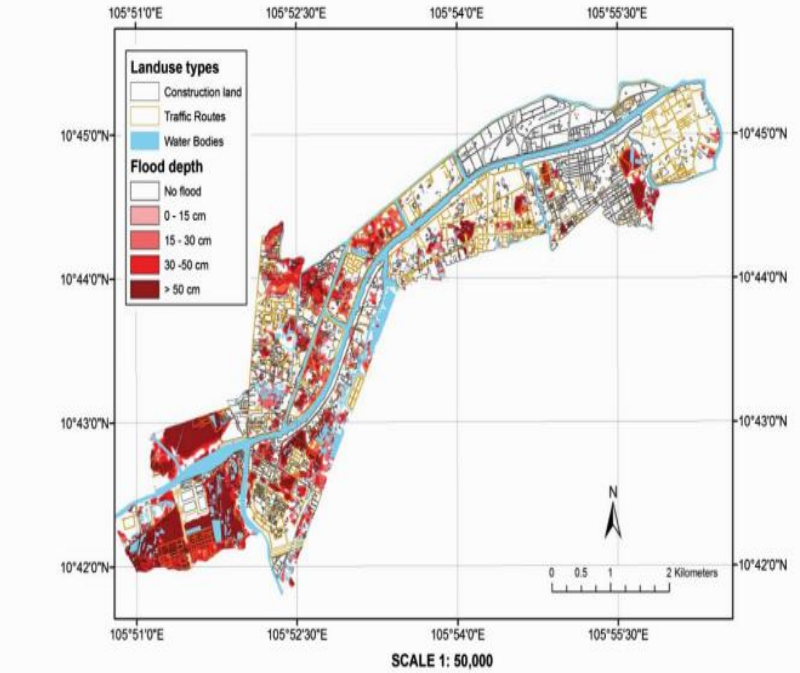


Figure 8. Map of simulated flooding caused by tides in District 8 of Ho Chi Minh City in the year 2010.

Future scenarios projections

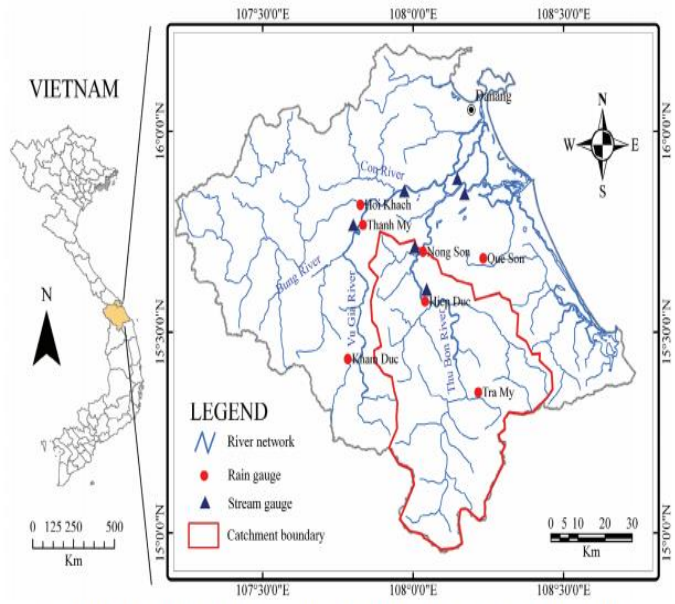


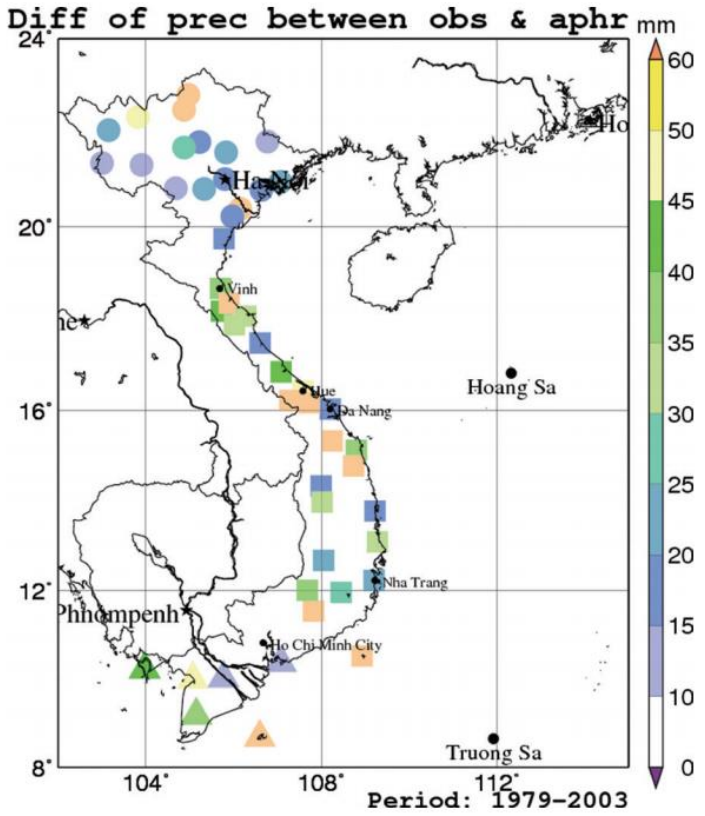
Fig. 1. Map of the Vu Gia-Thu Bon River system in Central Vietnam and locations of hydro-meteorological stations.

A1B scenario simulated by the CGCM model (MRI & JMA) 300 km resolution were statistically downscaled for run-off analysis at the upper Thu Bon River basin in central Vietnam. The results show that by the middle and end of this century annual rainfall will increase slightly. Temperature and potential evapotranspiration is also projected to increase as well. Run-off will decrease in dry season and will increase in rainy season. (Udo, Mano, & Sciences, 2012)

Future scenarios projections

In near and far future, the projected rainfall by NHRCM using outputs of GCM 3.2 of the MRI with RCP8.5 scenario will clearly decrease in Northwest and Central Vietnam in June-August, while it will remarkably increase in Northeast and Central Vietnam in September-November.

(Kieu-Thi et al., 2016)



Objectives of Research

- To Evaluate the future precipitation trends of future GCM scenarios.
- To Analyze impacts of LULC surface run-off using SWAT .

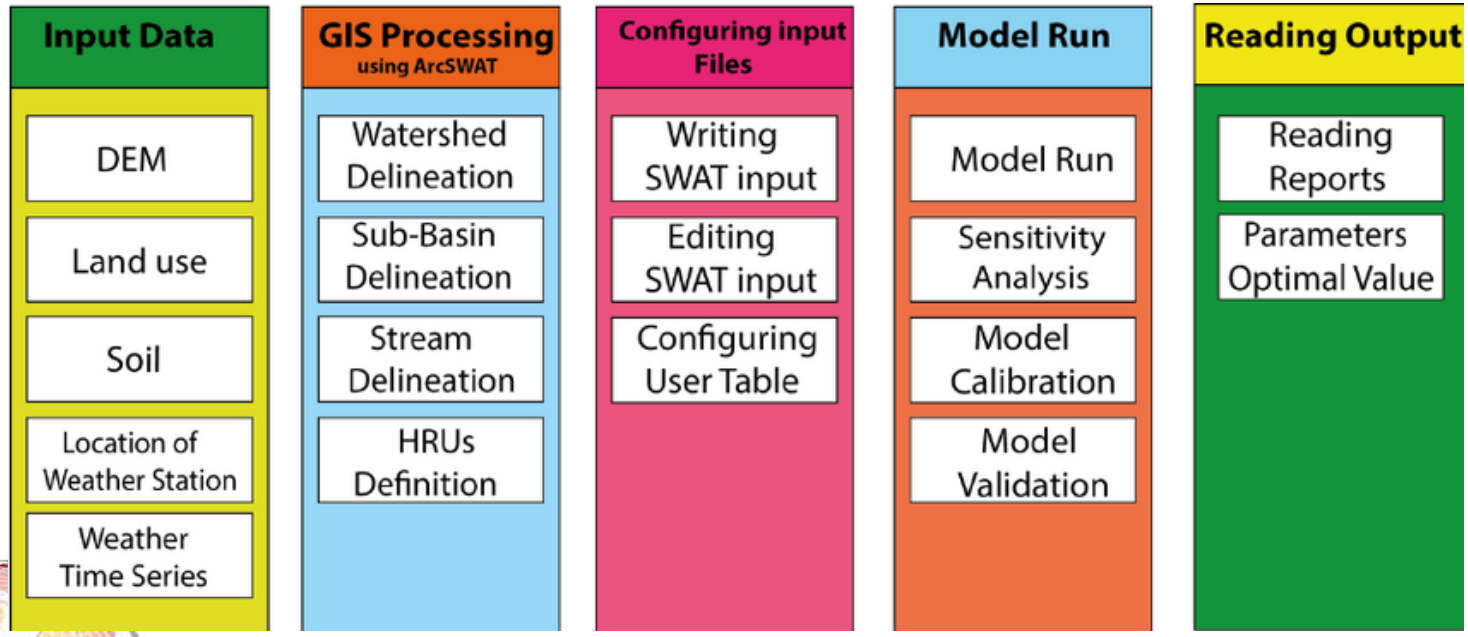
Materials and Methods

Brief Introduction of SWAT Model

- Soil and Water Assessment tool SWAT is a comprehensive, semi-distributed, continues long period, hydrologic quality and quantity river basin model developed by USDA-ARS in 1990.
- Model operates on daily time-step and designed to predict the impact of land management on water resources, sediment and agriculture management in ungauged watersheds.

Materials and Methods

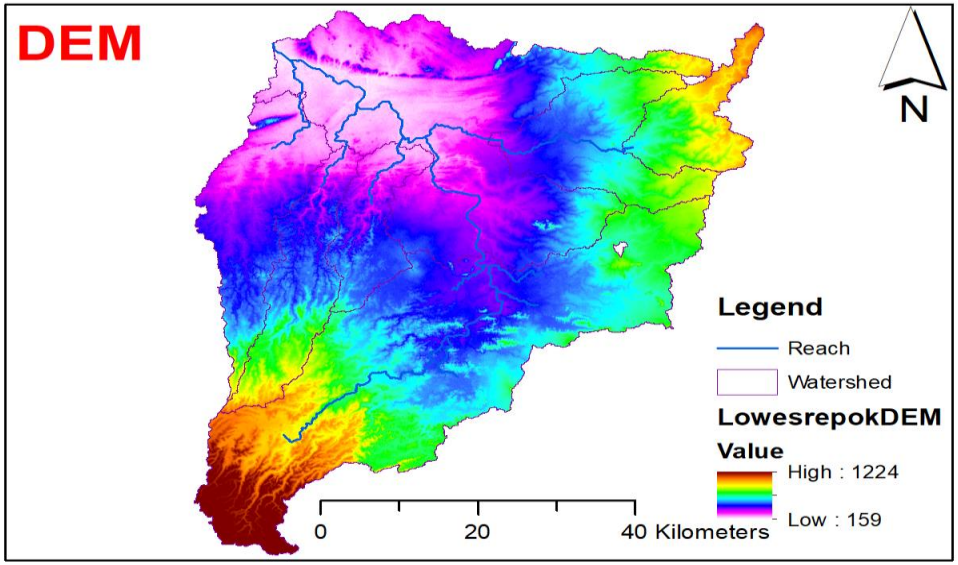
- SWAT needs the basic data for calculating and adjusting the results.

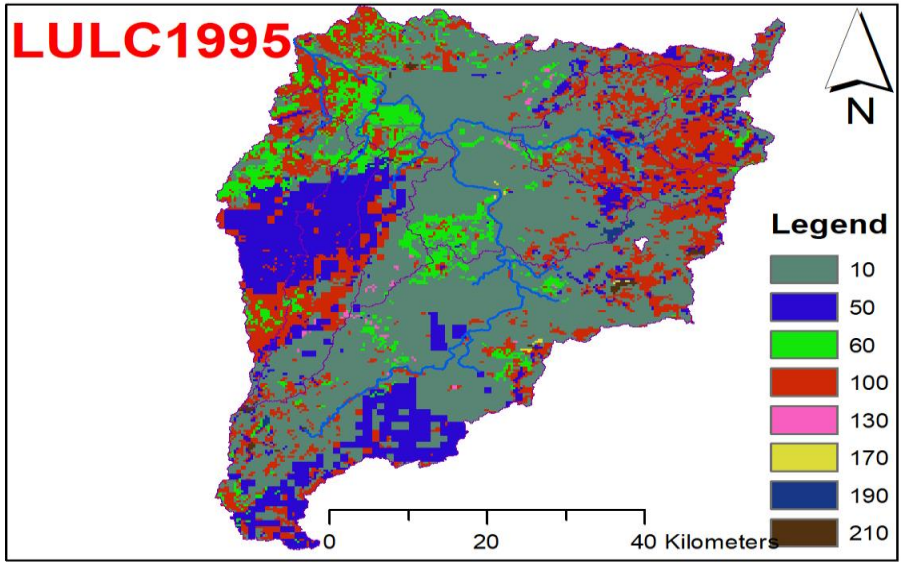


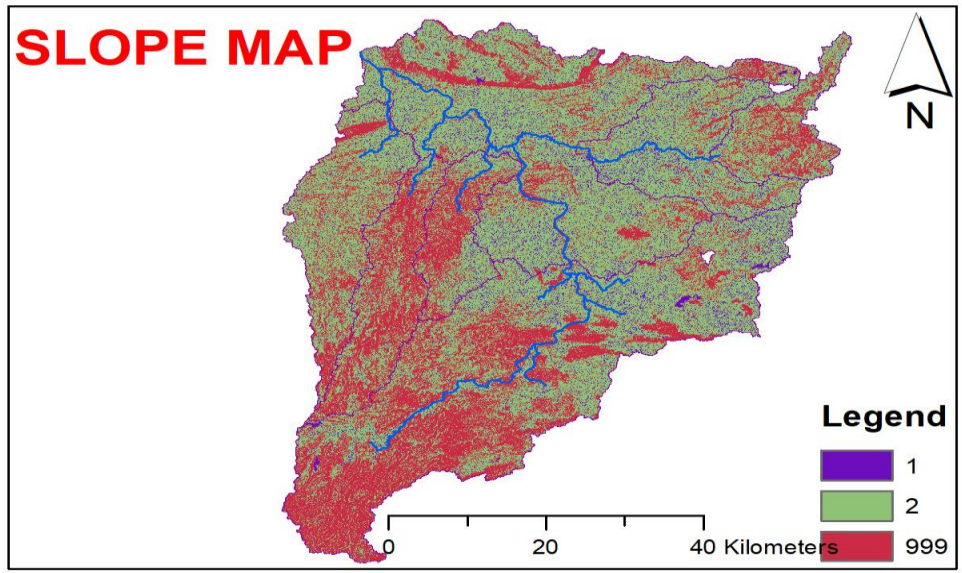
Data Sources

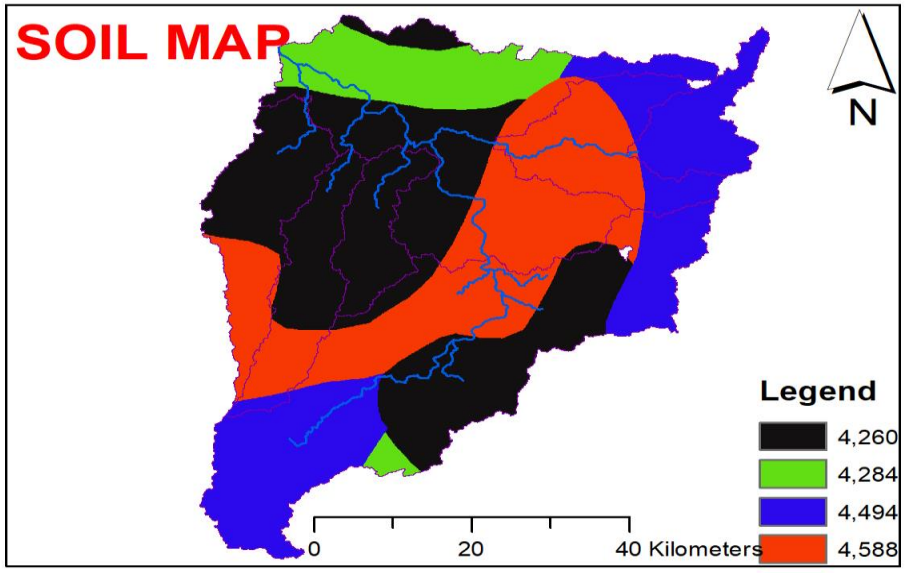
Sort	Description	Sources	Format
DEM	90m Resolution	USGS	Raster
LULC	90m Resolution	ESA	Raster
Soil Data	Soil FAO 1;50000	FAO UNESCO	ESRI SHP FILE
Weather Data	Precipitation, Solar, Relative Humidity, Temperature, Wind	CFSR	DBF
Observed Data	Discharge	MWR	TXT

Input Parameters

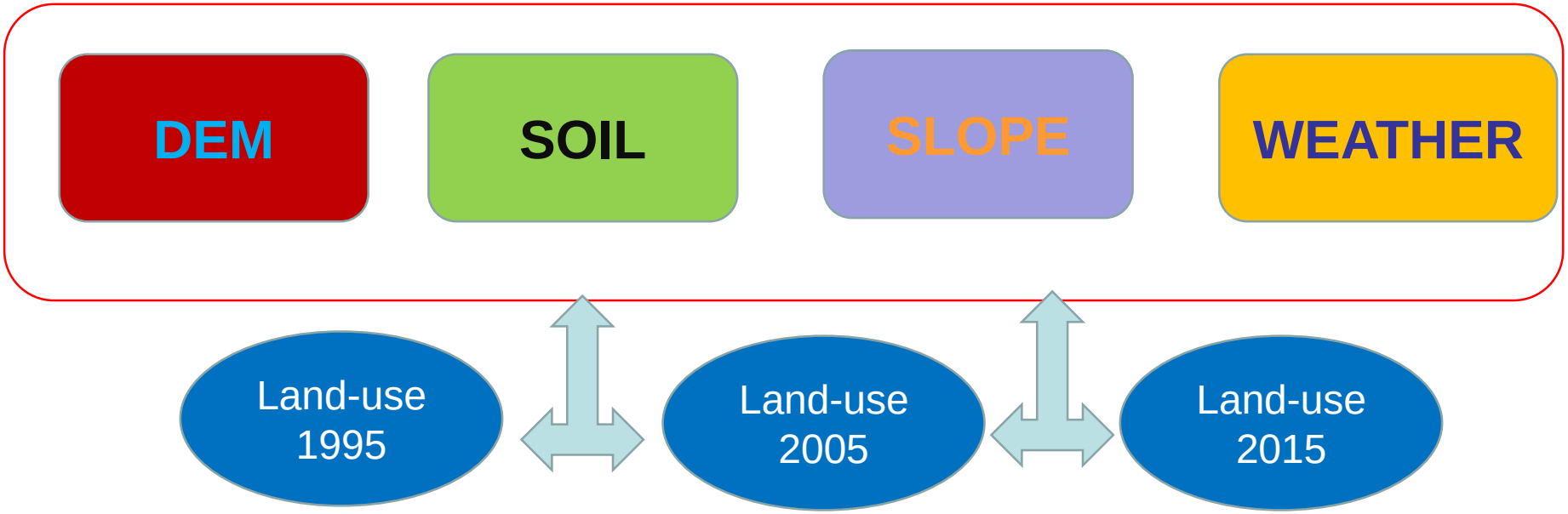




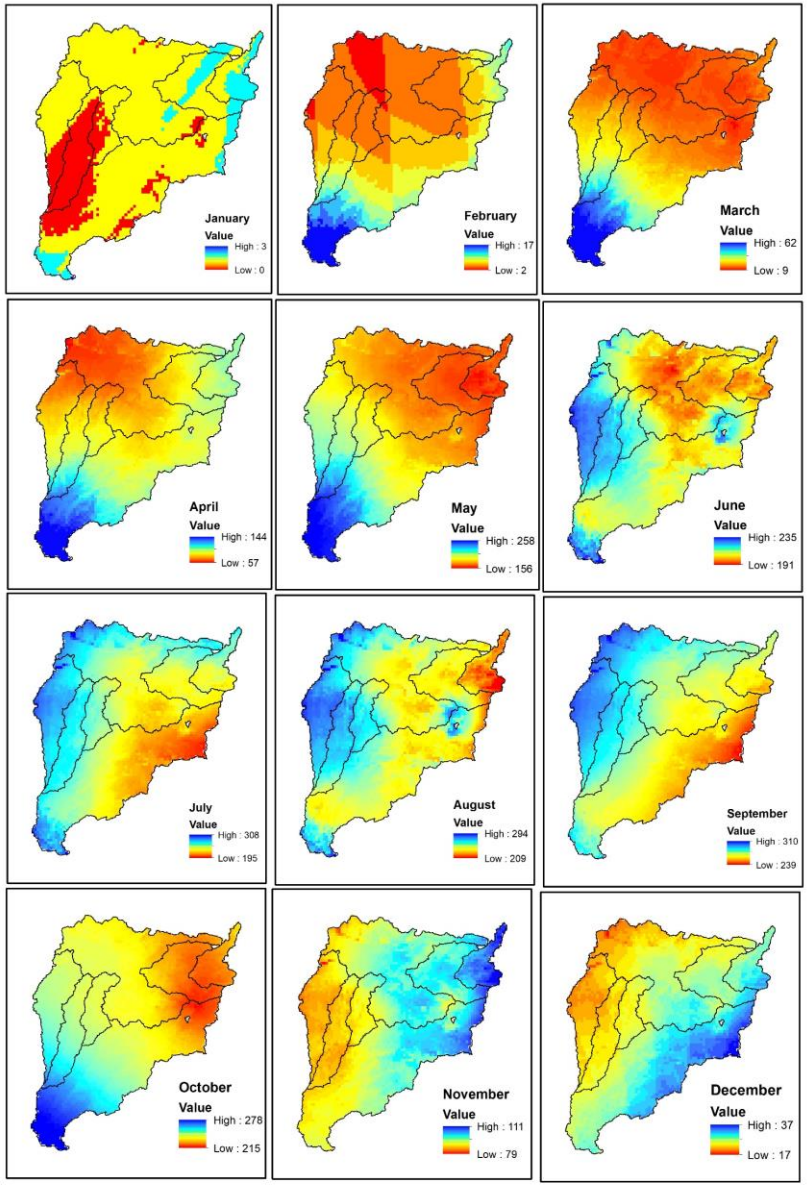




Methodology



CSIRO-ACCESS1.3
RCP-4.5 (2030s)



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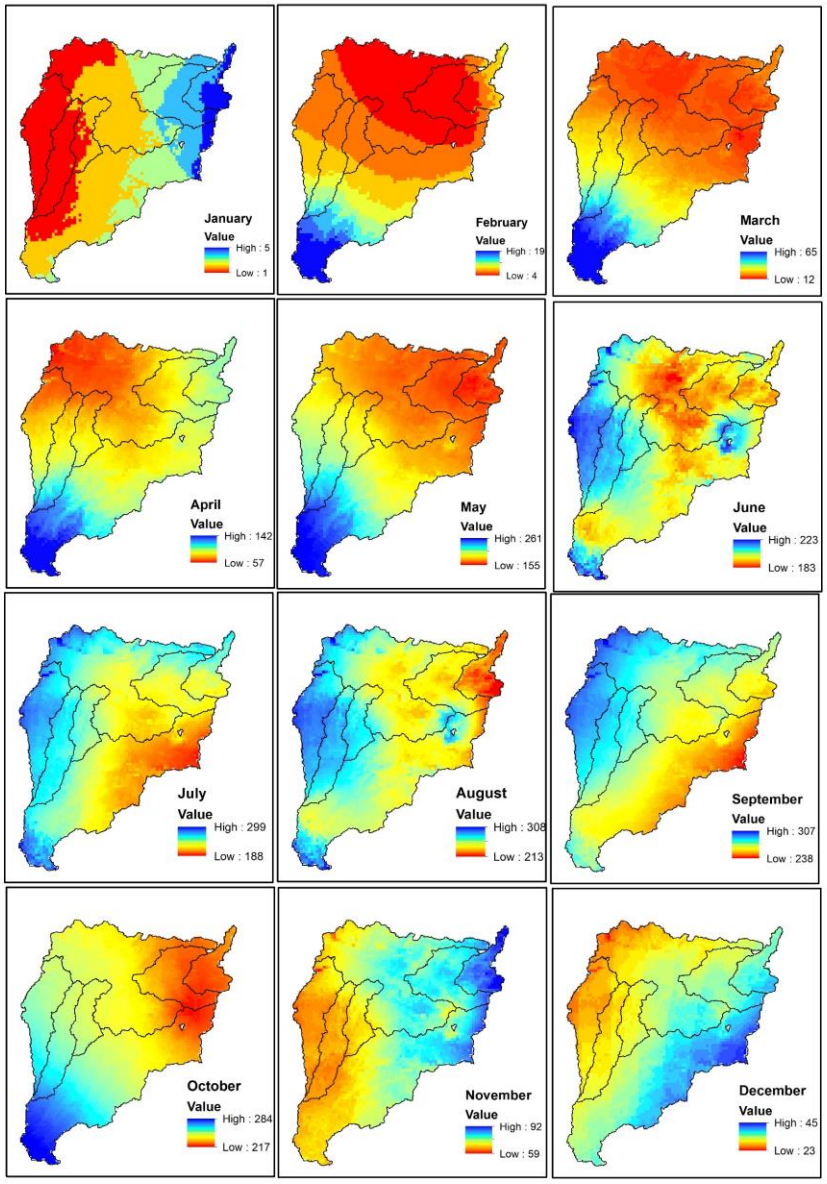
RCP-4.5 (2050s)



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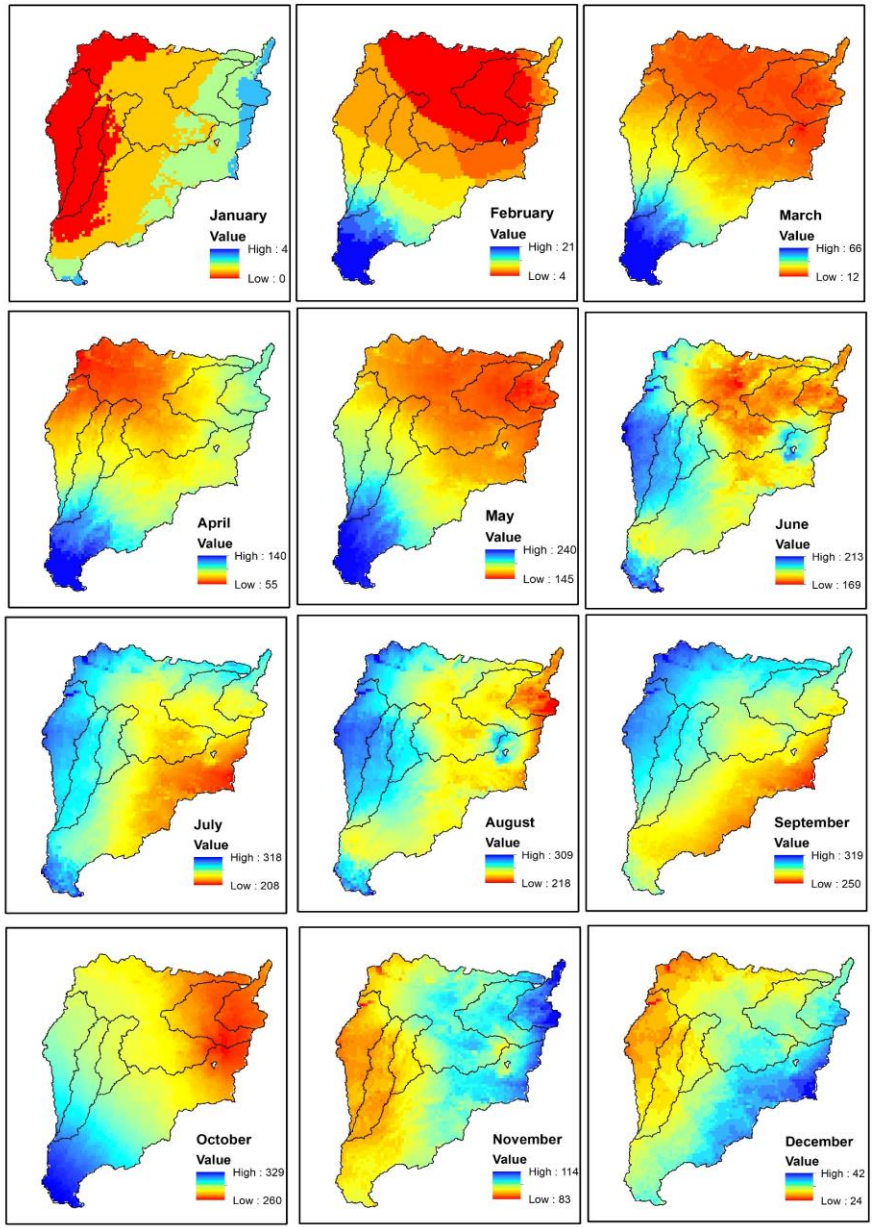

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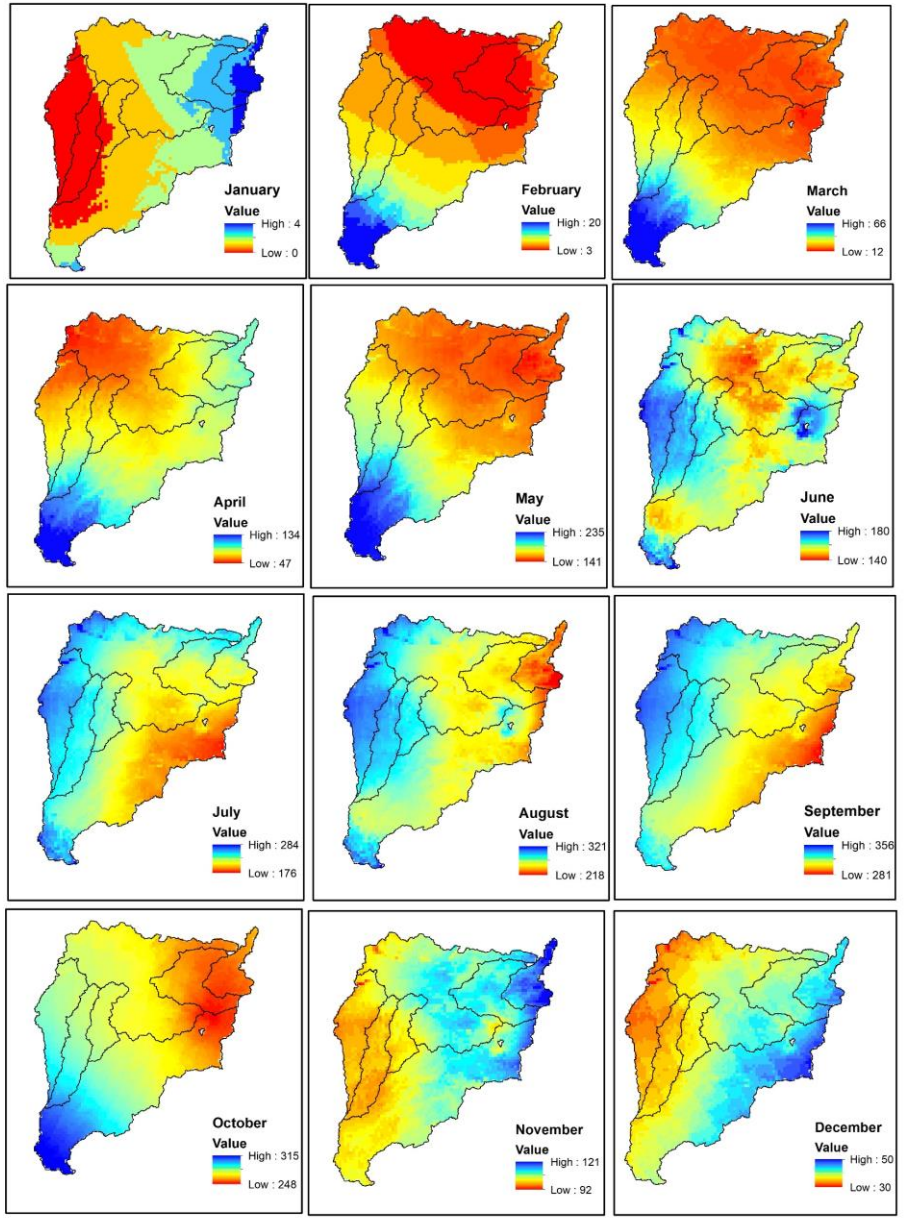
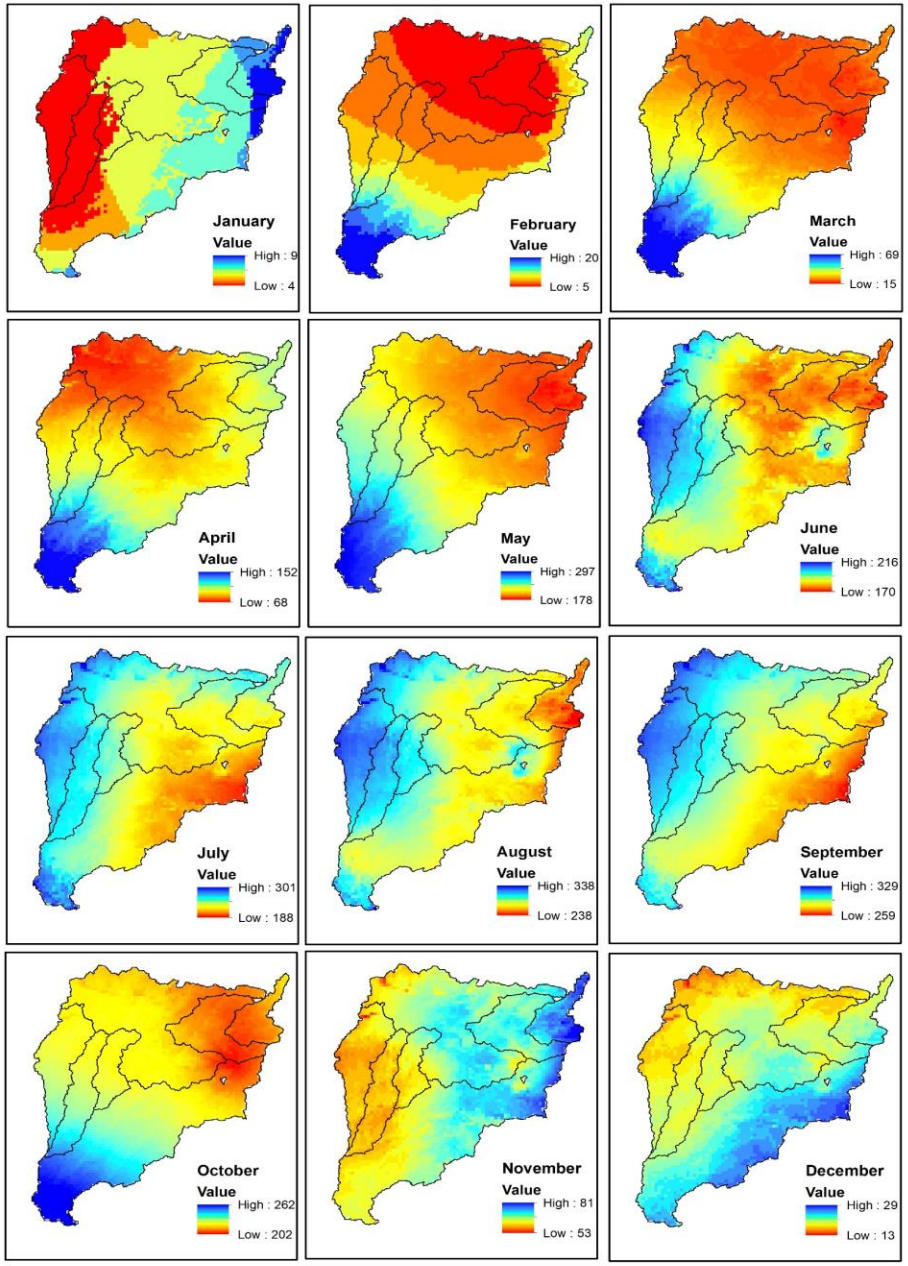


CSIRO-GFDL-CM3-RCP-4.5 (2030s)



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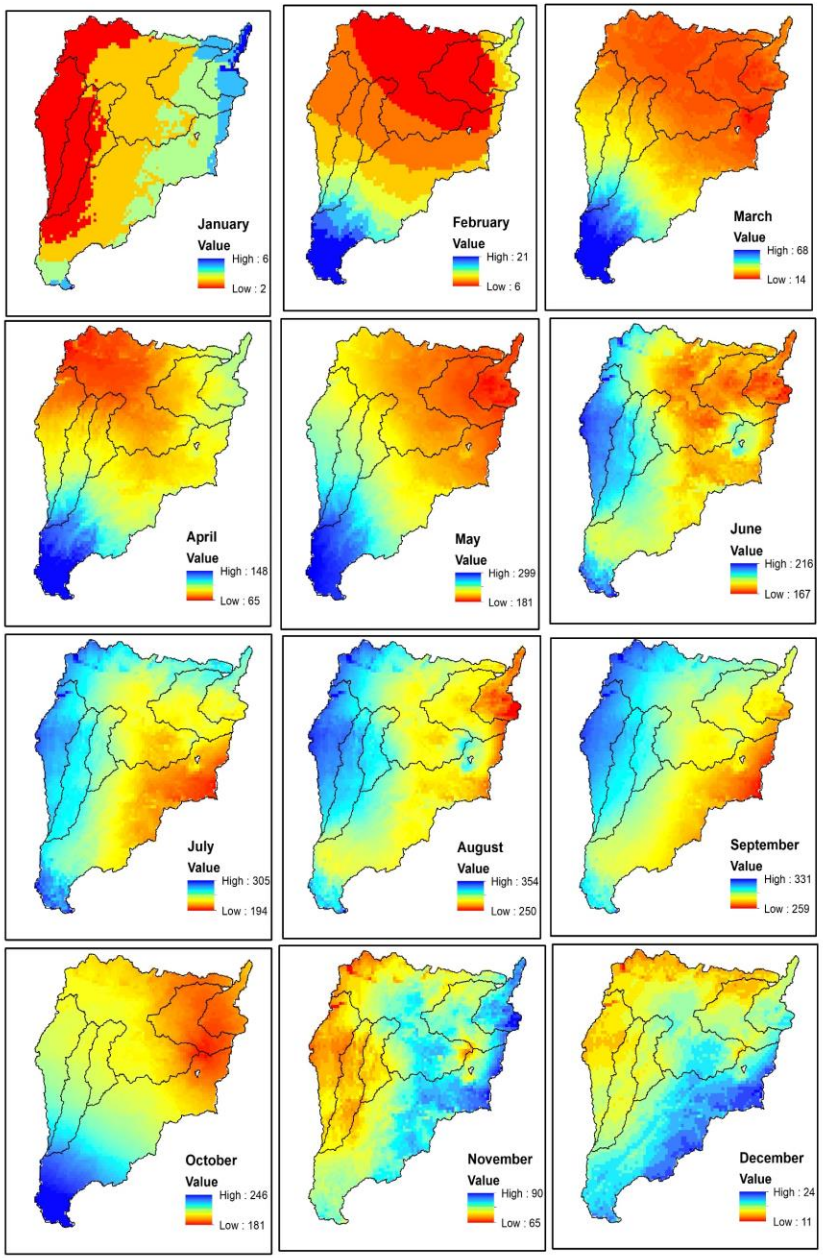

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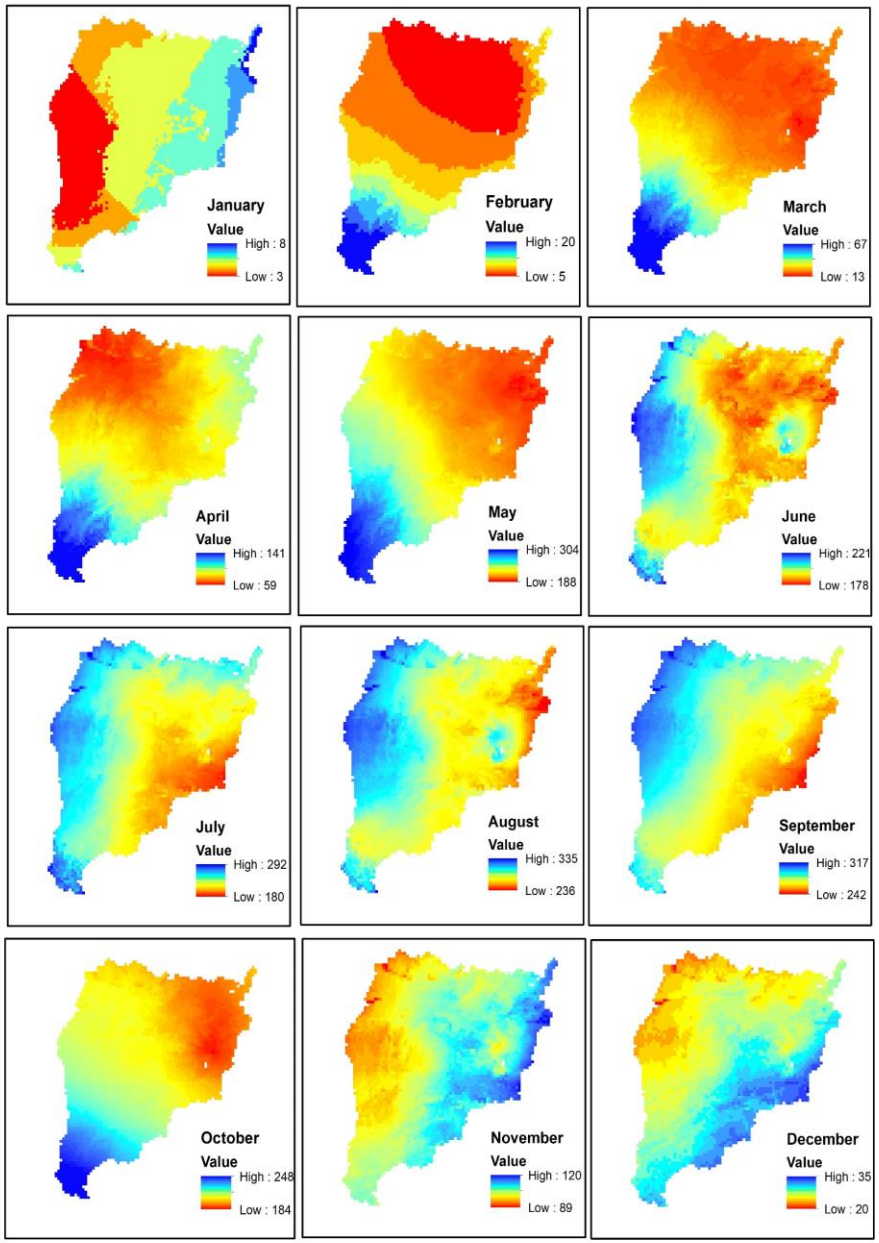

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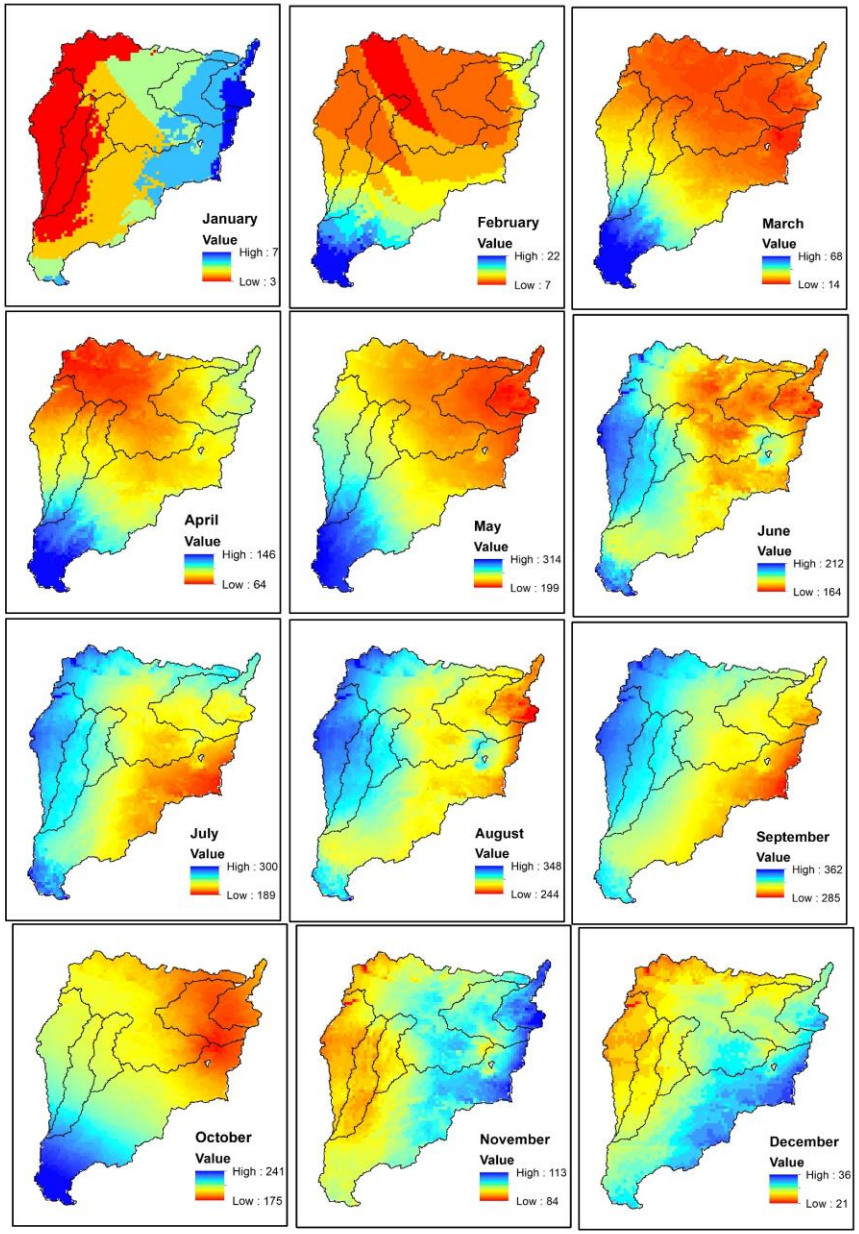
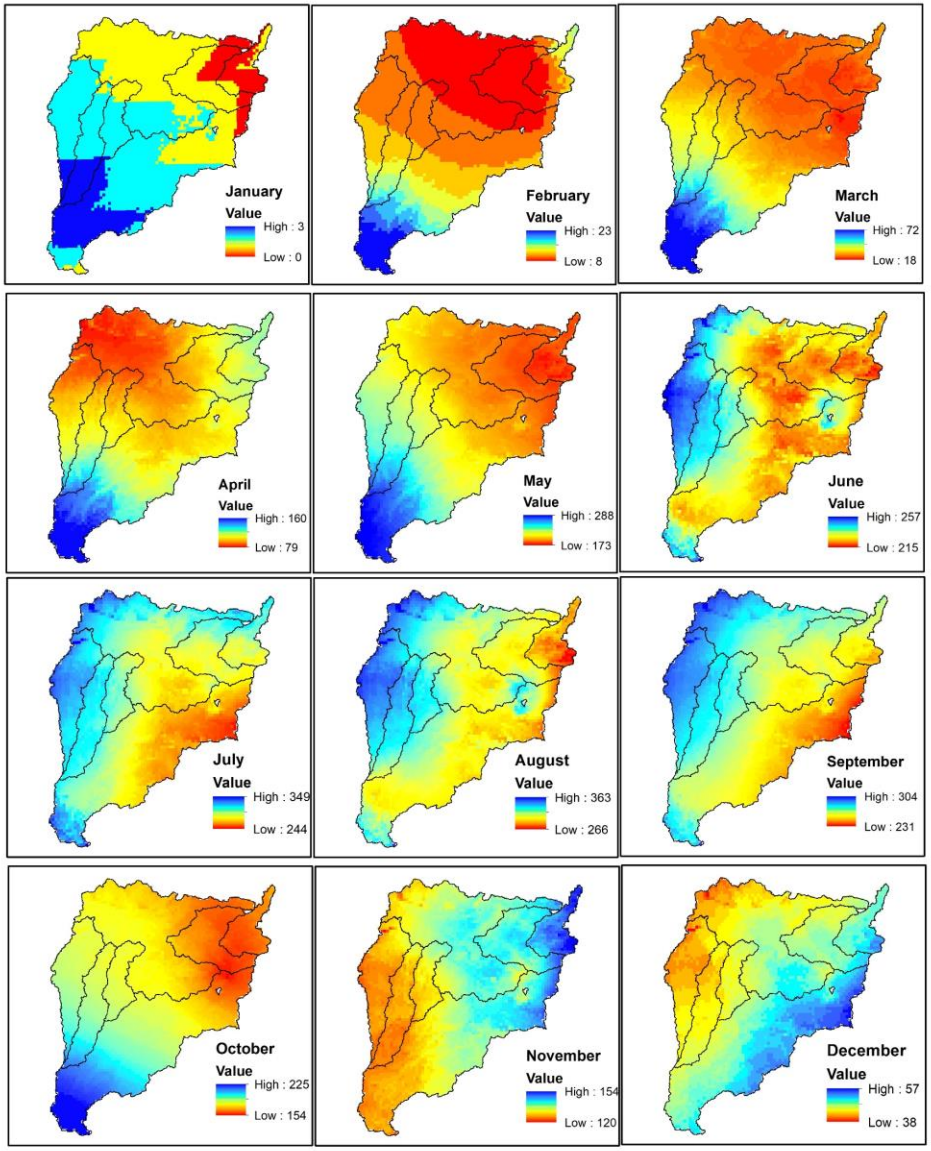


IPSL-CM5A-LR-RCP-4.5 (2030s)



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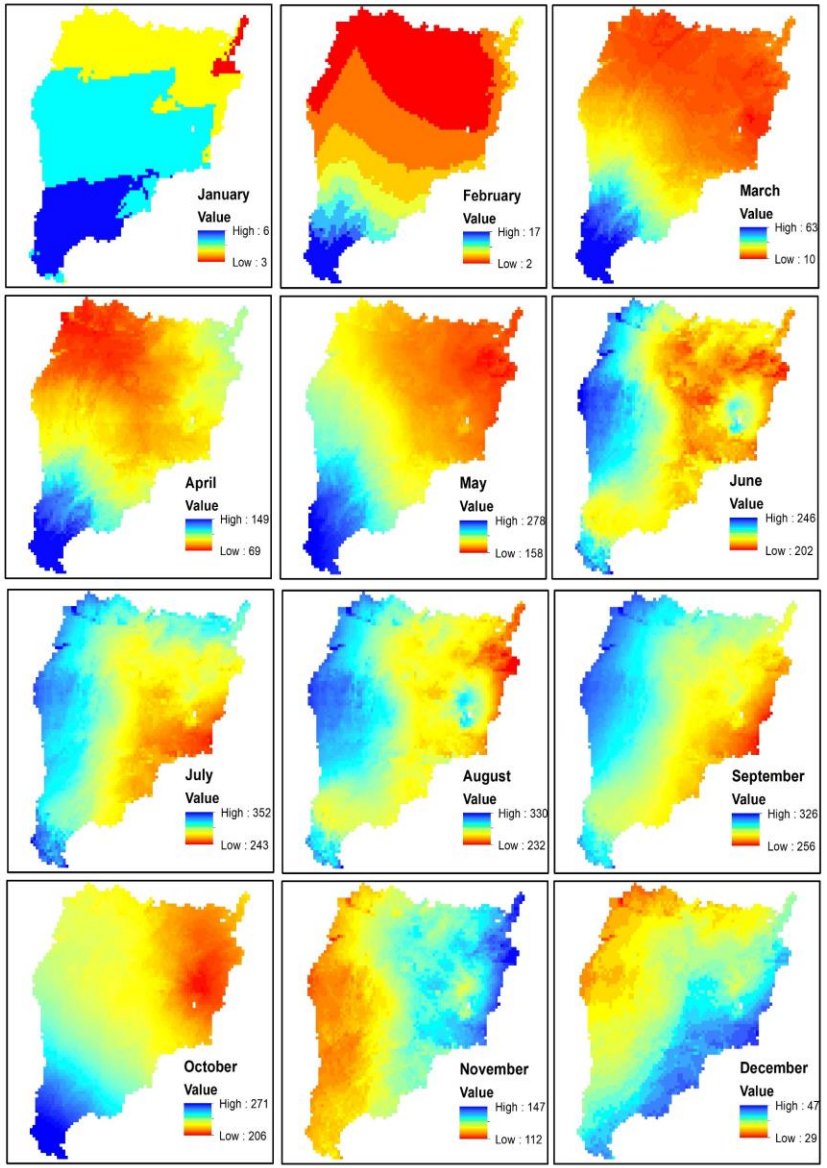

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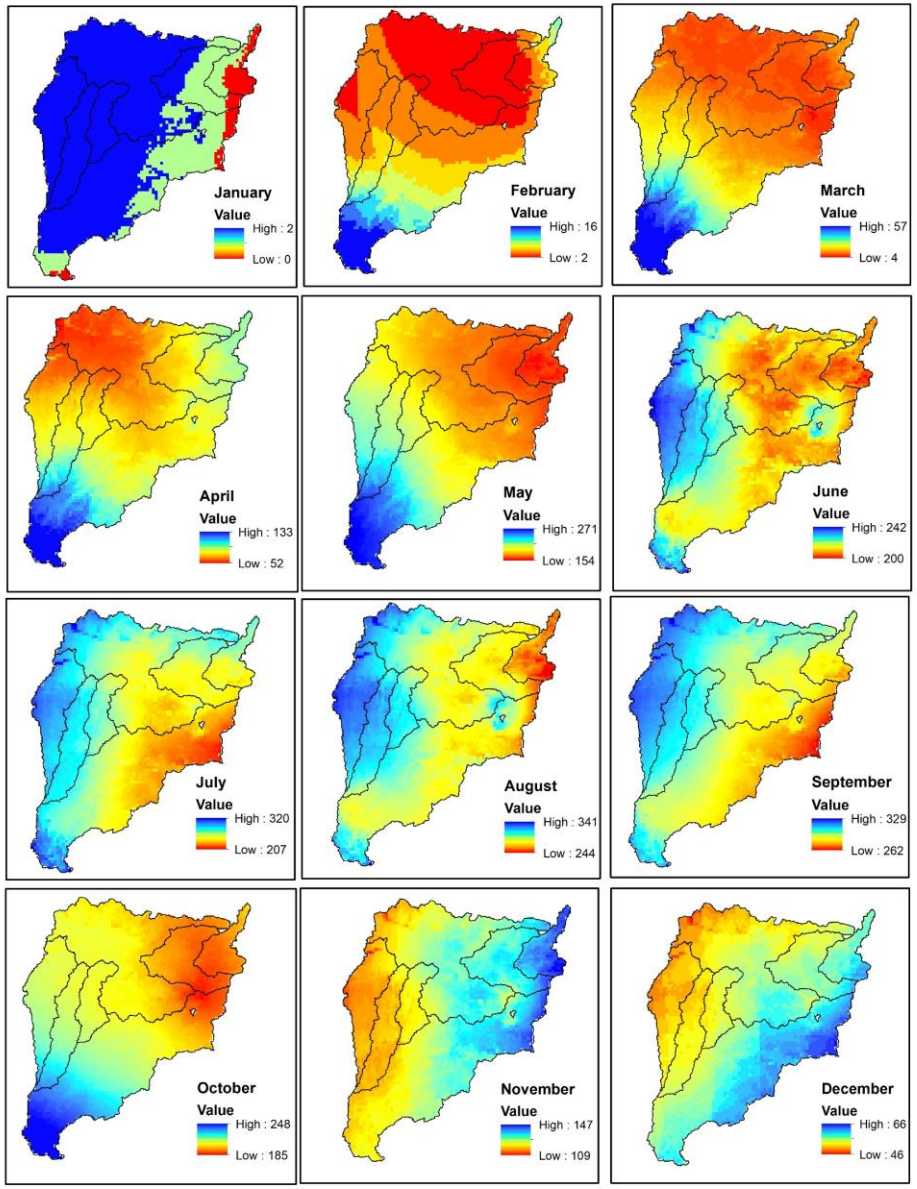

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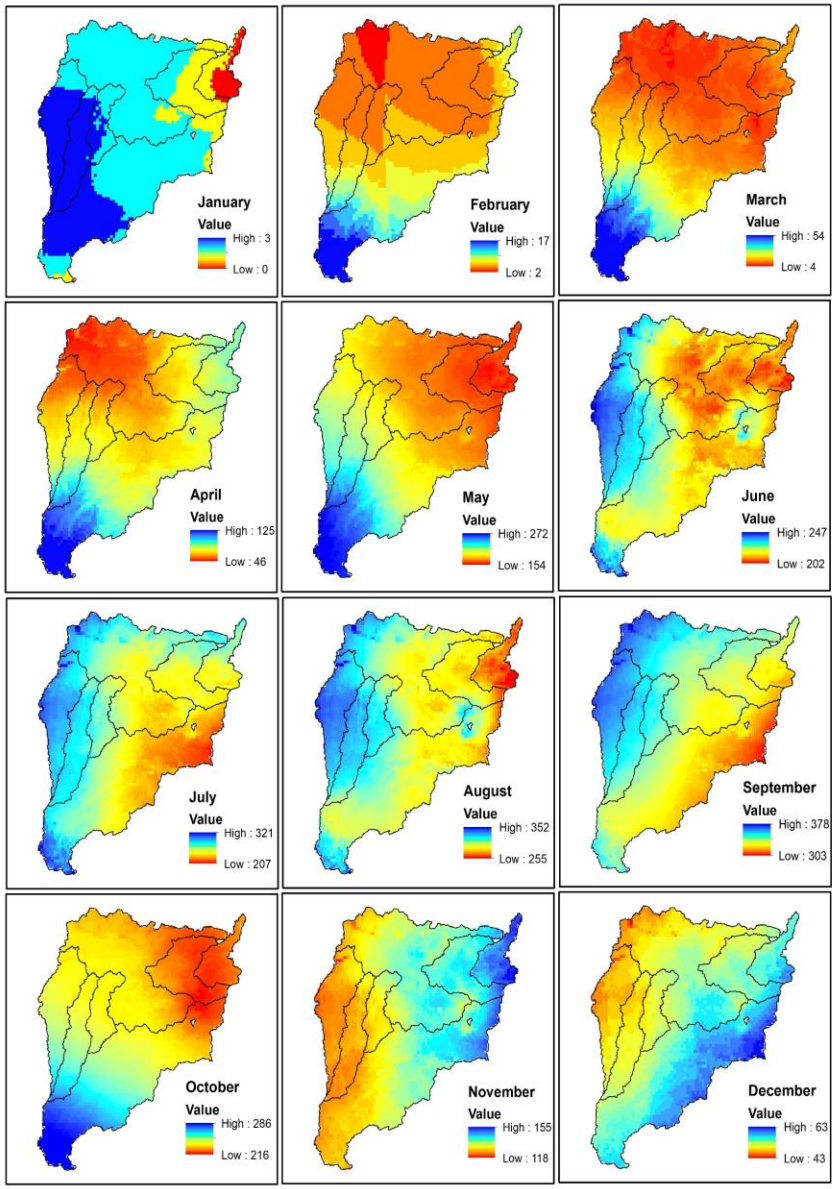
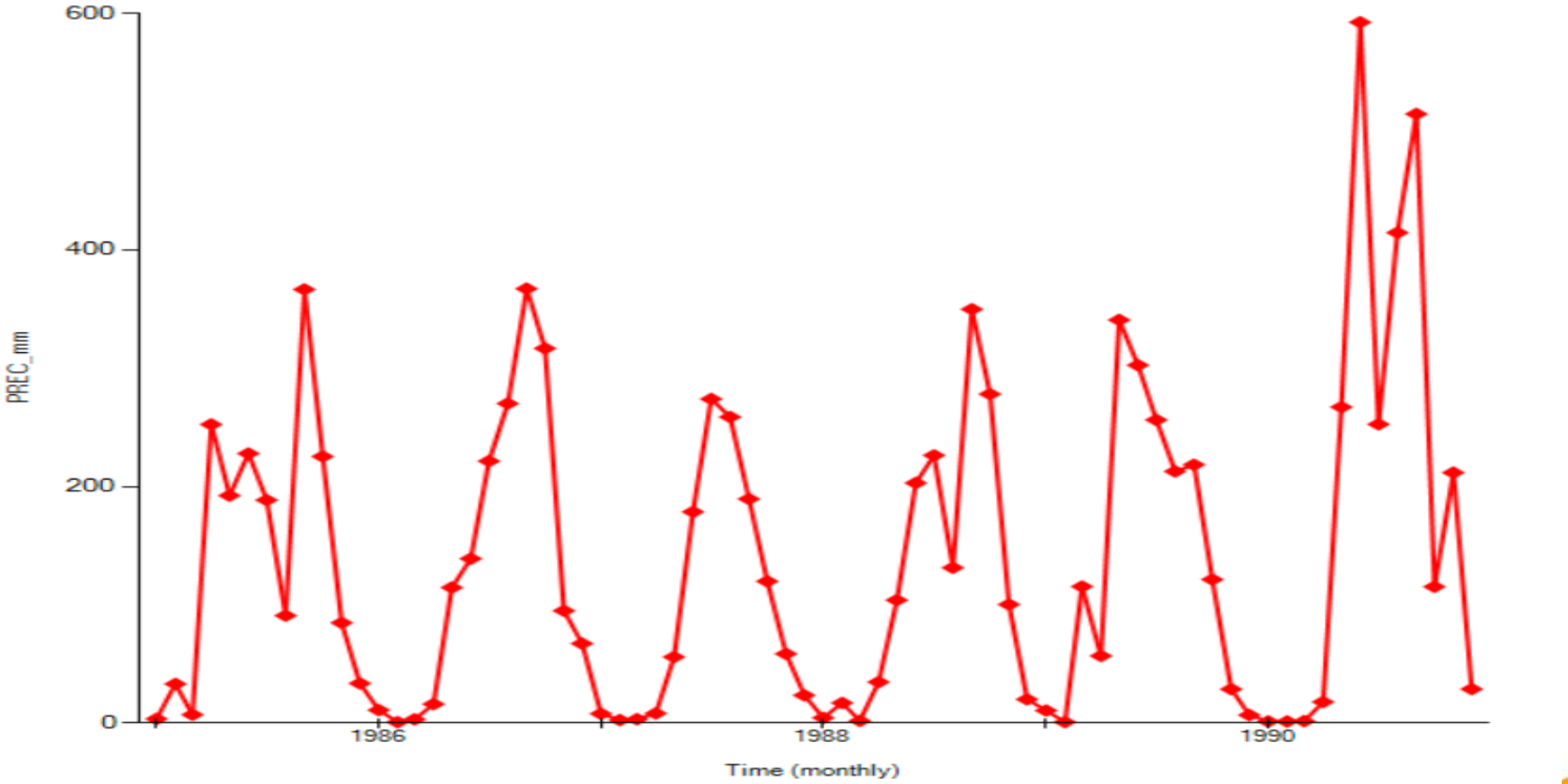
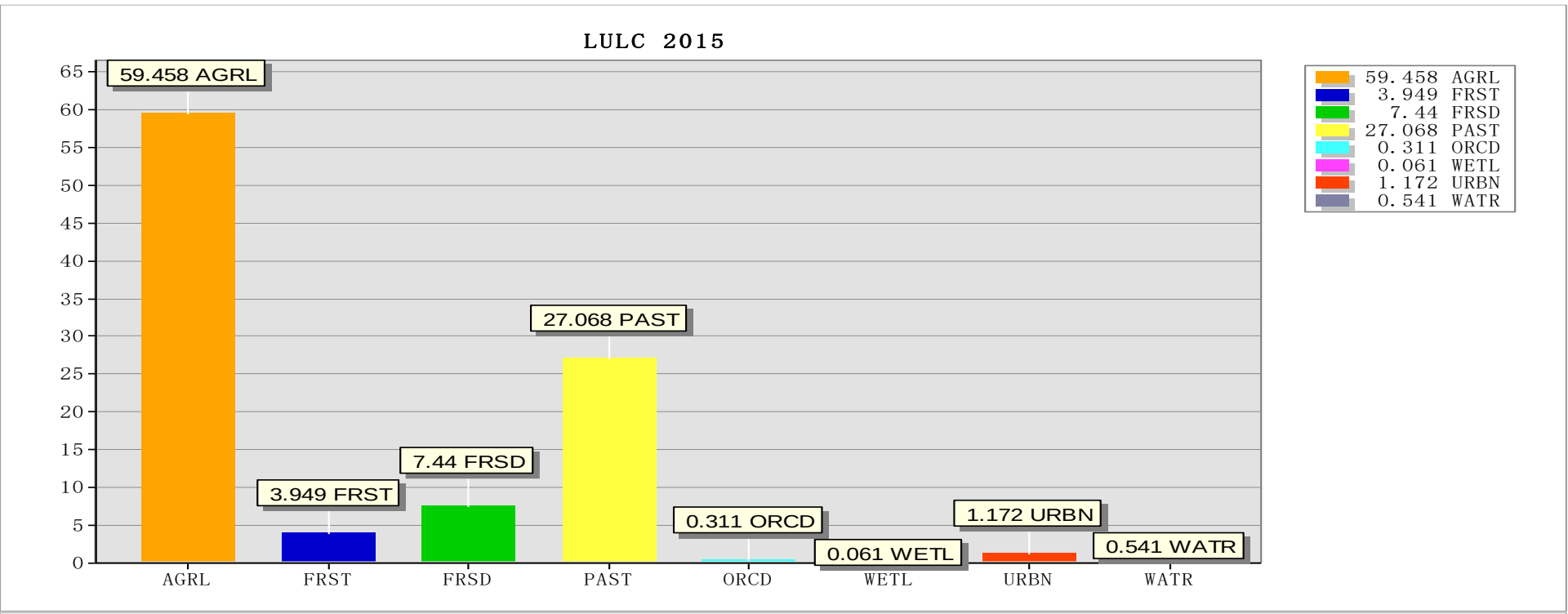
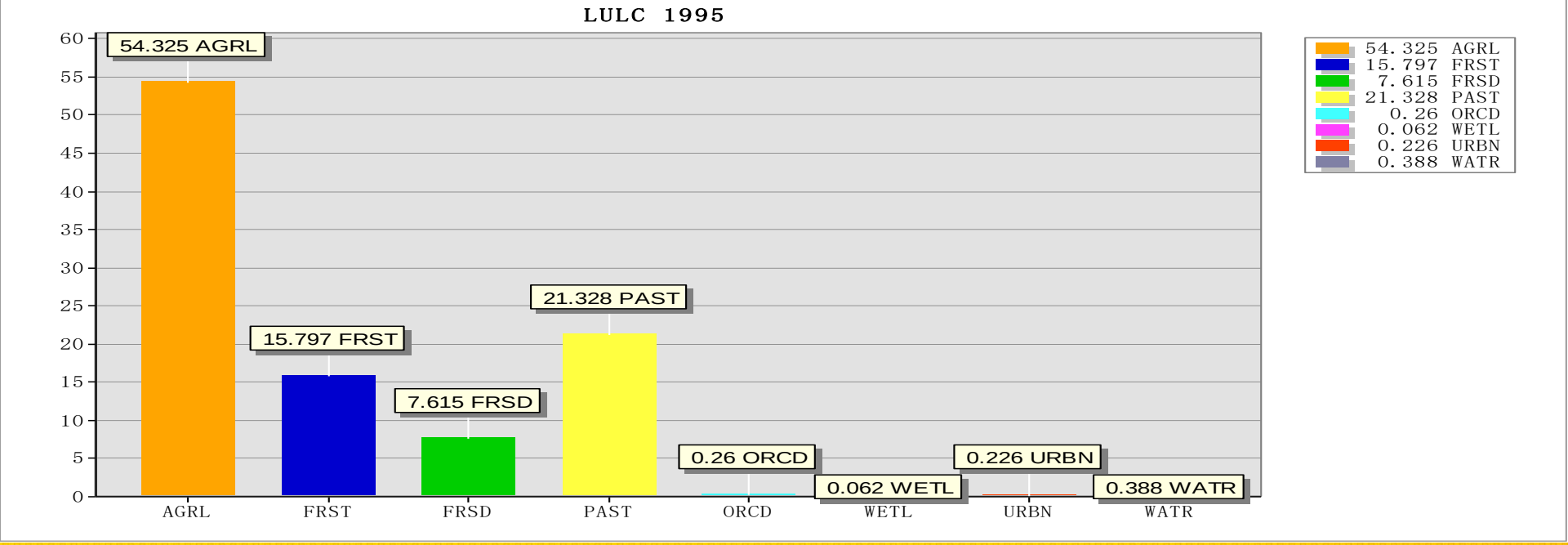
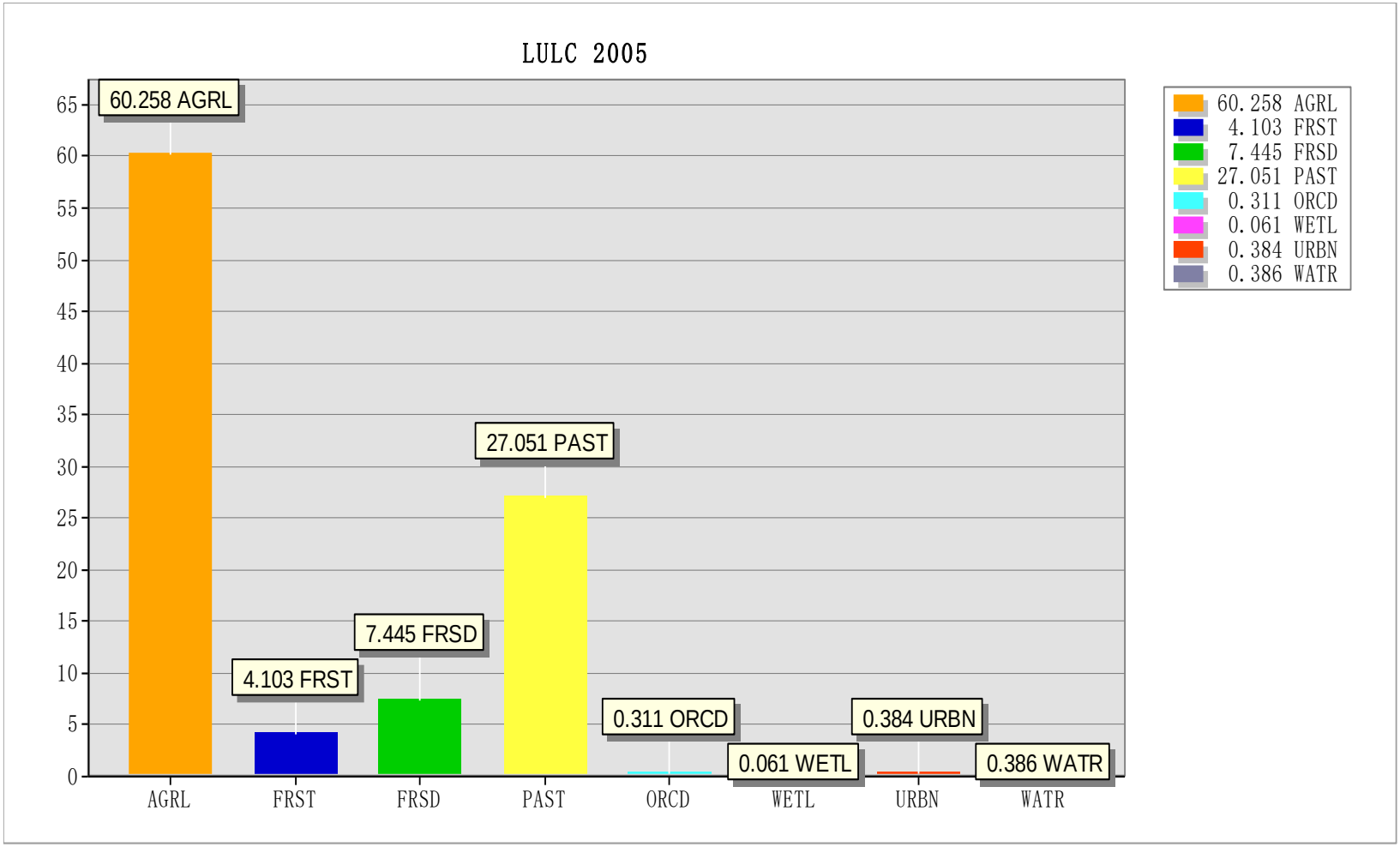


Historical Monthly Precipitation

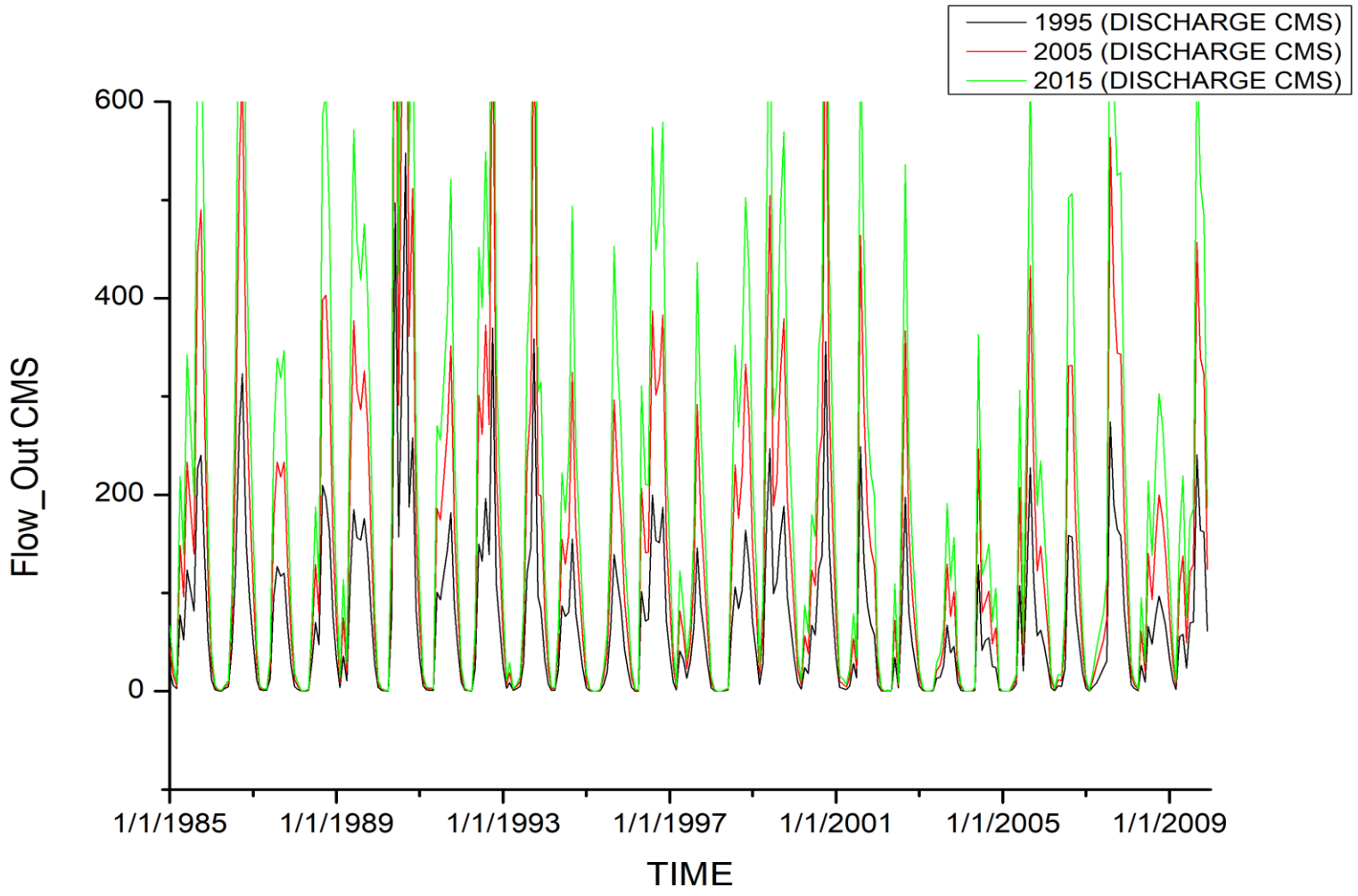



LULC 2015
59.458 AGRL
3.949 FRST
7.44 FRSD
27.068 PAST
0.311 ORCD
0.061 WETL
1.172 URBN
0.541 WATR
AGRL
FRST
FRSD
PAST
ORCD
WETL
URBN
WATR


LULC 1995
54.325 AGRL
15.797 FRST
7.615 FRSD
21.328 PAST
0.26 ORCD
0.062 WETL
0.226 URBN
0.388 WATR
AGRL
FRST
FRSD
PAST
ORCD
WETL
URBN
WATR

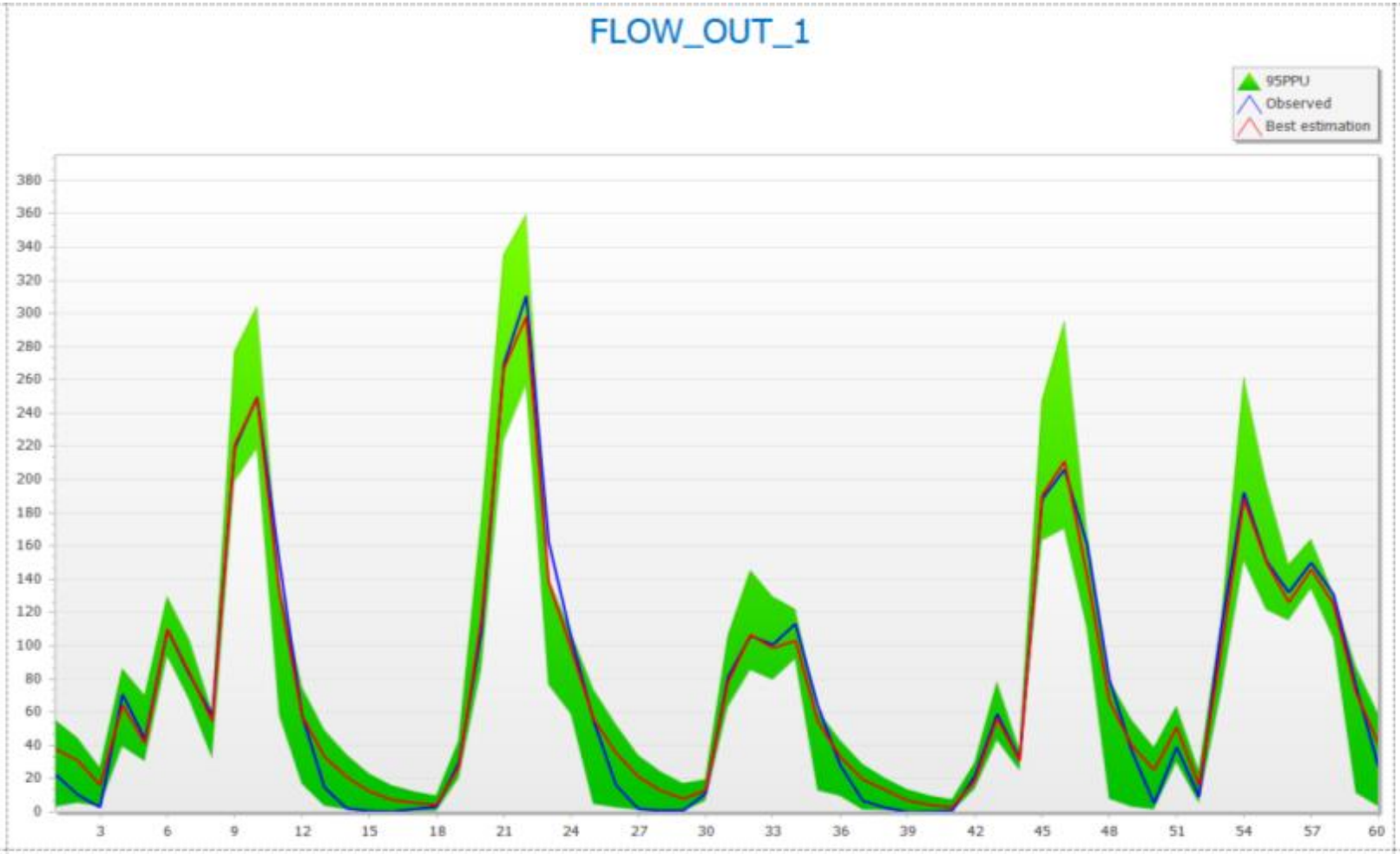

LULC 2005
60.258 AGRL
4.103 FRST
7.445 FRSD
27.051 PAST
0.311 ORCD
0.061 WETL
0.384 URBN
0.386 WATR
65
60
55
50
45
40
35
30
25
20
15
10
5
0
AGRL
FRST
FRSD
PAST
ORCD
WETL
URBN
WATR
60.258 AGRL
4.103 FRST
7.445 FRSD
27.051 PAST
0.311 ORCD
0.061 WETL
0.384 URBN
0.386 WATR

SWAT OUTPUTS

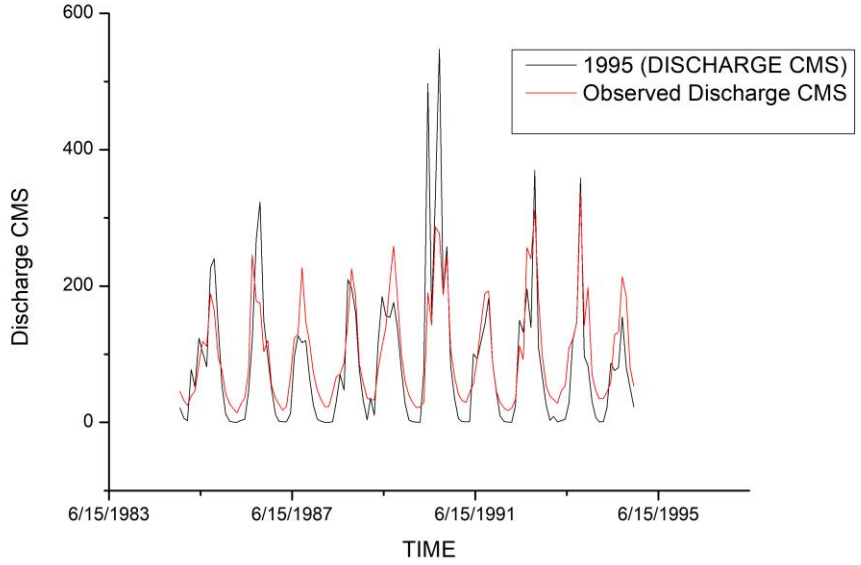


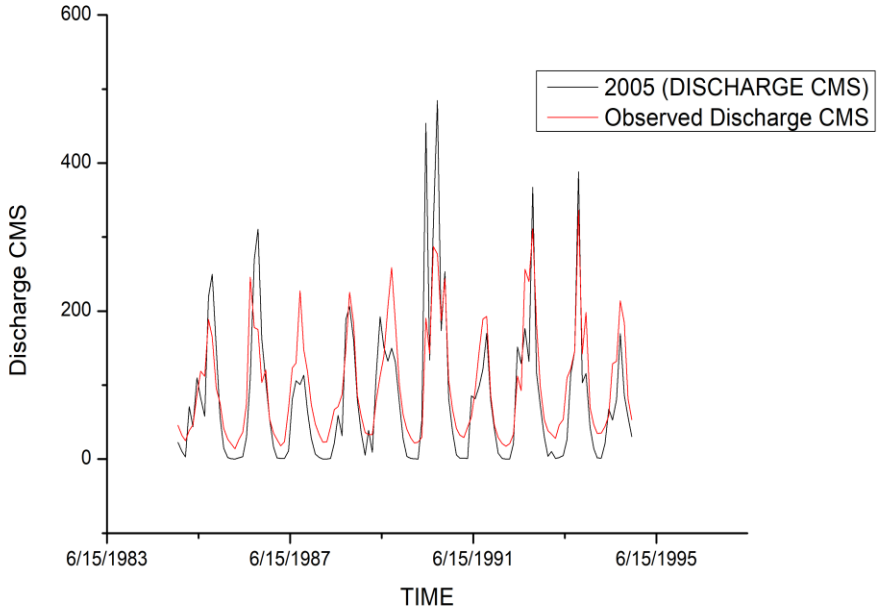
SWAT CALIBERATION

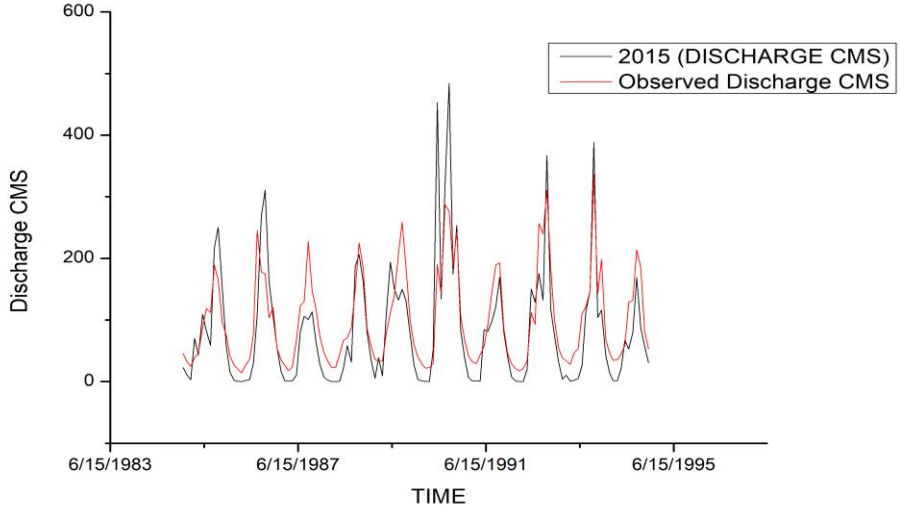
Variable	p-factor	r-factor	R2	NS	bR2	KGE
FLOW_OUT_1	0.97	0.59	0.99	0.98	0.9123	0.93



LULC1995,2005,2015







Conclusion

- RCP-4.5 shows that precipitation in 2050s will slightly increase than 2030s.
- RCP-8.5 have inverse results and shows decrease in 2050s as compare to 2030s precipitation.
- LULC have very slightly effect on run-off trends.

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