



Climatic control on inter-annual and inter-seasonal variability in Beas basin

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Introduction

- Climate change and growing anthropogenic activities enhance the intensity and frequency of extreme weather events.
- Temperature and rainfall are the key parameters to study climate change. Hence, it becomes crucial to analyse the trends in temperature and rainfall.

Study area

- Located in the northwestern Himalayas, Beas River is one of the major tributaries of the Indus River system.
- Spanning a distance of 460 kilometres, the Beas River is a vital source of sustenance for the 20 million population along its path.
- The geographical coordinates of the Beas River basin span from latitudes 31° 15' N to 32° 30' N and longitudes 75° 30' E to 78° 0' E.

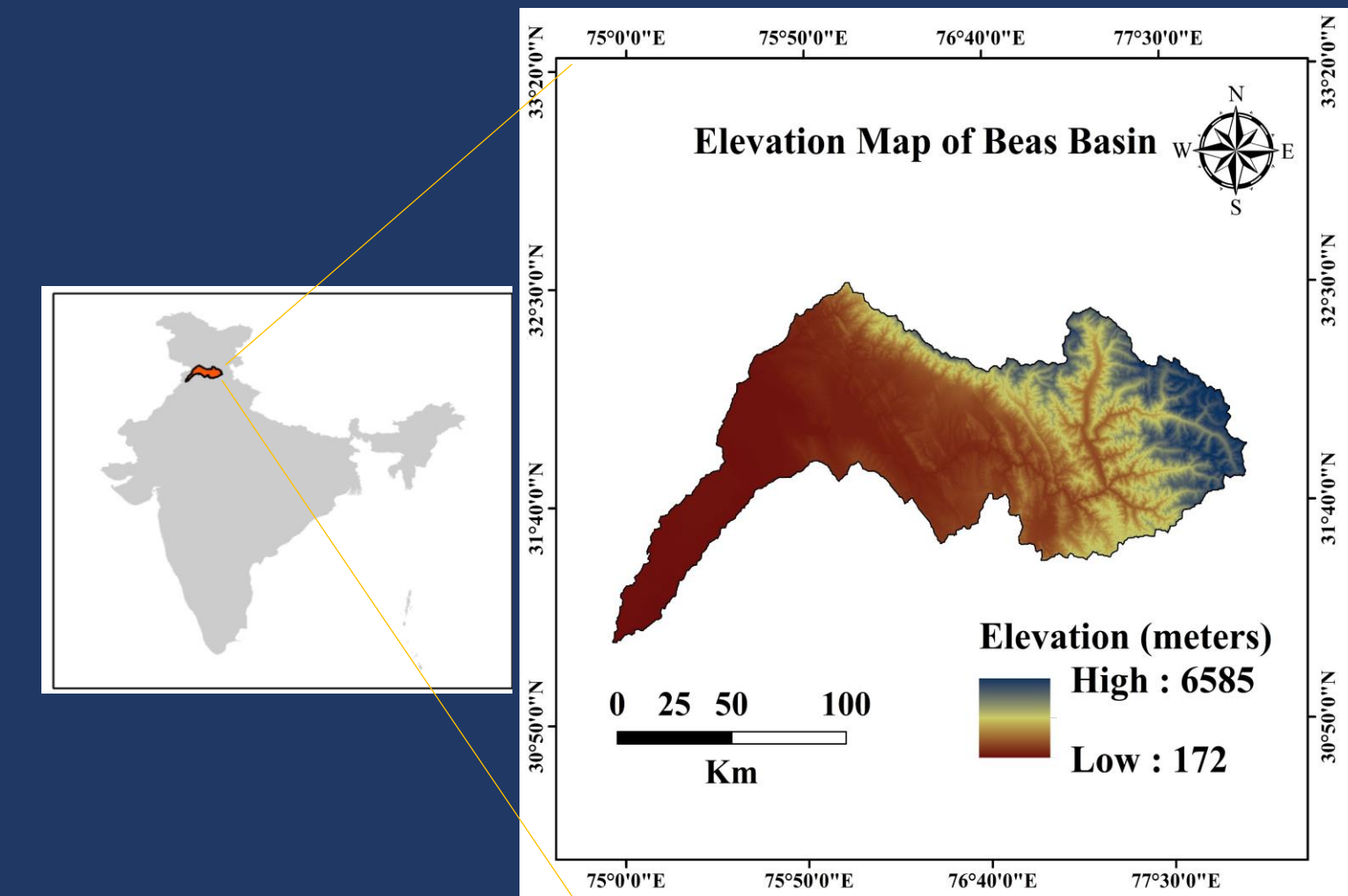


Fig 1. Elevation map of the study area Beas Basin

Materials& Methods

Data	Resolution	Source
IMD station	Point	IMD
ERA-5	25 km	ECMWF
Terra climate	4 km	World-clim

Fig 2. Datasets used for the study

- The Mann-Kendall and modified Mann-Kendall tests have been applied to detect trends and variations in temperature and rainfall.
- Descriptive statistics have been done to see the variability in meteorological parameters.

Result: Spatiotemporal Analysis of Variables

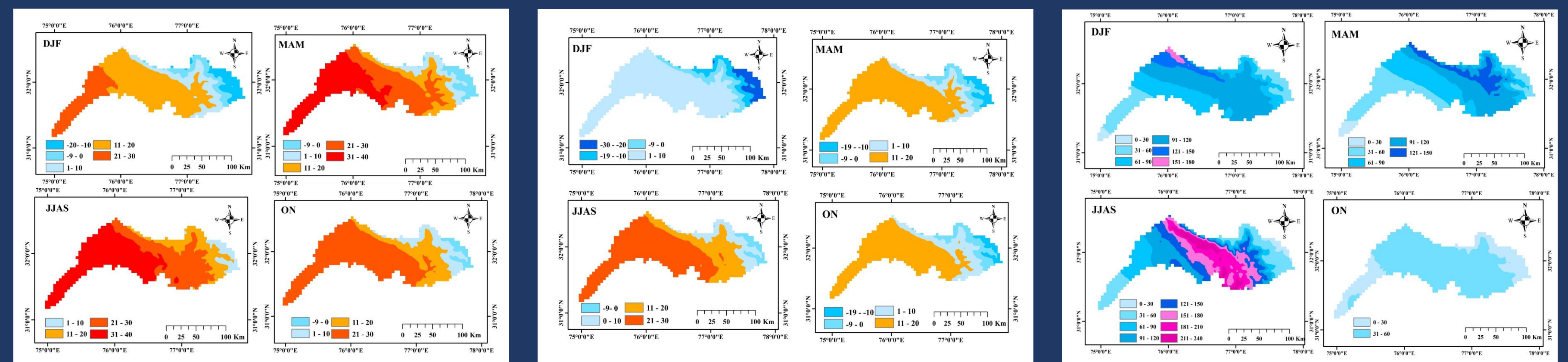


Fig 3. The spatiotemporal changes of temperature (max & min) and precipitation are shown on the entire Beas Basin over 43 years using Terra-climate (4 km) data.

Seasonal variability

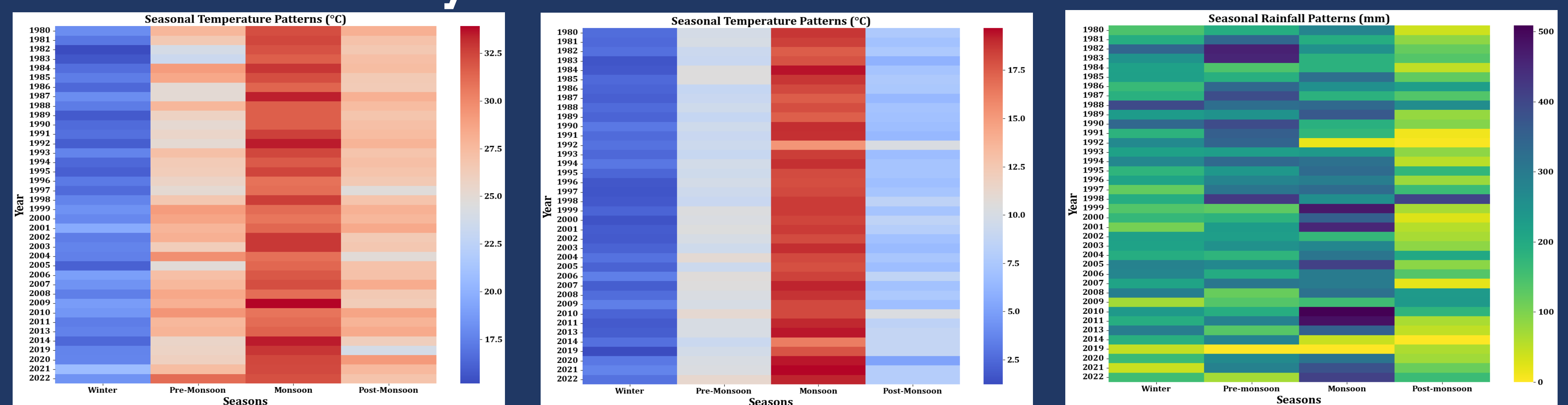


Fig 4. The seasonal variability of temperature (max & min) and precipitation on the Bhunter station using IMD station data

Annual Variability with Anomaly Analysis

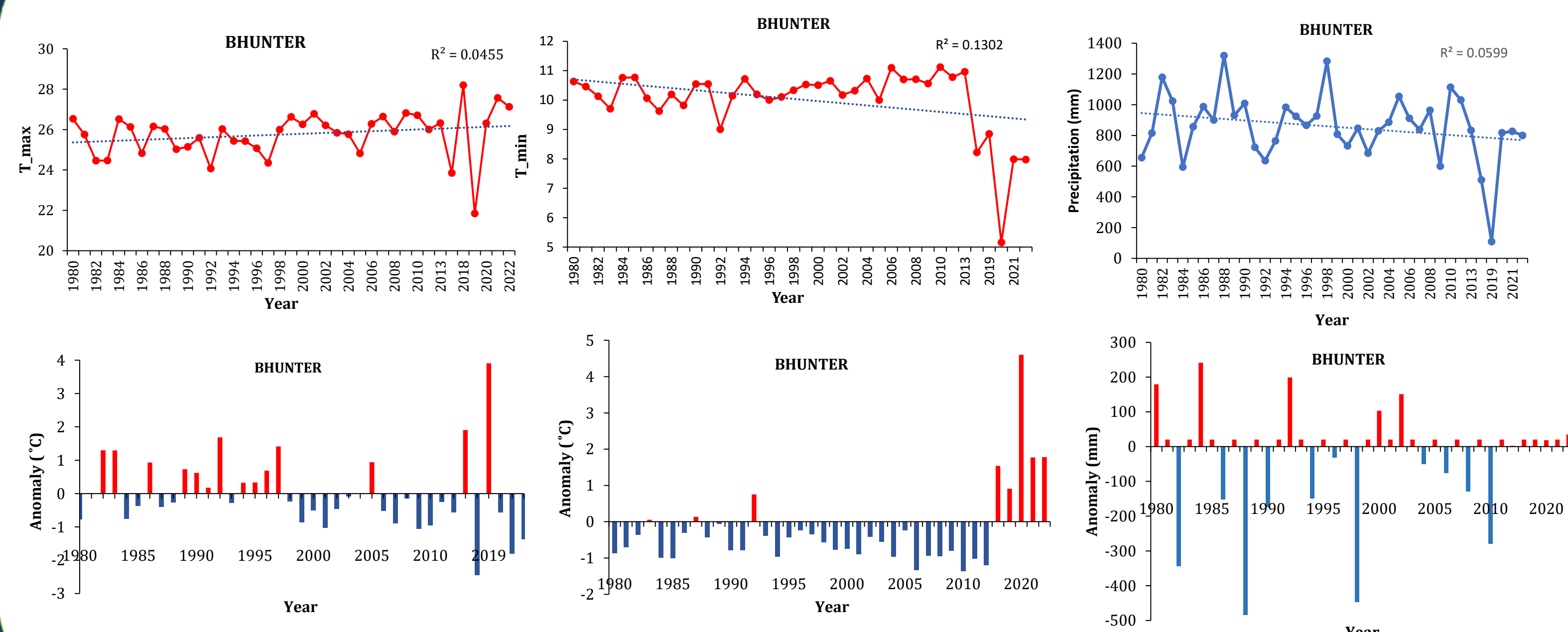


Fig 5. the anomalies are plotted on all the three variables on IMD station data

Conclusions

- A rising trend in annual maximum temperature and minimum temperature was observed. The decadal temperature was highest in 2000-2009, with a maximum of 26.13 °C and a minimum of 10.53 °C.
- Seasonal T_{max} and T_{min} have shown an increase over the decades, with winter T_{min} rising faster than other seasons at a rate of 2.30, 2.37, 2.40 and 2.46 degrees Celsius in consecutive 4 decades.
- There is no overall trend of precipitation at Bhunter station; however, it displayed considerable interannual variability through the spikes within the time series that are responsible for disasters in the region.
- The correlation of the mean temperature of IMD station, Terra-climate, and ERA-5 reanalysis is moderate, approximately 0.40. In contrast, the maximum temperature data from the IMD station and Terra-climate show a correlation of 0.67.
- A poor correlation of the precipitation of IMD station data with reanalysis datasets of Terra-climate and ERA-5 is 0.27 and 0.28, respectively.

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