



Invited review article

South Asian perspective on temperature and rainfall extremes: A review

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ABSTRACT

Climate change has pushed the natural limits of our environment, creating extreme weather events that are more frequent and more intense in certain locations around the globe. There is evidence of increasing trends in temperature extremes in most countries of South Asia, while in a few regions, temperature extremes have been decreasing. Heatwaves have intensified, which has contributed to accelerating drought and extreme flood events in most South Asian countries. Overall changes in rainfall and temperature have led to alterations in water availability in this region. With few exceptions, the general phenomenon in most South Asian countries is that rainfall intensity has increased, but with a reduced number of wet days. Studies that associate rainfall and temperature in the region of South Asia are scarce and rainfall extremes have been studied more extensively than temperature extremes. In fact, temperature trends are spatially less coherent than rainfall trends in most South Asian countries. It is more likely correlated for the teleconnection and South Asian climate for influencing the temperature and rainfall pattern, rather than any other factors. When it comes to trend estimations, statistical slope detection metrics, such as simple linear regression, have been commonly used to detect and quantify mean trends for countries in the regions of South Asia. However, application lacks in usage of robust nonparametric statistical tests to quantify temperature and rainfall extremes in many countries of South Asia. Statistical downscaling is recommended for better prediction accuracy as well as to find spatial coherence in trends.

1. Introduction

Weather and climate extremes have begun to receive increasing attention (Easterling, 1997; Fan and Chen, 2016) because the impact of these events are strongly felt (IPCC, 2007a) in today's world (Sivakumar and Stefanski, 2011). Climate change, which is defined as statistically significant variability in weather that continues over long periods, portends extremes in weather due to unprecedented environmental change over time. Climate change may become apparent as a change in average weather conditions or in the distribution of weather

around the average conditions. In this context, natural variability also plays a crucial role in climate change, which shifts the odds and may cause changes in natural variability, making certain types of extreme weather events more frequent and more intense (Urama and Ozor, 2010; Samo et al., 2017). Seasonal, annual, inter-annual, and decadal variability in an environment within a stationary period is known as climate variability. Climate change, in turn, is a significant lasting change in the statistical distribution of weather patterns over longer periods (Brander, 2007). Recently, the many observed cases of rare weather events show consistent trends that imply a shifting climate.

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