

Rising Temperature Trends of Parbhani, Maharashtra, India

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Abstract: It becomes common equation that climate change means change in temperature and rainfall. Most of the researcher, scientist focuses on temperature and rainfall while studying climate change. Taking this fact in consideration this paper attempt to study the temperature change in Parbhani city by analyzing data of annual maximum, minimum, mean temperature and by taking anomalies from 1969 to 2010. The study of linear trends indicates increasing trends in annual maximum, minimum and temperatures. During 1969-2010 annual maximum, minimum and mean temperature is on continues increasing. I.e. The linear trends in annual maximum temperature from 1969-2010 indicated the increasing trends. [Karnewar Kailas, Kadam Avinash. **Rising Temperature Trends of Parbhani, Maharashtra, India.** *Researcher* 2015;7(2):60-63]. (ISSN: 1553-9865). <http://www.sciencepub.net/researcher>. 10

Key words: Annual maximum and annual minimum and annual mean temperatures, anomalies.

1. Introduction

Climate change and, perhaps more importantly, human influence on the climate has been under scientific and public discussion for decades. Since the year 1990 the Intergovernmental Panel on Climate Change (IPCC) has published frequent assessment reports on global climate change. In the fifth report, whose Work Group I report was published in 2013 (IPCC, 2013) and Work Group II report was published in 2014 (IPCC, 2014), it was stated that the global mean surface temperatures for the period 2081-2100 may rise 0.3-4.8 °C relative to 1986-2005, depending on the emissions. This does not mean a similar rise in temperature everywhere. Locally the average temperature may be unchanged, change by more than +4.8°C or even decrease by some amount - and on top of this figure comes the possible seasonal or monthly variation. While it is generally accepted that the consequences will present a challenge for humanity, not all areas will be affected equally. Some areas might benefit from the change, while others could be rendered unfit for human life. In order to better prepare for the coming changes, we need to be able to predict as accurately as possible how the climate will change in different areas.

Any change in climate over time, whether due to natural variability or as a result of human activity is termed as climate change (IPCC, 2001). Due to urbanization the emission of greenhouse gases has increased. Urbanization transforms natural landscape to artificial landscape and alters radioactive, thermal roughness and moisture properties of surface and the atmosphere above (Hung et al., 2006). Due to all this anthropogenic activities normal behavior of climatic parameter get changed specially temperature and

rainfall. The forth assessment report of intergovernmental panel on climate change (IPCC, 2007) has concluded that the global mean surface temperature has risen by 0.74+ 0.18 C when estimated by linear trend over the last 100 years (1906-2005). The rate of warming over 50 years is almost the double of that over 100 years (IPCC 2007) which is largely connected with manmade activities. All over the world urban areas are being affected by urban climate change (Omvire S., et al 2013). Increasing temperature of Buldhana (D.T. Deshmukh, et al 2013), increasing mean maximum temperature of Hunza nagar district (Sheeba Afsar,etal,2013) and increase in annual maximum, annual minimum, annual mean temperature of Dehradun(Omvire singh etal 2013) increasing temperature of Dhaka (Alam and Golam Rabbani, 2007), increasing temperature of Sao paulo (Edmilson et al.2007) are the global example of urban climate change.

Although climate change is a global phenomenon its threat and vulnerability differ not only from one continent to another but also sub region, countries and even communities (Godwin O. Atedhore et al., 2011). Taking consideration importance of surface air temperature it would be interesting to study the long-term variation of surface air temperature at Parbhani in Maharashtra.

2. Data and methodology

2.1 Study area:

Parbhani city is part of Marathwada region of Maharashtra in India. Parbhani is situated approximately at the Centre of Maharashtra. Parbhani is located at 19.27 N76.78 E. It has an average elevation of 347 meters. In Parbhani district there is

extension of Ajanta ranges called Nirmal hills. According to 2011 census population of Parbhani city is 3, 07,191 and is officially accorded city status by establishing municipal corporation. Male and female are 157,628 and 149,563 respectively. The sex ratio of Parbhani city is 949 per 1000 males.



Figure: 1.1 Presenting Google map of study area.

2.2 Data Collection:

The daily temperature data recorded by IMD Pune for period 1969-2010 was collected. From daily time series data annual maximum and annual minimum and annual mean temperatures were derived to find out the possible changes in temperature. To determine a yearly variation in temperature series and to identify the warmest and coldest phases 5 year moving average technique was adopted (Omvir S., et al 2013). The linear regression method was used to analyzed the behavior of annual maximum and annual minimum and annual mean temperatures for 42 years (1969-2010).

Furthermore, for better understanding of the observed trends in temperature, anomalies of annual maximum, minimum and mean temperatures were also calculated anomalies are more accurate than absolute temperature to describe climatic variability. To analyze anomalies in maximum, minimum, mean temperature, the average annual maximum and annual minimum and annual mean temperatures were calculated for entire periods (1969-2010) and it was

subtracted from yearly average maximum and minimum and mean temperatures folland et al., (1990) suggested 30 year period as standard period for calculating the average used to analyze anomalies and comparison were made with the result obtained using average from whole dataset. The temperature anomalies obtained were plotted against the linear trends observed were represented graphically. The linear trends value represented by the slope of simple least square regression line with time as the independent variable show the magnitude of rise or fall.

3 Results and Discussion

3.1 Trends and anomalies in annual maximum temperature

The annual maximum temperature trends with 5 year moving average have been presented in figure 2. The long term annual maximum temperature at Parbhani found to be 33.5 °C during the study period. Three periods of warming and three periods of cooling during 1969-2010. Remarkable cooling period was during 1972-197. The warmest year was 2008 with annual maximum temperature 34.8° C which was 1.3 °C warmer than normal. The coolest years were 1990 and 2008 with annual maximum temperature 31.9 °C when drop was 1.6 °C below normal. The linear trends in annual maximum temperature from 1969-2010 indicated the increasing trends. Observed increase was found 0.61 °C. The increasing trends observed in annual maximum temperature is good agreement with finding of other urban studies on climate change (Bhutanie et al., 2007, 2010 and Omvir 2013).

The anomalies of temperature series data for annual maximum temperature have been presented in in figure3. Positive anomalies of about 1.4 °C in annual maximum temperature were observed in 2007. It was also observed from figure 1b that positive anomalies are more seen.

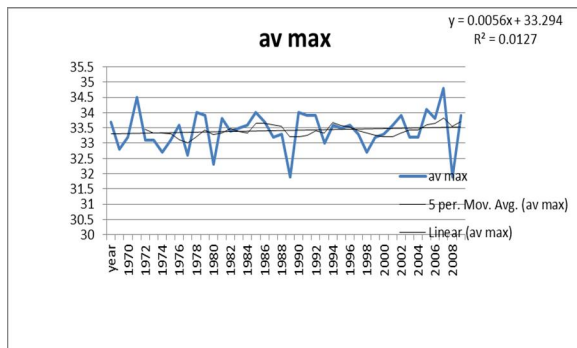


Fig.2: Observed average max temperature.

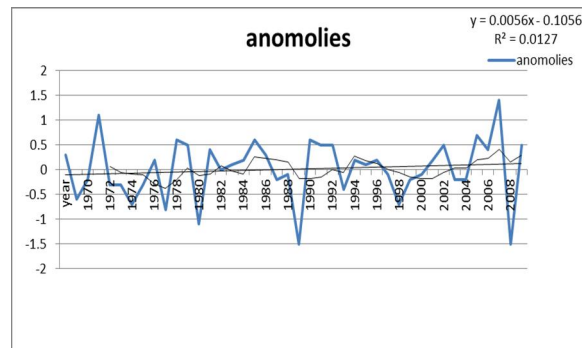


Fig.3: Celebrated anomalies of decades

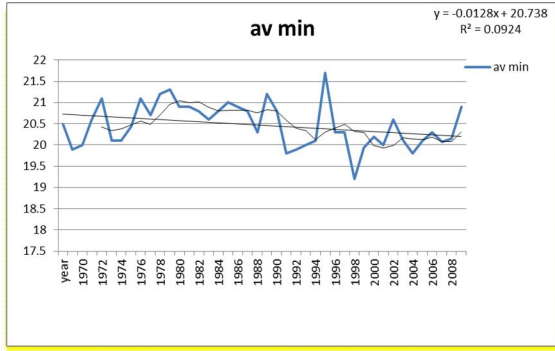


Fig.4: Detected average min temperature.

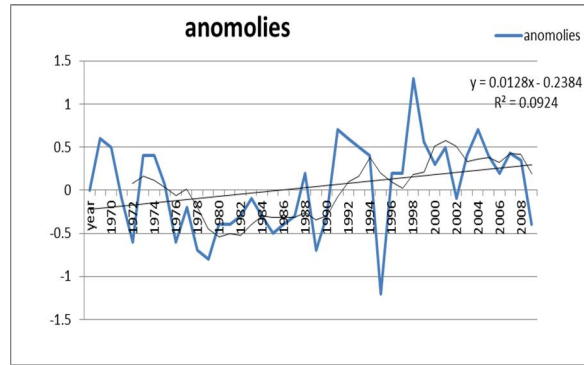


Fig.5: Variations of anomalies in °C.

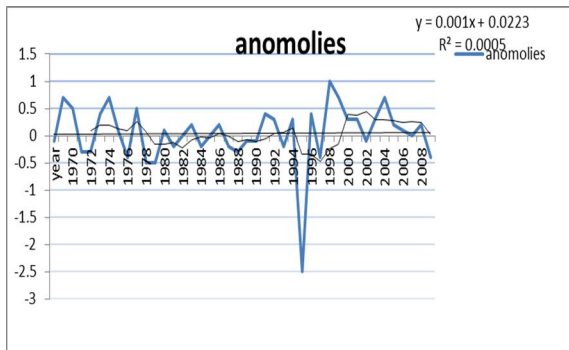


Fig.6: Perceived anomalies from 1997-2010.

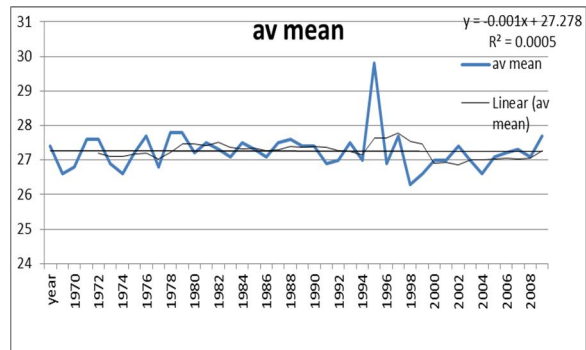


Fig.7: Observed average temperature.

3.2 Trends and anomalies in annual mean temperature

Both annual maximum and minimum temperature affect the annual mean temperature. The annual mean temperature trends with 5 year moving average have been presented in figure7. The long term annual mean temperature at Parbhani found to be 27.3 °C during the study period. The warmest year with annual mean temperature was 1995 with annual mean temperature 29.8 °C which was 2.5 °C warmer than normal. The coolest year was 1998 with annual mean temperature 26.3 °C when drop was 1.0 °C below normal. The linear trends in annual mean temperature from 1969-2010 indicated the increasing trends. Observed increase temperature was found approx. 1–2 °C. The increasing trends observed in annual mean temperature is good agreement with finding of other urban studies on climate change

The anomalies of mean temperature series data for annual maximum temperature have been presented in in figure 6. Positive an anomaly of about 1.0 °C in annual mean temperature was observed in 1998. It was also observed from figure that negative anomalies of about 2.5 were observed in 1995.

4. Conclusion

The long term annual maximum temperature at Parbhani found to be 33.5 °C during the study period. The linear trends in annual maximum temperature

from 1969-2010 indicated the increasing trends. The linear trends in annual minimum temperature from 1969-2010 indicated the decreased trends. Positive anomalies of about 1.4 °C in annual maximum temperature were observed in 2007. The long term annual minimum temperature at Parbhani found to be 20.5 °C during the study period.

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