

IMPACT OF CLIMATE CHANGE ON TEMPERATURE

Sarika Jain

Department of Mathematics
Amity University Haryana, India

Abstract: Climate change in India has confirmed a rapid rise in surface temp in the past 70 years. There is a notable warming trend in Northwestern India beginning in the 1970 and accelerating in the 2000 and 2010. The present study is also an attempt to study the seasonal change in temperature over Indian region due to climate change. For this purpose 10 year averaged temperature from 1948-57 and 2008-2017 has been calculated using NCEP-NCAR data. Then the difference between 10 year averaged mean temperatures is calculated. The study reveals that there is a warming trend over Himalayan region during all seasons. The increase in temperature is approximately 1° Celsius in monsoon season over all Indian region.

Key Words: NCEP-NCAR, temperature, winter, summer

Introduction:

Studies to detect climate change and its impact on the various sectors deserve urgent attention in light of the impact of climate change on agriculture, increased risk of hunger and water scarcity, rapid melting of glaciers, and decrease in river flows by Intergovernmental Panel on Climate Change (IPCC, 2007). Several observational studies show significant temperature and precipitation changes in India over the long term. A recent study shows that the all-India mean annual temperature increased by 0.58°C during 1901–2003 (Kothawale and Rupa Kumar, 2005). This increase is consistent with the expected effects from global warming. The temperature trends over north and south India for different phases of the monsoon were investigated by Dash and Hunt (2007) and Dash and others (2007). They found large differences in trends of minimum temperature and cloud cover between north and south India and asymmetry in increasing temperature trends between different seasons. The study also shows that significant warming started in the late 1960s, with the highest rate of increase between 1990 and 2009. Dimri and Ganju (2007) simulated wintertime temperature and precipitation over the western Himalaya.

The decadal mean of daily maximum temp for April and May in the 2010 is 40 to 42 degrees over large parts of India. In the 1950 the area with this high temp was limited with only a small spot in south –central India touching 41 degrees. The region with temp over 40 degrees began to expand in the 1970 and 1980 while the region with temp more than 41 degrees in south –central India has enlarged. While warming trend has been observed in northwest and southern India, cooling or reduced warming seems to be occurring in Northeastern India which is stretching Southwestward across central India.

Temperature change affects the environment and natural resources immensely. Rainfall, temperature and evapotranspiration are measured parameters of climate affecting change in the environment. Temperature plays a key role in crop production and water balance of a region. The temperature increase is projected in the high rise of minimum temperature in winter time and the highest increase in maximum temperature is projected in the pre monsoon season or from (March to May). Highest increase is projected in the 2080s in 2081-2091 and 2091-2099 in maximum temperature. Observed to have increase in the future as observed from the above study although future generations of rainfall and temperature are frequent, but there has been limited study of future generation of evapotranspiration. It is also necessary to co-relate three parameters and to assess their effects in the future develop better management strategies.

Study area and data:

The study has been done for Indian region by taking latitude from 0 to 40 degree and longitude from 60 to 100 degree. The data has been collected from NCEP-NCAR reanalysis datasets.

Methodology:

20 year data has been collected from 1948-1957 and 2005-2014 for 2m air temperature. The complete year data has been divided into four seasons namely Jan Feb (JF), March April May (MAM), June July August and September (JJAS) and October November and December (OND). Then corresponding to each season 10 year averaged temperature has been calculated for both

the decades. Our aim to see the impact of climate change on temperature. To achieve this objective the difference between the 10 year averaged temperatures is calculated.

Result and discussion:

Figure 1 is showing the difference between temperature for the year 1948 and 2017. 1 year analysis is never sufficient when we talk about climate study so figure 2 is showing seasonal 10 year averaged temperature difference.

Figure 2: Difference of 10 year averaged seasonal temperature between year 1948-57 and 2007-2017.

The winter season is considered from Oct to Feb and as we can see in figure 2 the temperature change in these months is more than 3 degree celcius specially over Himalaya region. During the winter season the eastern part of india showing decrease ni temperature. So as compare to base year the Himalayan reagon got warmer by 2-3 degree calcius and eastern season become colder. The same impact can be seen on March April and May. Although the heating over Himalayan reason is little less as compare to winter season.

During the monsoon season overall India is showing warming trend. This clearly indicates that the precipitation has decreased during monsoon season.

The probable reason for this increase could be global warming, increase in CO2 concentration, Land use land cover change due to urbanization.

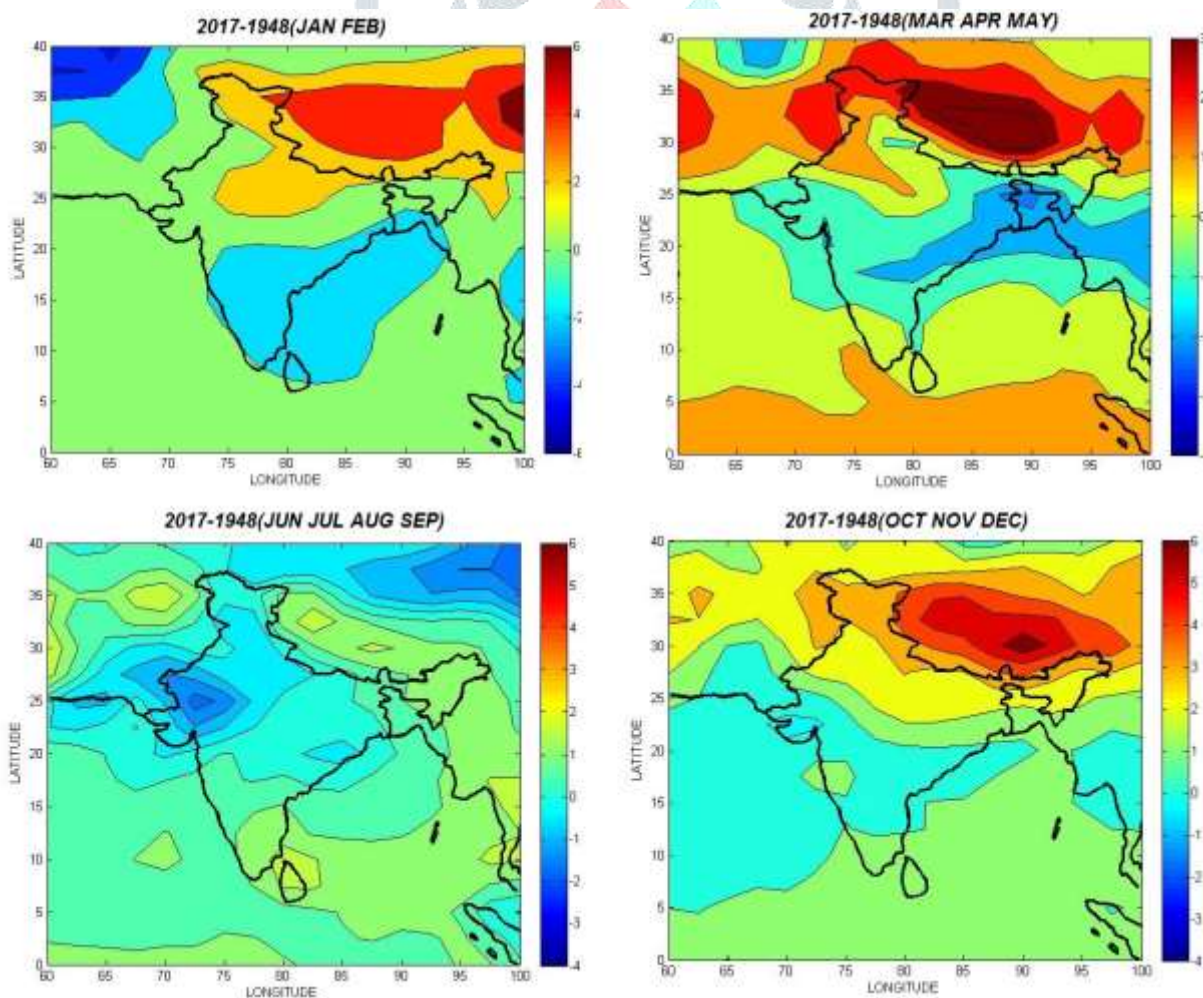
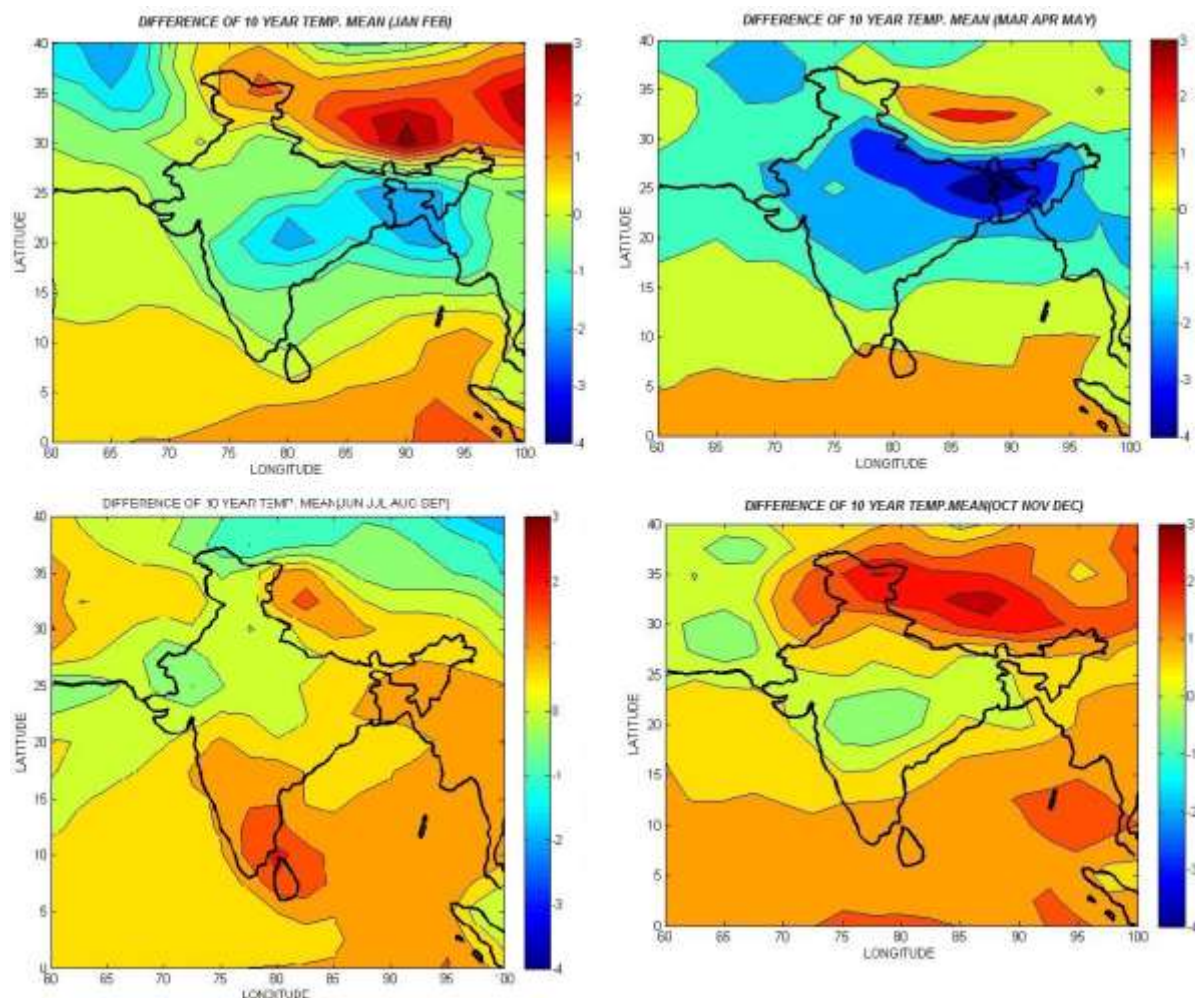


Figure 1: Difference of seasonal temperature between year 2017 and 1948.



Conclusion:

From this study we can clearly say that the Himalayan region is getting warmer day by day and a warming trend is observed all over Indian region. This needs special attention. The seasonal analysis showing an increase of more than 3 degree Celsius over Himalayan region and an increase of more than 1 degree Celsius over all Indian region during winter season. During summer season eastern part showing decreased temperature while in monsoon season temperature is showing an increasing trend all over Indian region.

References:

1. Parry M.L., Canziani O.F., Palutikof J.P. et al 2007. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA.
2. Kothawale, D.R. and Rupa Kumar, K. (2005) On the Recent Changes in Surface Temperature Trends over India. *Geophysical Research Letters*, 32, L18714. <http://dx.doi.org/10.1029/2005gl023528>
3. Dash S.K., Hunt J.C.R., 2007. Variability of climate change in India. *Current science* 93(6).
4. Dimri AP, Ganju A. 2007. Wintertime seasonal scale simulation over Western Himalaya using Regcm3. *Pure and Applied Geophysics* 164: 1733–1746.