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REGIONAL ASPECTS OF GLOBAL WARMING TREND IN RECENT DECADES

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Introduction

The monitoring and analysis of atmospheric temperatures on the global and regional scale has acquired special importance in the last few decades due to the clear indication of global warming. Warming or variation in temperature mainly depends on climate forcing such as greenhouse gases, tropospheric aerosols and land use and land cover etc., while climate forcing by anthropogenic aerosols may be largest source of uncertainty about climate change. Keeping this view, attempt has been made to study the longterm temperature variation at 18 major cities (Industrial, Coastal, Hill) well spread over India.

Methodology

To examine the temperature variation at 18 major city well spread over India, linear trends in annual and seasonal (winter, pre-monsoon, monsoon and post-monsoon) mean, maximum and minimum temperatures have been computed for two different periods 1901-2005 and 1976-2005. During the period 1976-2005, accelerated warming in global mean temperature has been observed (IPCC- 2001). Hence, in the present study, same period is chosen for analysis. The trend is quantified by slope of a simple linear regression line fitted to each of the series against the time and expressed as trend per 10 years. The statistical significance of trend is assessed by means of F-ratio, after taking into account the autocorrelation, if any, present in the series (Wigley and Jones, 1981). The trend values are shown in table 1.

Results

Out of 18 stations considered, 10 stations show the statistically significant warming trend and only one station viz., Ahmadabad show the significant cooling trend and 4 stations viz., Bikaner, New-Delhi, Poona and Hyderabad show the cooling tendency in mean annual temperature during the period 1901-2005. The significant warming trends at these stations are mainly due to significant warming trends in maximum as well as minimum temperatures, except the two stations viz., Trivandrum and Bombay where minimum temperature show significant cooling trend. It is important to note that during the recent period 1976-2005, all the stations show positive or significant positive trend except Poona where trend is slightly negative. The stations which show the cooling trend for the entire period 1901-2005 also show positive trend in recent period. In the case of few stations, the trends are statistically significant for entire period, however they only exhibit the warming tendency in the recent period. It is also important to note that most of the stations in southern part of India (south of 20°N, see. Table 1 , 11-18 stations) show significant warming trend as compare to stations in northern part of India in the recent period 1976-2005.

The trend in annual mean temperature is a replication of trend in annual maximum temperature. Out of 18 stations, most of the stations show the positive trends whereas only two stations viz., Ahmadabad and Poona show significant cooling trend in mean annual

maximum temperature during 1901-2005. In case of minimum temperature, 8 stations show negative trend in the period 1901-2005, while out of these, 5 stations show the positive trend in the period 1976-2005. This analysis reveals that in the recent period, minimum temperature is increasing mostly all over India. Kothawale and Rupa Kumar (2005) also reported that the recent accelerated warming over India is manifest equally in daytime and nighttime temperatures

The trend analysis on seasonal mean temperature shows that the trends in surface air temperature are more pronounced in winter and post monsoon season as compare to the pre-monsoon and monsoon season.

Conclusions

- The mean annual temperature at most of the stations show accelerated warming trend in the recent period 1976-2005.
- From 1970s the minimum temperature is significantly increasing at most of the stations.

References

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Table 1: Liner trend (°C/10 years) in annual mean temperature at major cities of India

		Mean		***Maximum***		***Minimum***	
1	***Stations***	1901-2005	1976-2005	1901-2005	1976-2005	1901-2005	1976-2005
1	Srinagar	0.07*	0.43*	0.08	0.62**	0.06*	0.23*

		Mean		***Maximum***		***Minimum***	
2	Jodhpur	0.03	0.12	0.06*	0.1	-0.01	0.14
3	Ahmadabad	-0.07*	0.11	-0.05*	0.14	-0.1	0.08
4	Bikaner	-0.01	0.33*	0.08**	0.27	-0.09	0.4*
5	Guwahati	0.06**	0.31*	0.05**	0.12	0.08*	0.5**
6	Indore	0.08*	0.2	0.11**	0.25*	0.05*	0.15
7	Sagar	0.05**	0.08	0.07*	0.1	0.02	0.06
8	Kolkata	0.09**	0.03	0.1*	-0.13	0.09**	0.19**
9	New-Delhi	-0.03	0.1	0.01	0.16	-0.07	0.05
10	Nagpur	0.02	0.05	0.04	0.08	0.01	0.02
11	Poona	-0.03	-0.02	-0.04*	0.03	-0.03	-0.06
12	Bangalore	0.07*	0.23*	No trend	0.24*	0.13**	0.22*
13	Thiruvanantha puram	0.12**	0.19**	0.3**	0.4*	-0.06*	-0.03
14	Hyderabad	-0.01	0.06	-0.01	0.22**	-0.02	-0.11
15	Jagadalpur	0.06**	0.13*	0.08**	0.13	0.04*	0.13
16	Bombay	0.06**	0.1	0.16**	0.22*	-0.03*	No trend
17	Chenai	0.06**	0.14*	0.06*	0.24*	0.06**	0.04
18	Ootakamund	0.12**	0.22*	0.2**	No trend	0.03	0.4**

* Significant at 5 % level

** Significant at 1 % level