Weakening of Zonal Temperature Gradient Between Indian Landmass and Neighboring Oceans and Its Impact on Indian Monsoon

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The study shows that in the scenario of global warming temperature gradient (TG) between Indian land mass and Arabian Sea/Bay of Bengal is significantly decreasing in the lower troposphere with maxima around 850 hPa. TG during pre monsoon (March to May) is reducing at a significant rate of 0.036°/ year (Arabian Sea) and 0.030°/year (Bay of Bengal). The above alarming results are based on sixty years (1948-2007) of daily temperature and wind data extracted from CDAS-NCEP/NCAR reanalysis data sets. TG based on ERA-40 data also indicates a decreasing trend of 0.023°/year and 0.040^{o} /year for Arabian Sea and Bay of Bengal respectively. As TG is not governed by any type of significant oscillation, there is a possibility of TG tending to zero in another 150 years. In such a scenario, the low level westerly jet (i.e. monsoon current over Arabian sea) would become weak. This will lead to reduced rainfall activity over Indian Peninsula. The break like circulation will prevail for a longer period of time.

It is further observed that the rate of warming over the oceans is more than that over the land which has resulted into the weakening of TG. Pre monsoon TG has significant correlations with i) All India Seasonal Monsoon Rainfall (AISMR), ii) Kinetic energy of waves 1 and 2 at 850 hPa, iii) Kinetic energy and iv) Stream Function at 850 hPa over Indian land mass during monsoon season. Except AISMR, the decreasing trends observed in all the above parameters are significant. All India rainfall for July and August together shows a significant decreasing trend of 0.995 mm/year. Reducing number of depressions and cyclonic storms and increasing number of break days during monsoon over India are the reflections of weakening of TG.