Warming in Bangladesh: An Example as a Part of Global Warming using Historical Observed Data and GIS

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Abstract: Global warming is a major threat that our planet faces at present. Temperature is one of the most important parameters of climate and the trend of temperature (maximum, minimum and mean) is used as an indicator of climate warming or cooling. To identify the characteristics and magnitude of warming, it is essential to quantify the spatial pattern, trend and changes of temperature spatially based on the recent historical data. Thus, this study was initiated to highlight the recent warming scenarios of Bangladesh using observed temperature data during the period 1971 to 2010, as an example as a part of global warming. This study focused on the annual and seasonal warming at local scale by analysing the trends, anomalies, change points and shifting of isotherm in temperature from 34 meteorological stations distributed over Bangladesh, spanning 40 years, 1971–2010. For trends, a linear regression using least square model was applied. Anomalies were calculated as a difference between the reference (1971–2000 mean) and actual occurrence value. Inverse distance weighted interpolation and GIS techniques were used to find out the spatial pattern of warming. Besides, the sequential version of the Mann–Kendall test was applied to detect the changing point of warming. Direction of shifting of warming was detected by the decadal distribution pattern of specific isotherms which were generated using GIS. The result reveals that the climate of Bangladesh undergone a significant warming during the period 1971–2010, 0.020 °C per year (for annual mean) and the maximum temperature warmed more than the minimum temperature (0.022 vs. 0.018 °C per year). On a seasonal basis, hot summer, humid summer and dry winter also show significant warming, 0.022, 0.026 and 0.011 °C per year, respectively. The warming of maximum temperature (0.032 °C per year) in humid summer was greater than other seasons, contributed more on annual warming. Spatial patterns indicate that geographically the warming varied significantly and some places warming exit 2.0 °C and reached up to 3.2 °C. The north western, north eastern, southern and south eastern parts of the country are more susceptible to rising temperature. In 2010, mean annual temperature was 0.84 °C warmer than the base period (1971–2000) mean. The significant warmest period was spread across the year 1995–2010, with 2010 being the warmest year. Statistically significant warming was began in early 1990's and the years 1990, 1994 and 1997 identified as important abrupt change points of warming. Moreover, a remarkably northward and north eastward warming was identified, denoting the north, north western and north eastern belts of the country are more susceptible to the warming. Praiseworthy of note, Bangladesh is indeed warming strongly and warming pattern is broadly consistent with the existing global warming. Moreover, the warming trend, magnitude and spatial patterns identified here may provide helpful information on global warming on a regional/country level scale.