

Global Warming and Climate Change in India during the Recent Hundred Years

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The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) released in early 2007 has given an account of the ongoing Global Warming scenario and its effects which include the decrease of the area covered by sea ice, loss of glacier mass and the increase of the heat content of the ocean's top 3000 metres and the consequent increase of the sea level. Small island states are under the threat of sea level rise and would be affected by storm surges associated with tropical cyclones even before they are submerged by the rising sea levels. The average temperature of the global atmosphere just above the surface of the earth has warmed through 0.74 degrees during the 20th century. Arctic air temperatures have increased at twice the global average. The IPCC report has also described the observed rapid increase in the concentration of green house gases (carbon-di-oxide, methane, nitrous oxide etc) in the atmosphere and states with a high degree of confidence that global warming since 1750 has been the net effect of human activities.

All India average air temperature has increased through about 0.6 degree Celsius during the 20th century. It is comparable to the global average. The sea



surface temperatures over the Arabian sea and the Bay of Bengal have shown increase during this period. The climate of India has also changed during the last 100 years. The observed change in climate has been in two ways (a) decadal change (a few decades of increase followed by a few decades of decrease, a sort of multi-decadal oscillation) and (b) long term trends, either decreasing or increasing. Monsoon onset dates over Kerala and the number of tropical cyclones per year in the Indian seas did not have any long term trend but had long period oscillations in the last 100 years. Annual number of monsoon depressions and the monsoon rainfall of south Kerala (particularly over the slopes of the Western Ghats) had strong decreasing trends. On the other hand very heavy one day rain rainfall occurrences in India and the annual number severe tropical cyclones of the Indian seas had increasing trends. The strength of the low level monsoon winds through peninsular India (the Low Level Jetstream) had a decreasing trend through about 20% during the recent 50 years of good reanalysis wind data which goes well with the observed decreasing trend in monsoon depression frequency. A new finding is that the Sea Surface Temperature of the equatorial central Indian Ocean has had a phenomenal increasing trend through about 1.5 degrees Celsius in the recent 50 years which is much larger than anywhere else in the global tropics. This is feared to have adverse impact on the Indian monsoon by creating an area of increasing rainfall (and the consequent heating of the atmosphere through latent heat release) near the equator already seen through satellite observations, which will weaken the monsoon heat engine (the vertical Monsoon Hadley Cell that drives the monsoon circulation).

