Latitudinal Variations of Temperature in Northern Hemisphere

To identify the latitudinal difference of temperature several meteorological station data from 0˚ to 40˚ North latitude has been taken. It is assumed that there is significant difference in the rate of radiative forcing from 0˚ to 40˚ North latitude. Northern Hemisphere is taken for analysis since the ration of land is high in this Hemisphere than Southern Hemisphere. To identify the variation of Radiative Forcing (RF) the following observation is found;

Location (latitude)	Annual Historic Radiative forcing (Watts/m^2)	Annual data composite (Watts/m^2)	Decadal temperature trend in Watts/m^2 (2005)	Average annual temperature 1881	Average annual temperature 2011	Temperature difference between 1881-2011
0˚-10˚N	0.005	0.001	0.6182	22.74˚ C	23.69˚ C	0.95˚ C
10˚-20˚N	0.005	0.002	0.8502	22.07˚ C	23.02˚ C	0.95˚C
20˚-30˚N	0.005	0.003	1.0472	19.53˚ C	20.36˚ C	0.83˚ C
30˚- 40˚N	0.005	0.003	0.9319	7.97˚ C	8.88˚ C	0.91˚ C

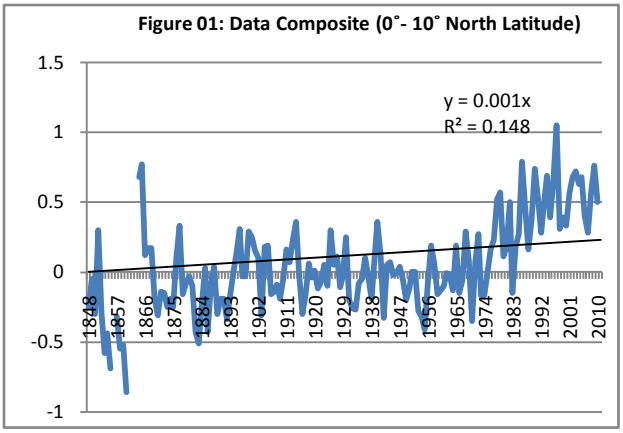
Latitude 0˚-10˚N: A Total 17 stations have been taken for the analysis of 0˚-10˚N latitude. The annual historical radiative forcing is 0.005 Watts/m^2 along the Equator to 10˚ N latitude. It was 0.007 Watts/m^2 in 1881 and became 1.559 Watts/m^2 in 2011. The decadal growth of historical radiative forcing has significantly increased after 1950. In 1955 it was -0.1427 Watts/m^2 while it became 0.6182 Watts/m^2 in 2005 (http://climatemodels.uchicago.edu/timeseries/#JfGfZBdvBCYxBBBBCDMjDtFnkDo). However, from 1881 to 2011 the annual growth rate of combined forcing is 0.001 Watts/m^2 (Figure-1). According to GCM model of bcc-csm 1-1 through AR5 Climate Model Mapper the map shows that in 1881 the average annual temperature was 22.74˚ C while it became 23.69˚ C in 2011 (Map-1)

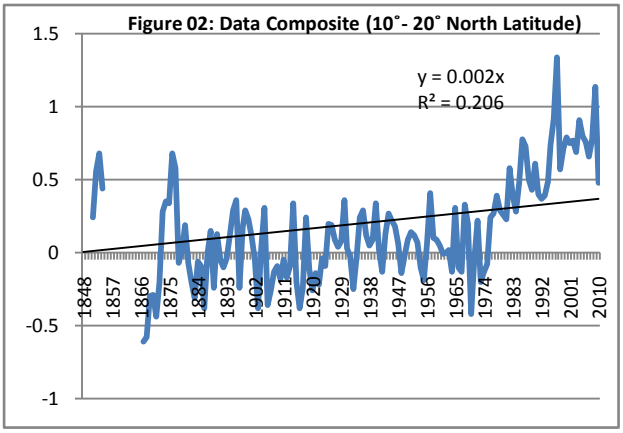
Latitude 10˚-20˚N: To understand the Trend of temperature from 10˚-20˚N latitude 17 station has been taken. Annual historical data represents that it was -0.1377 Watts/m^2 in 1950 while it became 0.8737 Watts/m^2 in 2012. The decadal trend represents that -0.0656 Watts/m^2 in 1950 and it became 0.8502 Watts/m^2 in 2005 (http://climatemodels.uchicago.edu/timeseries/#ElLjEEjZgFFFNkNcBkBwdDdbBdkNIM). Besides the annual growth rate of combined forcing is 0.002 Watts/m^2 from 1881 to 2011 (Figure-2). The Map-2 represents that the average temperature was 22.07˚ C in 1881 and it reached to 23.02˚ C in 2011.

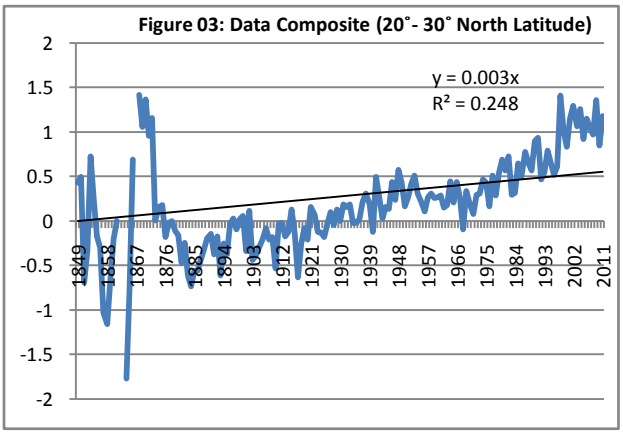
Latitude 20˚-30˚N: Total 13 stations have been taken along the 20˚-30˚N latitude. In this zone annual historical radiative forcing was 0.0725 Watts/m^2 in 1950 while it became 1.1088 in 2012. Besides, the decadal radiative forcing was 0.1138 Watts/m^2 in 1955 which turned in 1.0472 Watts/m^2 in 2005 (http://climatemodels.uchicago.edu/timeseries/#ZbBuRwPBJeGHnCoxBxnQBgWi). Simultaneously the annual growth rate of combined forcing is 0.003 Watts/m^2 (Figure-3). Map 3 shows that the temperature has increased 0.83˚ C within 130 years along the zone.

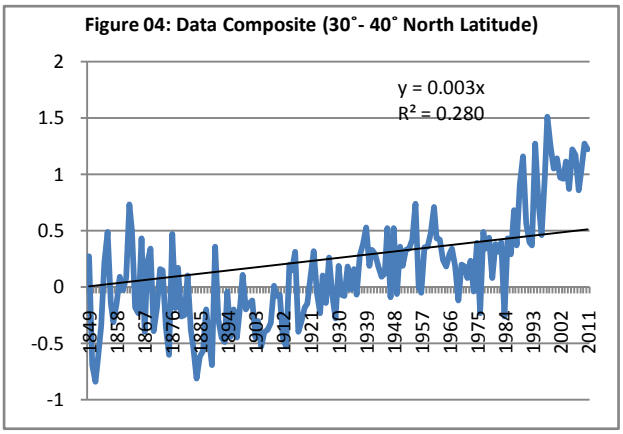
Latitude 30˚-40˚N: In this zone total 19 stations have been taken. In 1950 the annual historical radiative forcing was 0.0531 Watts/m^2 and it reached to 1.0655 Watts/m^2 in 2011. On the other hand decadal radiative forcing indicates a significant growth after 1950. In 1955 the decadal growth rate was only 0.1408 Watts/m^2 while it reached to 0.9319 Watts/m^2 in 2005 (http://climatemodels.uchicago.edu/timeseries/#CBhaQpHHWCdMKxIoDEchCsDhDCivGdEjGc). However, the rate of annual combined radiative forcing is 0.003 Watts/m^2 from 1881 to 2011 (Figure-4). Map-4 represents the change of temperature over 130 years and it is important to note that temperature has increased 0.91˚ C during this period.

Concluding remarks: The overall scenario of temperature shows (Map 1, 2, 3 and 4) that the average annual surface temperature is dramatically decreased towards low latitude to high latitude both in 1981 and 2011 where the temperature of 40˚N latitude is decreased about 11.56˚C than the equator. In the case of composite data there seems a similar latitudinal variation that the slope rate of RF is high in between 20˚-40˚C in comparison to low latitude. But in between 0˚ and 20˚N latitude the rate of RF is almost same. In conclusion it is observed that 0˚N to 20˚N latitude area is getting warmer more quickly while decadal RF is high in 20˚N to 40˚N latitude.

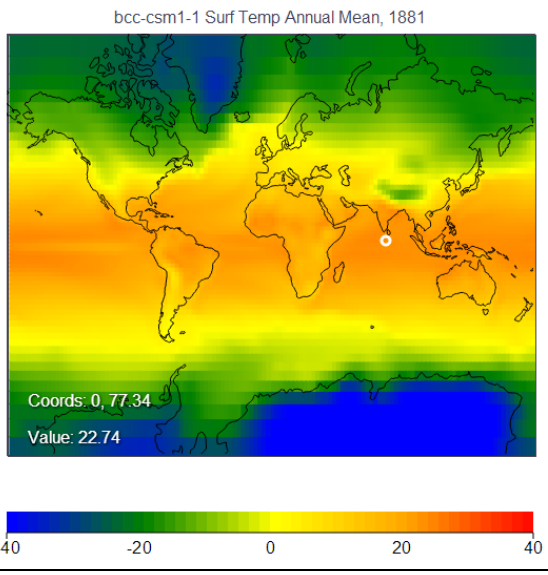


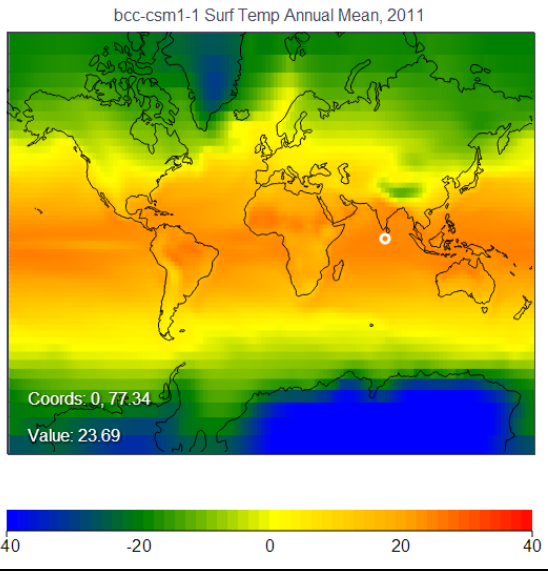






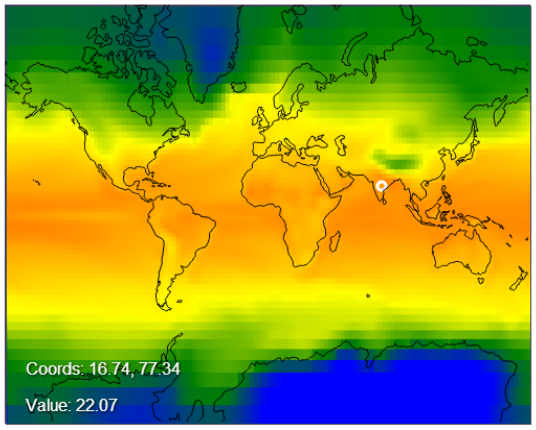
Map: 1

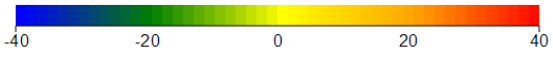




Map: 2

bcc-csm1-1 Surf Temp Annual Mean, 1881





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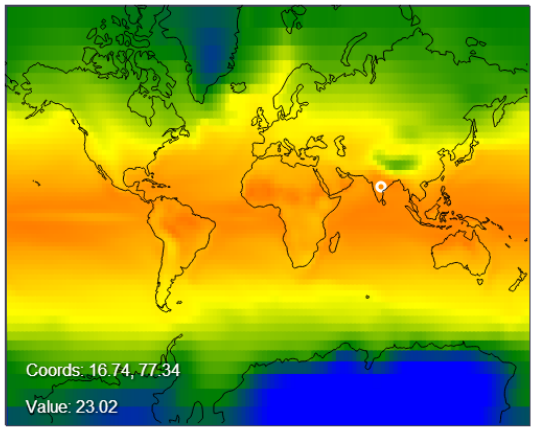
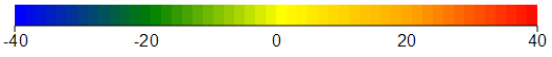
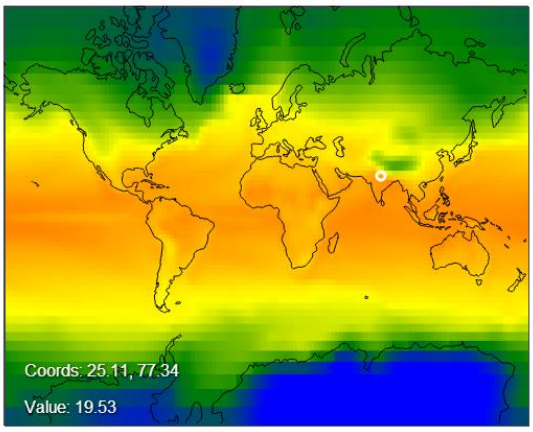
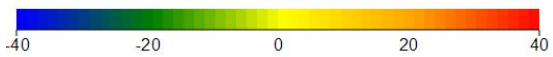




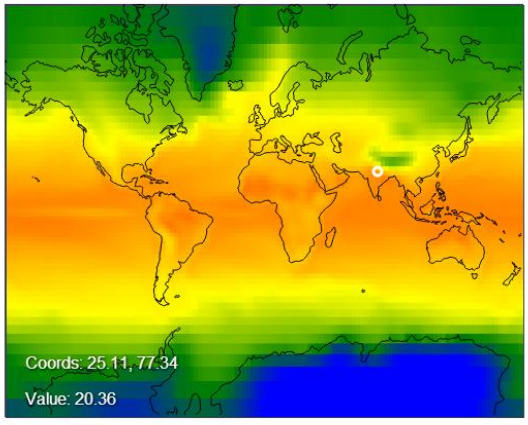
Map: 3

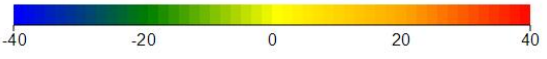
bcc-csm1-1 Surf Temp Annual Mean, 1881





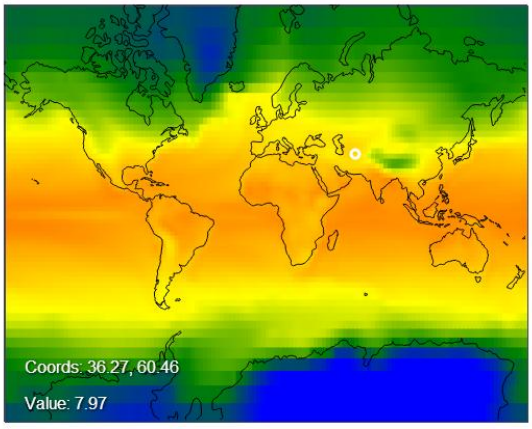
bcc-csm1-1 Surf Temp Annual Mean, 2011

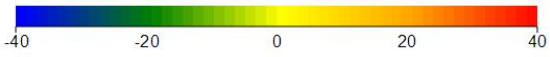




Map: 4

bcc-csm1-1 Surf Temp Annual Mean, 1881





bcc-csm1-1 Surf Temp Annual Mean, 2011