"CLIMATE CHANGE AND CLIMATE VARIABILITY FOR MYSORE TALUK USING RS AND GIS"

Malini[1], Ravikumar [2], Dr. Gouda [3], Dr. Laxmikantha

[1]M.Tech student KSRSAC Bangalore
[2]B.E Student GMIT Mandya
[3]Senior Scientist CSIR-CMMACS, Bangalore
[4]M.Tech Co-Ordinator and Scientist, KSRSAC, VTU-EC Bangalore

---***---

Abstract - *In the present study, an attempt was made to find the climate change on in relation to climatic parameters for Mysore taluk. To analyze the variations in climatic parameters like Rainfall data, temperature data were used. NDVI analysis, MODIS TERRA data was used. Whereas, NCEP reanalysis, Relative Humidity, Soil Moisture, Solar radiation, water runoff were used. The findings of the study shows that the climate variability and climate change for Mysore Taluk from 1986 to 2016, the monthly rainfall is increase in trend and monsoon rainfall shows decrease in trend. And the monthly, summer, monsoon minimum temperature shows that decrease in trend. The monthly maximum temperature shows decrease in trend but in case of summer and monsoon seasons increase in trend respectively.*

In case of NCEP reanalysis, the monthly average of Relative Humidity (RH), soil moisture and water runoff is positive trend. The solar radiation (Upward/Downward) for monthly is negative trend.

***Key Words*: climate variability, Rainfall, temperature, and NCEP reanalysis and MODIS data**

1. INTRODUCTION

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time. Climate change is a change in the long-term weather patterns that characterize the regions of the world. The term "weather" refers to the short-term (daily) changes in temperature, and precipitation of a region. Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions.

Certain human activities have been identified as primary causes of ongoing climate change, often referred to as global warming. But increased in anthropogenic activities such as industrialization, urbanization, deforestation, agriculture, change in land use pattern etc. leads to emission of green house gases due to which the rate of climate change is much faster.

1.1 CLIMATE VARIABILITY

Climate varies over seasons and years instead of day-to-day like weather. Some summers are colder than others.

Some years have more overall precipitation. Even though people are fairly perceptive of climate variability, it is not as noticeable as weather variability because it happens over seasons and years. Evidence includes statements like: "the last few winters have seemed so short," or "there seem to be more heavy downpours in recent years."

1.2 CLIMATE CHANGE

If climate variability is year-to-year variation, what is climate change? Climate change is a long-term continuous change (increase or decrease) to average weather conditions (e.g. average temperature) OR the range of weather (e.g. more frequent and severe extreme storms). Both can also happen simultaneously. Long-term means at least many decades. Climate change is slow and gradual, and unlike year-to-year variability, is very difficult to perceive without scientific records.

Climate change occurs because of changes to Earth's environment, like changes in its orbit around the sun or human modification of the atmosphere. There is nothing inherently wrong with climate change. It has happened in the past and will happen again

2. OBJECTIVES

The objectives of the present study are as follows

To study the variations of climate change for Mysore taluk

Estimate the climate change using multi-source remote sensing as well as observation data.

Analysis of NDVI over the study area using satellite data (MODIS TERRA).

MATERIALS

The study is carried out by using data from various sources like Karnataka State Remote Sensing Application Centre (KSRSAC), Karnataka State Natural Disater Monitoring Centre (KSNDMC), NCEP/NCAR Reanalysis, and India Water Portal. The local scale (station) data for Mysore taluk are being collected from the Statistical Department of GOK are used.

3.1 Methodology for study area

A methodology was developed to know about the variations in rainfall and temperature and Data are collected from the Giovanni website to Analysis the Rainfall and Temperature Data and also the other climate parameters from NCEP/NCAR Reanalysis data for the study area by Open Grads Software in .NC Format.

4 RESULTS AND DISCUSSION

4.1 Variability in Rainfall

Variability in the rainfall and Temperature data are studied for the study area. The monthly rainfall data shows that a increasing in the trend and monsoon rainfall shows that a decreasing in the trend (chart-1, chart-2) for the study area.

The Annual average rainfall data shows that a decrease in trend (chart-3) for Mysore Taluk .
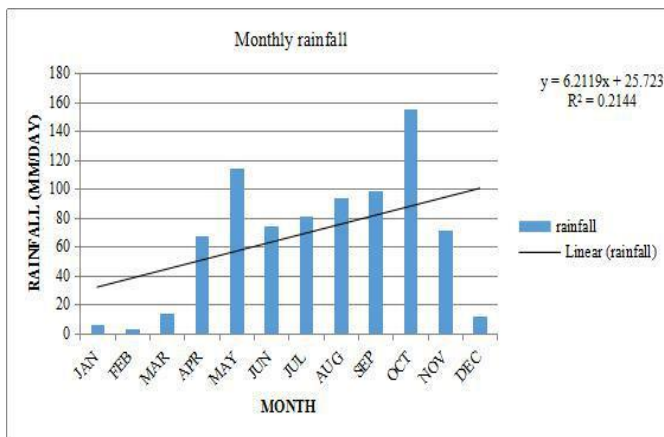
Chart-1 Monthly average rainfall trend for Mysore Taluk from 1986-2016
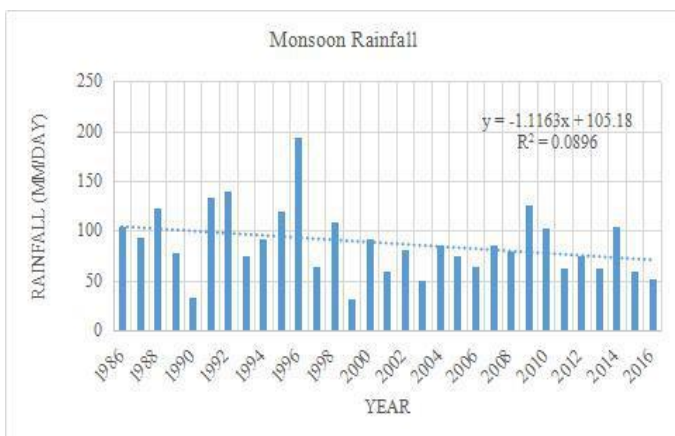
Chart-2 Monsoon average rainfall trend for Mysore Taluk   from 1986-2016
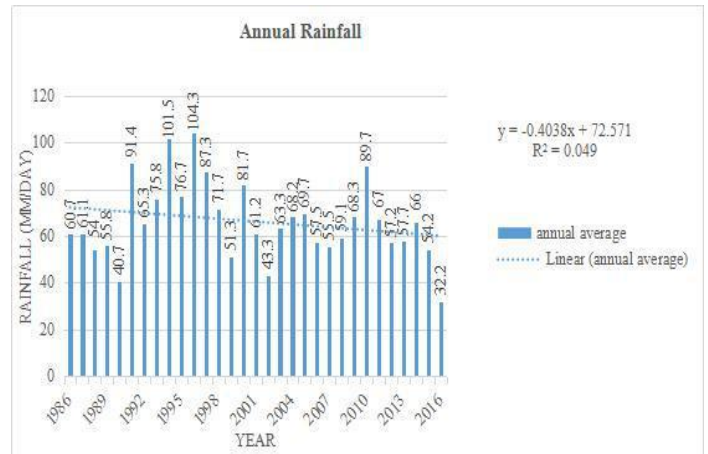

Chart-3 Annual average rainfall trend for Mysore Taluk   from 1986-2016

4.3 Variability in Temperature

The monthly, summer, monsoon minimum temperature shows that decreasing in the trend (chart-3, chart-4, chart-5) and monthly maximum temperature data shows that there is decreasing (negative) in trend (chart-6); the monsoon and summer maximum temperature data shows that there is increasing (positive) in trend (chart-7, chart-8) for study area. The Annual average minimum temperature shows that decrease in trend (Chart-7), in case of Annual Maximum temperature shows that increase in trend (chart-11) for Mysore Taluk .
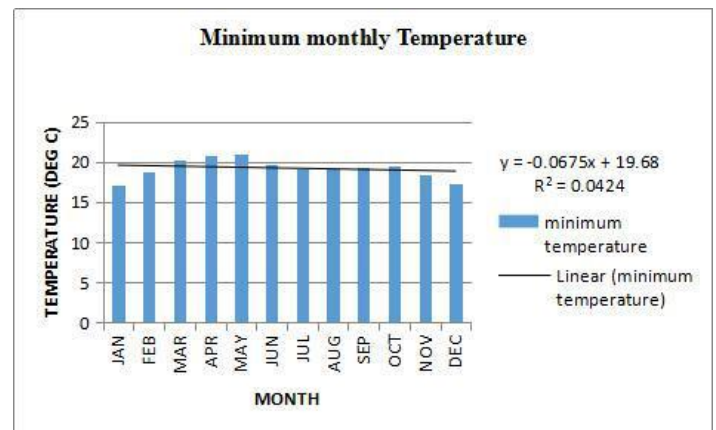

Chart-4 Monthly average minimum temperature trend for Mysore Taluk   from 1986-2016

Chart-5 summer average minimum temperature trend for Mysore Taluk   from 1986-2016
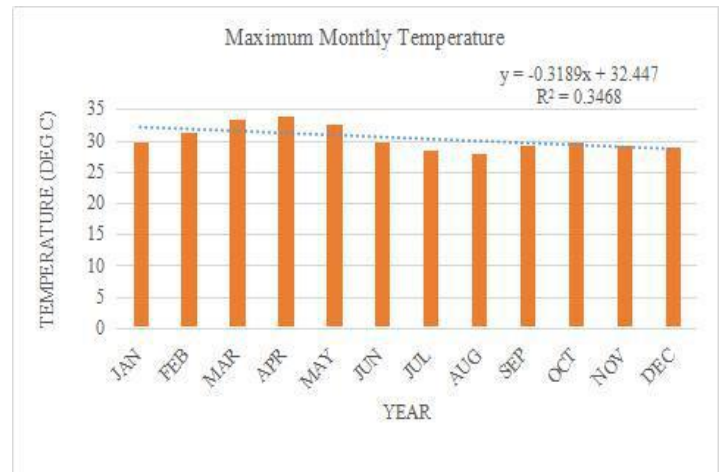

Chart-8 monthly average maximum temperature trend for Mysore Taluk   from 1986-2016
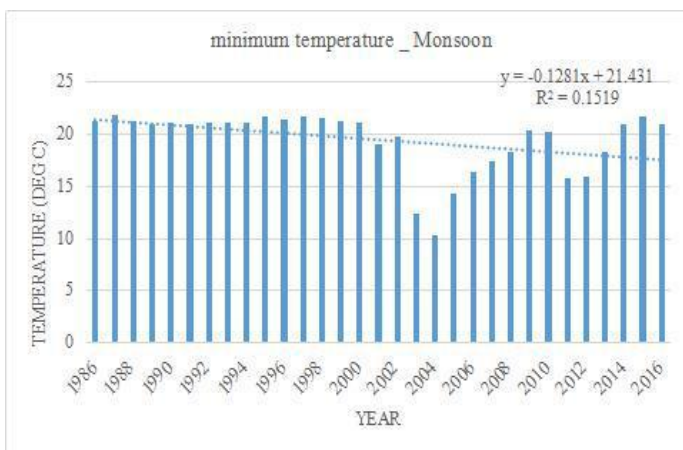

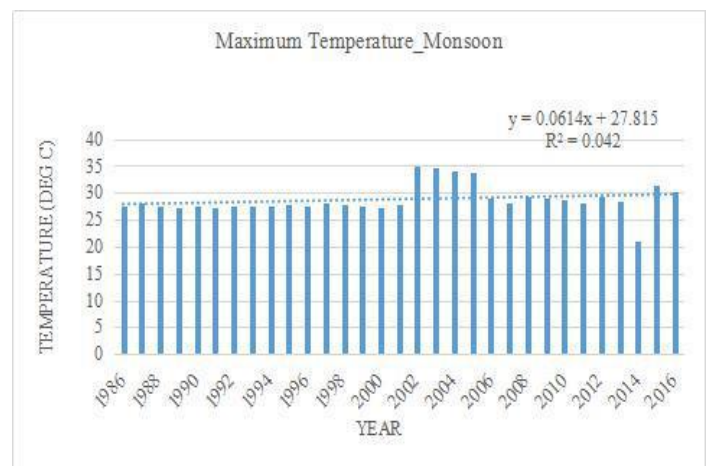**Chart-6 Monsoon average minimum temperature trend for Mysore Taluk   from 1986-2016**

Chart-9 monsoon average maximum temperature trend for Mysore Taluk from 1986-2016
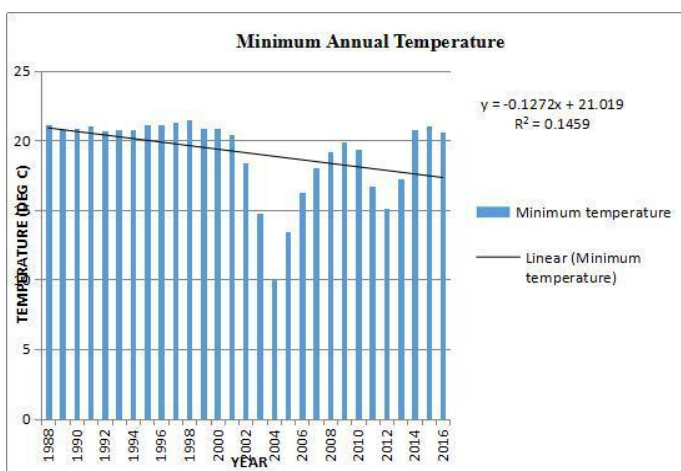

Chart-7 Annual average minimum temperature trend for Mysore Taluk   from 1986-2016
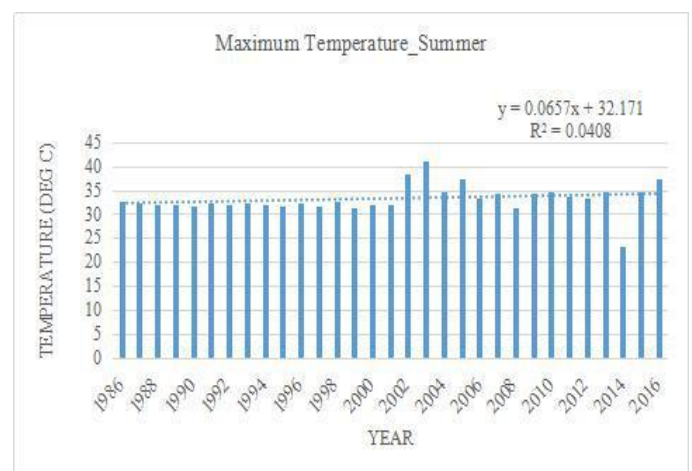

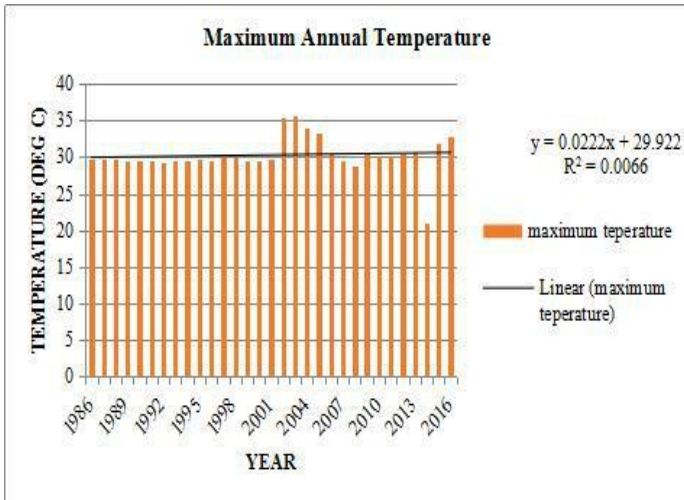**Chart-10 summer average maximum temperature trend for Mysore Taluk from 1986-2016**

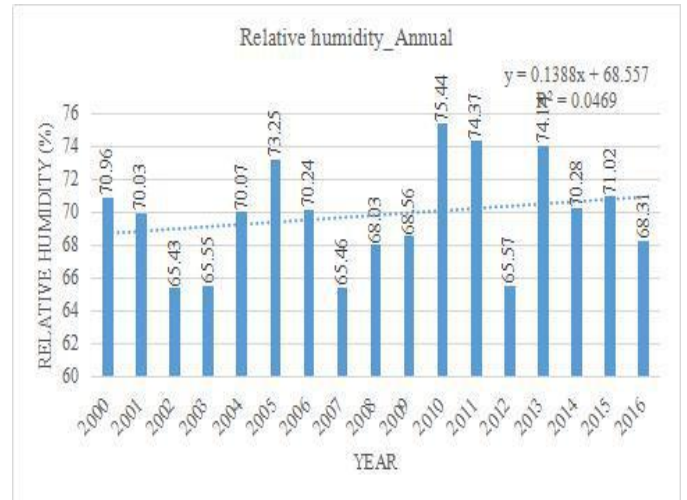**Chart-11 Annual average maximum temperature trend for Mysore Taluk from 1986-2016**

4.2 Variability in National Centers for Environmental Prediction (NCEP) reanalysis

NCEP Reanalysis data such as Relative Humidity, Runoff, Soil Moisture and Solar Radiation are taken in the Analysis for the Mysore taluk by using downscaling Techniques i.e., extracting the values for Mysore Taluk from the global data at the monthly scales by using Grads Software from the year of 2000-2016.

a) Relative Humidity (RH)

The Relative Humidity is a ratio of the actual amount of water vapour in the atmospheric compared to the saturation amount of water vapor. If the relative humidity percentage increases then the air water mixture is more humid. The monthly Relative Humidity shows that increase (positive) in trend. There is decrease in RH from January to April and increase in the RH during Monsoon season for Mysore Taluk (Chart-9). The Annual average Relative Humidity shows that increase in trend (Chart-13) for Mysore Taluk.

Chart-12 Monthly average Relative Humidity trend for Mysore Taluk from 2000-2016

Chart-13 Annual average Relative Humidity trend for Mysore Taluk from 2000-2016

b) Soil Moisture

Soil Moisture is a important variable to control the exchange of water and heat from energy between the land surface and the atmosphere through evaporation and plant transpiration. The monthly soil moisture for shows that increase (positive) in trend. There is a gradual increase in the month of June-November and then decreases from December to April (Chart-10). The Annual average soil moisture shows that decrease in trend (Chart-15) for Mysore Taluk.
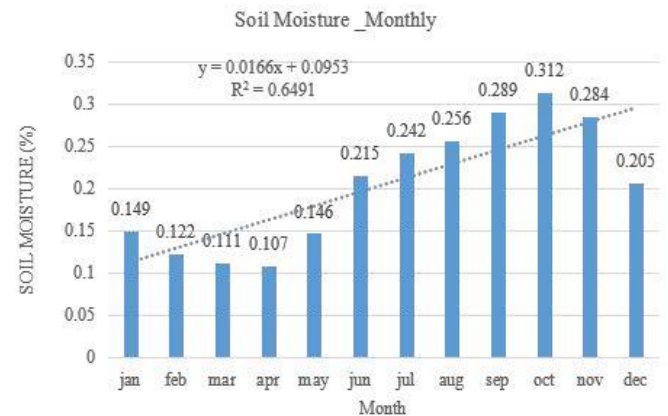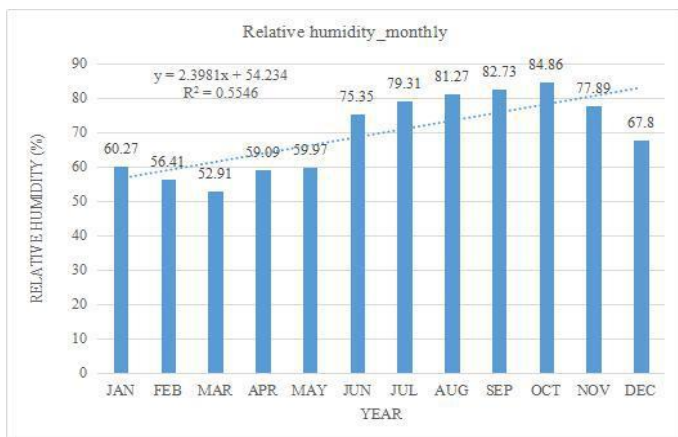

Chart-14 Monthly average soil moisture trend for Mysore Taluk from 2000-2016

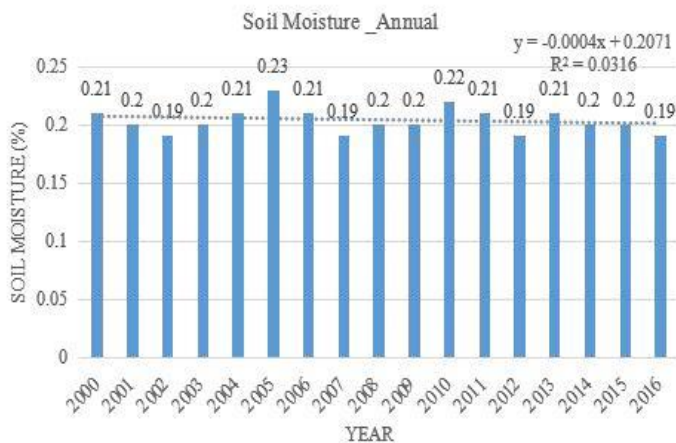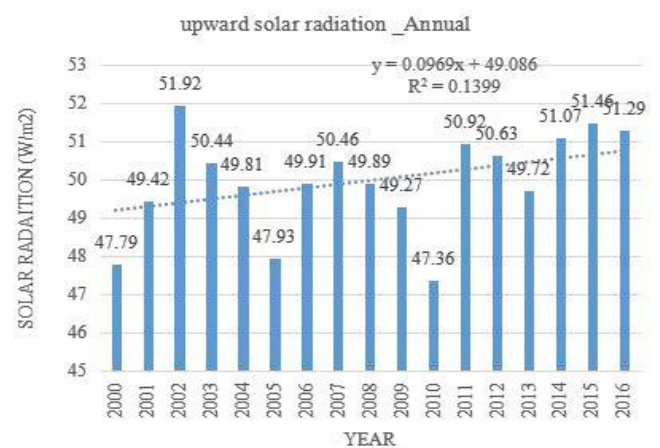**Chart-15 Annual average soil moisture trend for Mysore Taluk from 2000-2016**

c) Solar Radiations

Solar radiation at the earth surface is not constant over time but varies considerably over decades. A solar radiation provides the light and heat for the plants development. The Monthly solar Radiations for both upward and downward shows that decreasing in the trend. There is gradual increase in the upward and downward solar radiation during Feb-May but in the case of the upward solar radiation its rise to maximum in the month of May. Likewise in case of downward solar radiation in the month of March it rises to maximum radiations (Chart-11, Chart-12). The Annual average upward solar radiation shows that increase in trend for Mysore Taluk (Chart-17) and The Annual average downward solar radiation shows that decrease in trend (Chart-19) for Mysore Taluk.
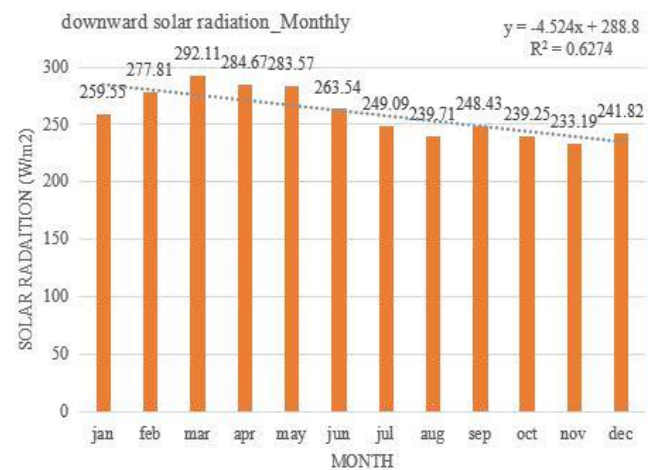

Chart-16 Monthly average upward solar radiation trend for Mysore Taluk from 2000-2016
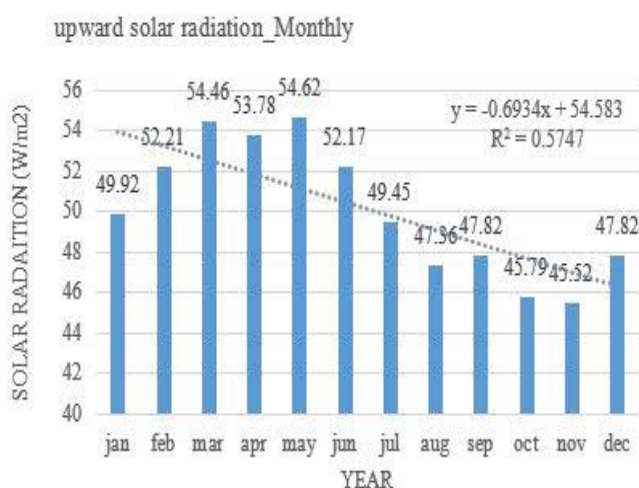

Chart-17 Annual average upward solar radiation trend for Mysore Taluk from 2000-2016

Chart-18 Monthly average downward solar radiation trend for Mysore Taluk from 2000-2016
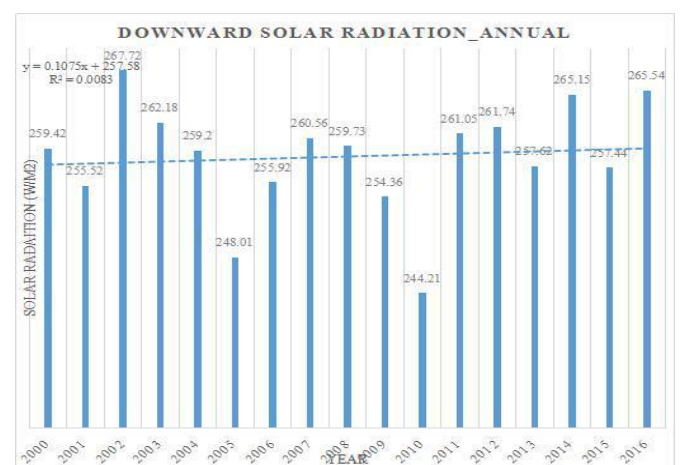

Chart-19 Annual average downward solar radiation trend for Mysore Taluk from 2000-2016

d) Water runoff

  Runoff is part of the precipitation, snow melt or water that appears in uncontrolled surface streams, rivers, drains or sewers. The monthly water runoff shows that increases (positive) in trend. The interesting point of observation is the runoff is low throughout the year except during the post monsoon season (Oct-Nov) showing the peak water runoff (Chart-13). This clearly indicates that this region receives the maximum amount of rainfall in the NE Monsoon season as compared to SW Monsoon. The Annual average Water Runoff shows that decrease in trend (Chart-21) for Mysore Taluk.
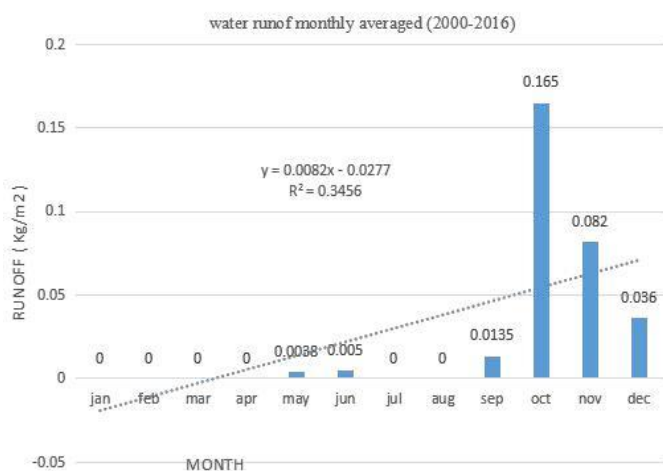

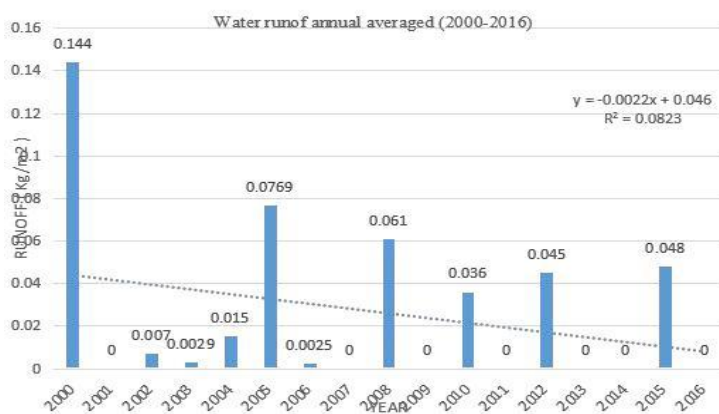**Chart-13 Monthly average downward solar radiation trend for Mysore Taluk   from 2000-2016**

Chart-21 Annual average WaterRunoff trend for Mysore Taluk   from 2000-2016

3. CONCLUSIONS

Climate variability is the variations in season to season wise and climate change is due to year to year changes from weather patterns and it is a good example to study climate for the selected area and main thing is that the outcome of the "Global Warming" has now started showing its impacts

worldwide. Climate is the primary determinant of agricultural productivity which directly impact on food production across the globe. The Rainfall and temperature play an important role in the climate change. As temperature increases the rainfall decreases this leads to less water runoff and if temperature decreases the relative humidity increases because the relative humidity is an important factor in between atmosphere. As temperature increases the solar radiations is more in the land surfaces so downward solar radiation should me less because solar radiation is in the form of different rays like uv, gamma and x rays etc. so that downward solar radiations should be less compared to upward solar radiation because radiations is harms the environment like global warming .There will always be natural climate variability at many scales – decadal, yearly and short-term extreme events. This means that over the long-term record, there will be ups and downs with the yearly and 30-year averages, even if climate is getting warmer. We cannot expect every summer to be warmer than the previous one, but we can expect and plan for variability.

REFERENCES

[1] Raji Reddy .D., Sreenivias .G. and Pranuthi .G. 2007, Climate change impacts on ice in Andhra Pradesh , ISPRS Archieves 37 - 8/W3 Workshop proceedings ; Impact of climate change on Agriculture 124-126

[2] IPCC, (2013). Climate change 2013: The physical science basis. Working Group I contribution to the IPCC Fifth Assessment Report. Cambridge, United Kingdom: Cambridge University Press. www.ipcc.ch/report/ ar5/wg1.

[3]   Thanh Van Hoang and Chih Yuan Chien, 2014, International Journal of Advanced Remote Sensing and GIS **3: (**1), 642-659

[4] Nathaniel Bayode Eniolorunda 2008, International Journal of Computational Engineering Research (ijcer.online.com) 04**: (**01)

[5] Anupama Mahato 2014, Climate change and its impacts on Agriculture, IJSR Publication, 4: (4).