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CLIMATIC VARIABILITY OVER SRINAGAR: IDENTIFYING TRENDS

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ABSTRACT

Temperature and rainfall are regarded as the essence of climate and therefore, its variability is often considered as synonym of climate variability. Our nation being agriculture based is highly vulnerable to the anomalies of temperature and rainfall, especially the latter. In this paper, therefore, an attempt has been made to identify the trends of rainfall and temperature on different spatio-temporal basis in the Srinagar. The study has analyzed monthly, seasonal and annual rainfall and temperature trends over Srinagar. For both temperature and rainfall, monthly and seasonal data has shown greater variability though the annual trends of both the parameters are more or less constant. Though the variability for monthly and seasonal basis is sharply increasing or decreasing but statistically most of it is not statistically significant. The mean maximum temperature for winter and autumn has shown a sharp increasing trend suggesting a warm trend for the period of the year. Examination of the seasonal mean minimum temperature series indicates that the winter season and spring season show warming trend as the seasons have shown a drastic increase in trend especially for winter season. Seasonal trends for the JFM and AMJ show a sharp increase in the rainfall trend. JAS and OND also show a sharp declining trend for rainfall.

Key Words: Climate variability, rainfall, temperature, trend, seasonal, monthly.

INTRODUCTION

The last decade has witnessed a rapid a rapid increase in the awareness of global Change and triggered widespread apprehension among Scientists & governments about the implications for their part of the globe. A change of climate for any place of the world is likely to portend serious consequences with respect to the manner of life for the people of the region, particularly as it relates to their agricultural practice. Climate change will impact different regions and sectors differently; based on their sensitivity and adaptive capacity, and therefore, vulnerability. Less developed and poor societies have higher risk of bearing the adverse impacts of climatic change. The scenario of climate change is spatially and seasonally different in various agro-ecological regions of the country. Inter annual climatic variability, in terms or temperature and rainfall, has noticeable, spatial and temporal variations.

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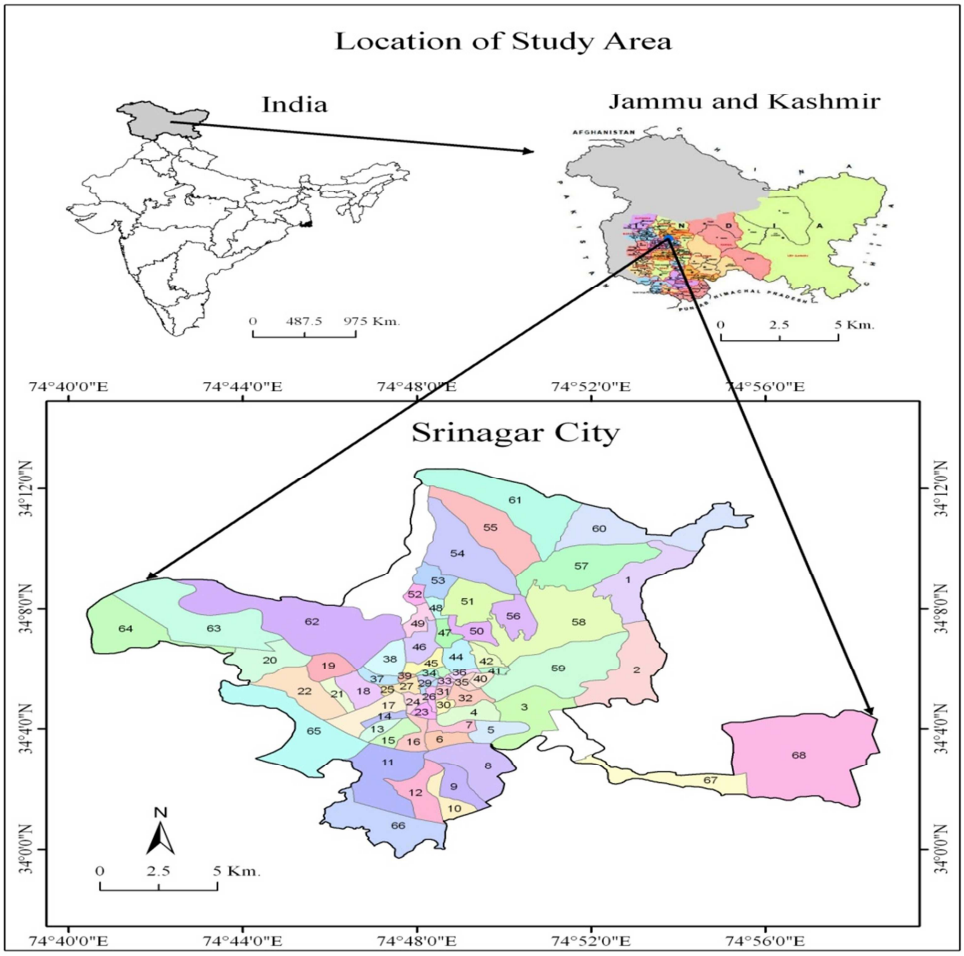
The course of variability is significant at some places because of which a wide range of variations take place from year to year. The quantity of rainfall and its events have also become uncertain. In certain places climatic extremes such as droughts, floods, timing of rainfall and snowmelt have also been affected. It should be noted that no single factor is likely to be responsible for all of the observed changes in climate. All causes have had some effects; the problem is to determine which are more significant.

Study Area



Srinagar city is located at an average elevation of 1600 meters above mean sea level and it is spread over in the heart of the oval shaped Valley of Kashmir. It is situated between 74^0-56' and 75^0-79' East Longitude and 33^0-18' and 34^0-45' North Latitude. The city as well as its hinterland is bounded by natural wall of mountains (sub-mountain branches of Pir Panjal Ranges and Zanskar mountains). In the east, the city is bounded by Zabarwan Mountains with lush green vegetation, locating famous Dachigam Sanctuary and Mughal Gardens and is environed by the

shallow and swampy lakes of Dul and Nagin with the eminence of hillocks of Takth-i-Suliman in the east and Kohi-Maraan (Hariparbat) in the centre adding to its beauty and making surroundings of the city invigorating.

REVIEW OF LITERATURE

Climate has fluctuated throughout the earth's history between periods of relative warmth and cold. Climatic variation has a large impact on mans activities and on the economy of human population. Occurrence of extreme variations in precipitation leading to droughts and floods has always been a cause of concern. Recognition of climate change as a significant global environmental challenge has a recent origin. International efforts to address climate change formally began only a decade ago with the adoption of the United Nations Framework Convention on climate change (UNFCCC) in 1992.

Spatial variation in precipitation in the Upper Indus Basin has been investigated by correlation and regression analysis of long period record by Archer, D.R and Flower, H.J (2004). Trends in the Greater Himalaya have been studied by many authors. Shresth el al (2000) found no distinction in long term trends in precipitation (mainly monsoon origin) from 1948 to 1994 in the Nepalese Himalaya. Arnell, N.W (2002) compares effects of mean climate due to global warming with those due to multi-decadal variability and also explore the effects of changing the yearly variability in climate. Hua Chen, Shenghan Guo, Chong Yu Xu and Singh, V.P (2007) have investigated the issue of temporal trends of runoff, precipitation and temperature from 1951 to 2003 and the impact of climatic change on water resources. Impact of climatic variability on hydrology and vegetation cover using the pattern ecosystem model was observed by Mulligan, M (1997) – an examination of the variability of soil erosion which results from this variable hydrology and vegetation cover and the dynamic response of erosion to climatic variability. Nath, C.D. et al (2006) found that tree diameter growth is sensitive to environmental fluctuations and rainfall also affects tree growth in the mudumalai dry forests of southern India. The effect of climate change on snow water equivalent, snowmelt runoff, glacier melt runoff, total stream flow of Himalayan river is examined by Singh, P. and Kuman, N. (1996). Implications of seasonal changes are also briefly discussed by them. Mieche (1992) reports a general perception that winter precipitation has decreased over the last 30 to 40 years, a view supported by changes in vegetation and a change in the duration of winter closure of high mountain passes. Singh and Sen Roy (2002) observed a slight upward trend in winter rainfall and a slight downward trend in monsoon rainfall between 1964 and 1992 in the Beas catchment, while Baraonkar et al (1996) found significantly decreasing trends in both winter and summer precipitation in a record at Shimla from 1876 to 1982. A compilation of papers on the vulnerability assessment in different sectors in India was carried by Shukhla, P. R. et al. The compilation represents the scientific capacity as well as the concerns in India regarding the vulnerability to climate change and need for policies to craft adaptation responses. Climatic variability and its implications for sustainable agriculture to a better understanding of the impact of climatic variability on the sustainability and diversification of Prairie agriculture was initiated in may, 1997 by Sauchyn , D. J. Abrol, Y.P. et al (1996) made an attempt to look at the mean pattern of precipitation and surface air

temperature variations over whole of South Asia and also to summarize the vast literature on climate change and variability over India providing the essential backgrounds. Causes of climate variability and change, climate system and future challenges have been discussed by Ahlluwallia, V. (2oo7) which indicate that the capacity of a society to absorb adverse climatic impacts is not a simple linear function of its wealth or degree of development. Inter-annual climatic variability, in terms of temperature and rainfall, has noticeable spatial and temporal variations. The course of variability is significant at some places, because of which wide range of variation take place from year to year.

Objectives

- To provide information of the main climatic parameters- rainfall and temperature variability which are most likely to affect the sustainability of the natural and agricultural ecosystems.
- To examine the spatio-temporal variations in the patterns of winter rainfall.
- To examine the rainfall and temperature pattern on the basis of data and identify and project future trends for the next 40 years up to 2050 AD.

Data Base and Methodology

The standard methods of climatic variation studies will be used for detailed survey and analysis. The required data for the study will be collected from Indian Institute of Meteorological department. The data would be used to identify the trend of climate over the period of time for the variables of temperature and rainfall. Decadal climatic trend and mean maximum and mean minimum of the variables would also be carried out. A very simple method is followed to classify the performance of monthly, seasonal and annual rains based on the departure of rainfall from their mean in comparison to the Standard deviation (SD). The years with the deficiency and Number of years of rainfall on different spatial scales are also determined. Since the area is agricultural in nature, therefore, an attempt is also made to assess the coefficient of variation (COV) over the area. The coefficient of variation varies between 156.07 in December, 86.29 in OND and 25.32 (annual). Based on the results of calculations and analysis of monthly, seasonal and annual rainfall and temperature data, trends of variability are identified and presented through construction of various graphs and tables.

RAINFALL VARIABILITY

Seasonal and large spatial-temporal variability characterize rainfall occurrences in India. . Climatic variability is best thought of as the manner of variation of the climatic parameters within the typical averaging period. Large variation in any climatic parameter from its long term mean is referred to as anomaly. These anomalies are part of climatic variability and change. These climatic anomalies are part of climatic variability and change. Climate changes on a wide range of time scales are known from the records of the past. Climatic fluctuations lasting several decades are not uncommon and are often strongly regional in their effects. In particular, the

inter-annual to decadal scale variability of rainfall has been known to have caused considerable stain on the economic progress of the south Asian countries.

Table 1: Statistics of rainfall variability of Srinagar

Month/Year/ Season	Mean	Standard Deviation	Co-efficient of Variation
Annual	657.52	166.46	25.32
January	50.51	31.70	62.76
February	77.27	42.42	54.90
March	103.44	74.40	71.93
April	81.95	42.97	52.43
May	71.12	43.01	60.48
June	41.64	28.23	67.80
July	55.57	35.02	63.02
August	64.84	51.04	78.72
September	28.64	26.07	91.03
October	26.76	33.00	123.32
November	28.90	29.56	102.28
December	40.20	62.74	156.07
JFM	231.22	91.50	39.57
AMJ	198.84	74.54	37.49
JAS	150.26	73.52	48.93
OND	92.91	80.17	86.29

Source: IMD, Pune

The valley receives considerable rainfall throughout the year but mostly during winter in the form of snow due to western disturbances originating from the Mediterranean Sea. Rainfall over Srinagar shows considerable month to month, season to season, and year to year variation. There are months when the rainfall is much above the normal followed by months of much below normal rainfall. Also, there are year of much above normal rainfall and vice-versa. Thus, there is a certain mode of variability, which is common mode of rainfall variability, which is common on inter-annual scales.

The present study investigates the trends and fluctuations in monthly, seasonal and yearly rainfall in Srinagar. For this purpose, Coefficient of Variation (COV) and Standard Deviation (SD) of monthly, seasonal and annual are calculated. Table1 Clearly shows the extent of variability and the mean monthly, seasonal and annual rainfall with their Standard deviation and Coefficient of variation which apparently indicate the pattern of the variability of rainfall in the valley. The coefficient of rainfall is different for annual, seasonal and monthly amounts. Table 1 clearly reveals that coefficient of variation becomes smaller as the time period reduces. Normally, coefficient of Variation decreases with increase in rainfall amount up to about 100 cm and does

not vary much above 100 cm rainfall. For rainfall amounts of less than 50 cm, coefficient of variation is much higher than 35% (Rao et al, 1971).

RESULT AND DISCUSSION

The analysis of the rainfall data on monthly, yearly and seasonal basis show mixture of rainfall trends in the meteorological sub-division under study (See Appendix; 1-17). Analysis of the monthly rainfall data suggests that the degree of trend differs months as well as seasons. Sharp increasing trends are observed in case of January, February and November over the metrological sub-division. However, it appears to be trendless in April, June, July and September. However, there is a sharp declining trend for the months of August, October and December. The trend for the month of December is showing an alarming declining trend; decreasing from 11.1in 1970 to 8.5 in 2006 and then again increasing to 10.5 in 2008. The yearly trend has shown a slight decreasing trend and seasonal trends for the JFM (January, February and March) and AMJ (April, May and June) show a sharp increase in the rainfall trend. JAS (July, August and September) and OND (October, November and December) also show a sharp declining trend for rainfall. The winter rainfall trend of the meteorological sub-division also shows a sharp increasing trend. It should be noted that the region is highly depend on winter rainfall (mainly in the form of Snow) for its food production.

SRINAGAR TEMPERATURE VARIATION

Variation in annual, seasonal and monthly mean Minimum temperature over Srinagar is depicted in figure 18 to 34 for the period 1970 to 2009. The mean Minimum annual temperature of Srinagar has shown a slight increasing trend; however, it is not statistically significant. Examination of the mean monthly temperature indicates that the months of January, February, March, November and December) show warming trend as can be seen from the sharp increase in the mean monthly temperature of the said months while the months of May, June, July, September and October show a slight increasing trend in mean minimum monthly temperature. The month of August is trend less while a slight decreasing trend can be seen for the month of April.

Examination of the seasonal mean minimum temperature series indicates that the winter season (December, January and February or DJF) and spring season (March, April and May or MAM) show warming trend as the seasons have shown a drastic increase in trend especially for winter season (DJF). Slight increase in trend can also be seen for the remaining two seasons of summer (June, July and August or JJA) and winter (September, October and November or SON) However, it is not statistically significant.

Figure 35 to 52 depicts the variation in annual, seasonal and monthly mean Maximum Temperature over Srinagar. Analysis of the monthly data depicts that a sharp increasing trend is seen for the months of February and December which is not a good sign as rise in temperature in winter does not allow snow to freeze for a longer time which could lead to floods and even shortage of water in summer time as the valley is dependent on snow and glaciers for its water. A

slight increase can also be seen for the months of January, March, April, October and November, but statistically it is not very significant. The months of May, August and September are trend less while a slight decreasing trend can be seen for the months of June and July. It is amazing to note that the annual mean temperature is trend less. Also, the mean maximum temperature for winter (December, January and February or DJF) and Autumn (September, October and November or SON) have shown a sharp increasing trend suggesting a warm trend for the period of the year. March, April and May (MAM) also show a slight increase I trend but not very significant statistically. Surprisingly, the summer season has shown a sharp decreasing trend. Rupa Kumar, Krishna Kumar and Pant G.B. (1994) showed that the warming over India has been mainly due to increasing maximum temperatures rather than minimum temperatures.

CONCLUSION

The result of the study is quite amazing. It is implicitly indicated that the variability of temperature and rainfall on various spatio-temporal scale is significantly evident. It is noteworthy that broadly there are clear trends of both increasing and decreasing rainfall on monthly, seasonal and yearly basis during the last 40 years period. But on each scale the trend is not identical in intensity. Monthly rainfall is more variable, for example, December rainfall has shown clearly decreasing trend. The decreasing rainfall trend in December is a clear signal of delaying of winter in the region. Similarly, the mean Minimum annual temperature of Srinagar has shown a slight increasing trend. Monthly temperature is more variable, for example, January, February, March, November and December show warming trend. It is amazing to note that the annual mean temperature is trend less. Also, the mean maximum temperature for winter and autumn has shown a sharp increasing trend suggesting a warm trend for the period of the year.

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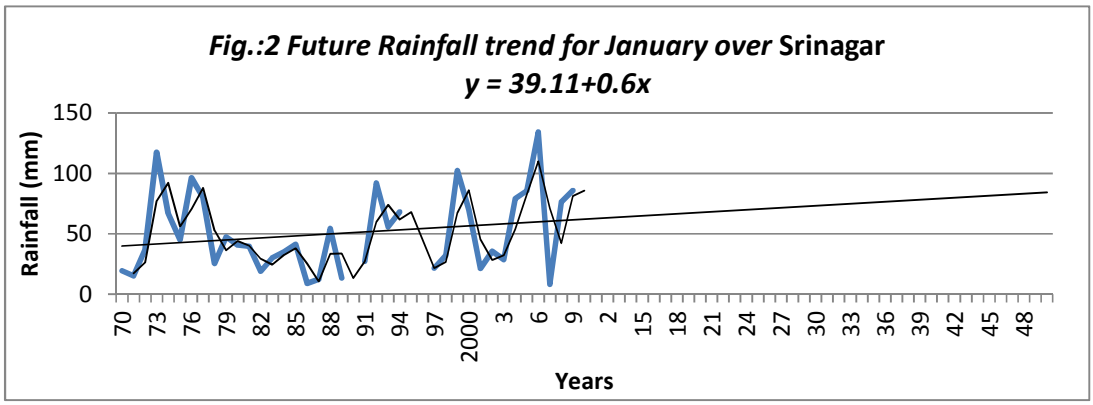
Annexure: Temperature and Rainfall trends on Spatio-temporal Scales-1970-2009 and projected up to 2050



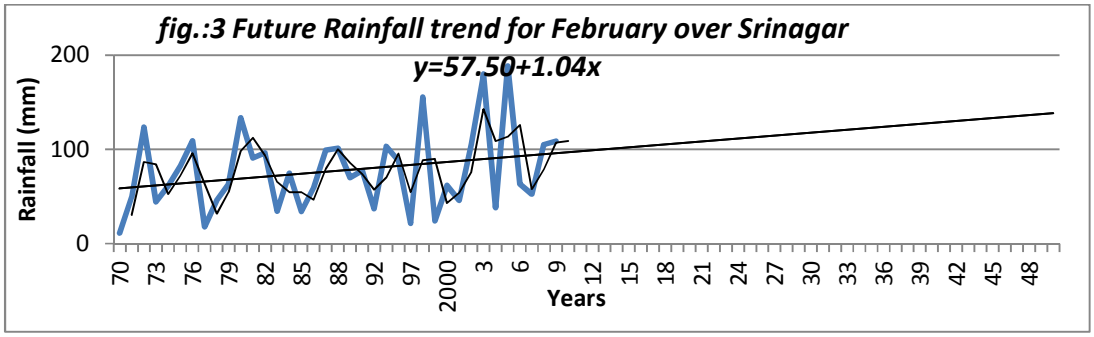


fig.:3 Future Rainfall trend for February over Srinagar
y=57.50+1.04x
Rainfall (mm)
200
100
0
70 73 76 79 82 85 88 92 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Years

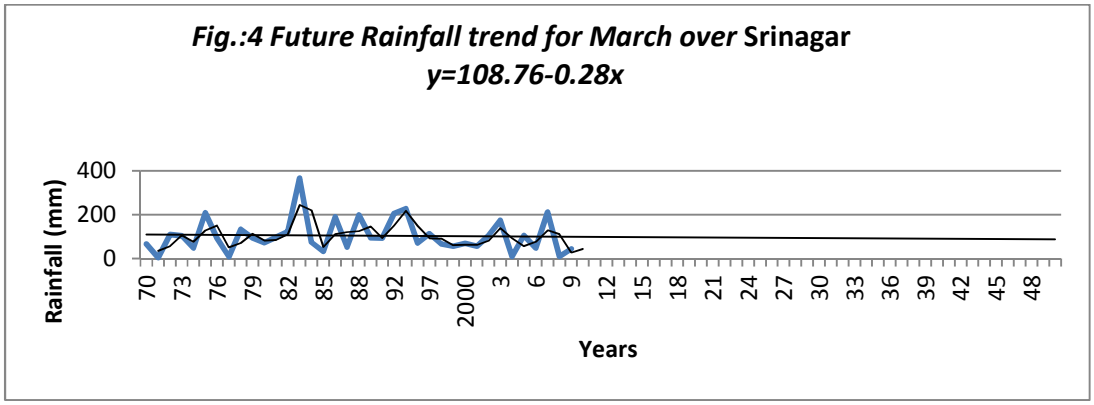


Fig.:4 Future Rainfall trend for March over Srinagar
y=108.76-0.28x
Rainfall (mm)
400
200
0
70 73 76 79 82 85 88 92 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Years

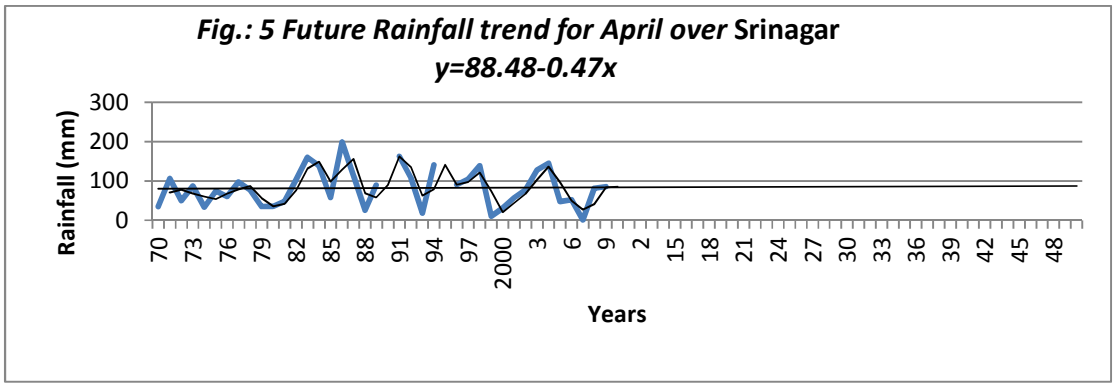


Fig.: 5 Future Rainfall trend for April over Srinagar
y=88.48-0.47x
Rainfall (mm)
300
200
100
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

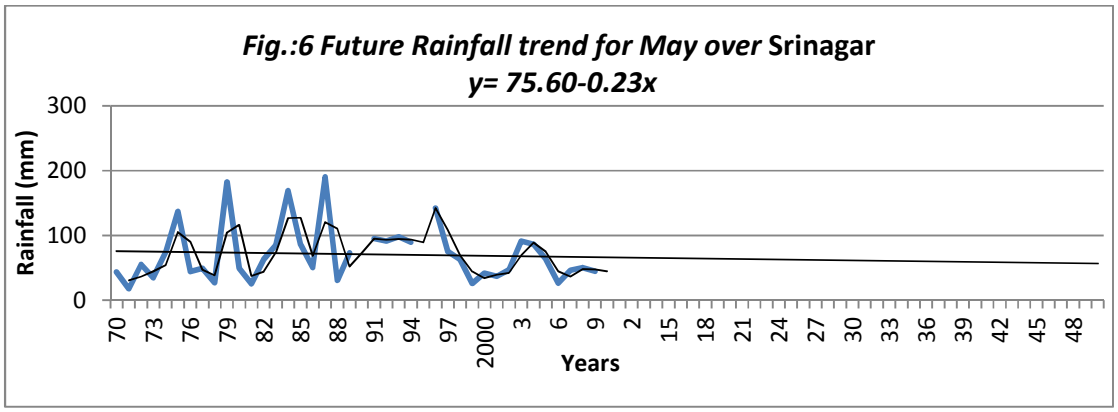


Fig.:6 Future Rainfall trend for May over Srinagar
y= 75.60-0.23x
Rainfall (mm)
300
200
100
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

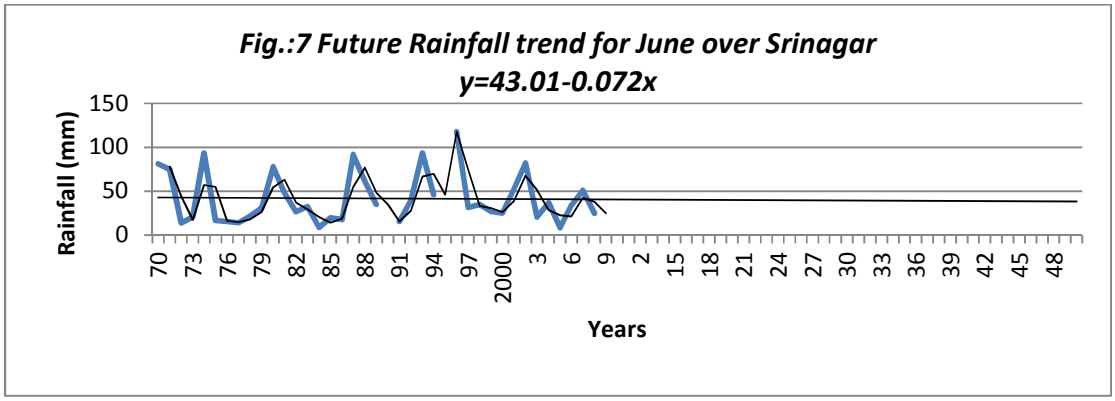


Fig.:7 Future Rainfall trend for June over Srinagar
y=43.01-0.072x
Rainfall (mm)
150
100
50
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

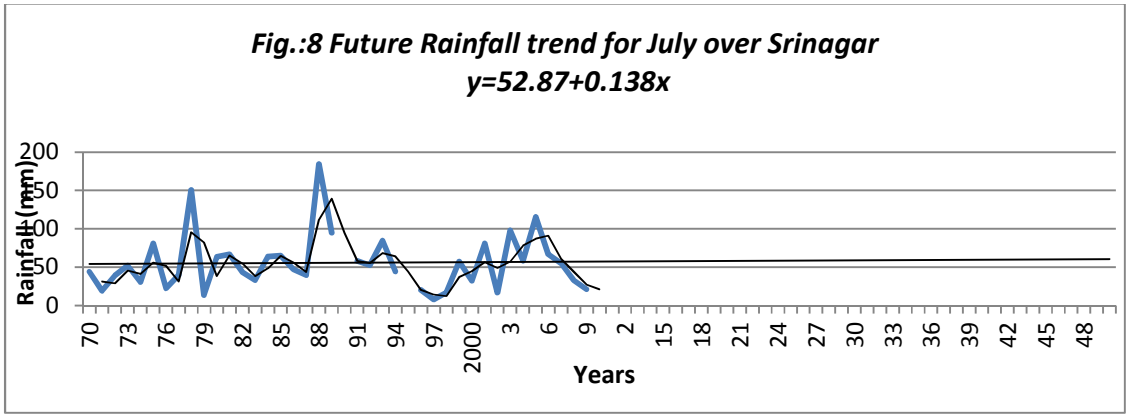


Fig.:8 Future Rainfall trend for July over Srinagar
y=52.87+0.138x
Rainfall (mm)
200
150
100
50
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

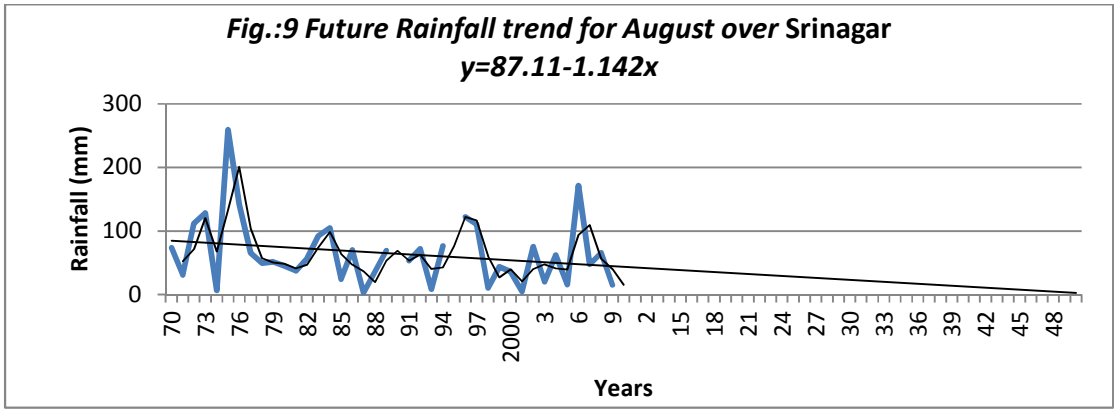


Fig.:9 Future Rainfall trend for August over Srinagar
y=87.11-1.142x
Rainfall (mm)
300
200
100
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

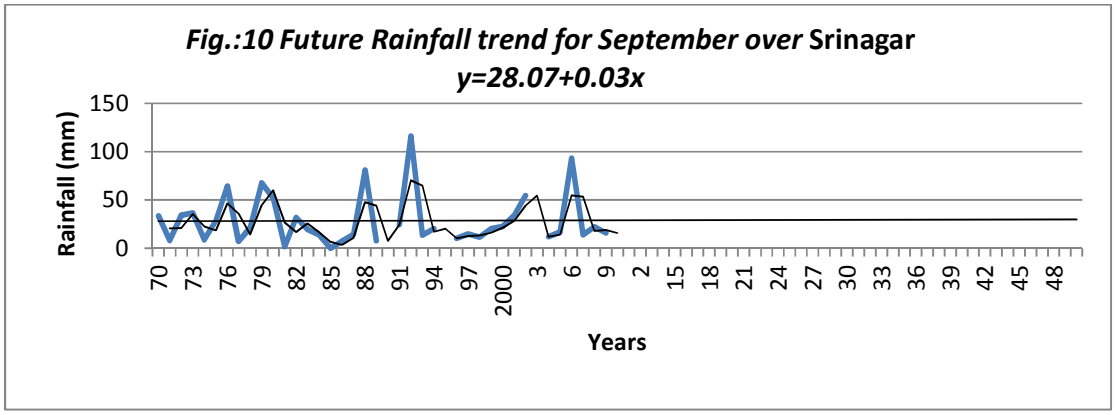


Fig.:10 Future Rainfall trend for September over Srinagar
y=28.07+0.03x
Rainfall (mm)
150
100
50
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

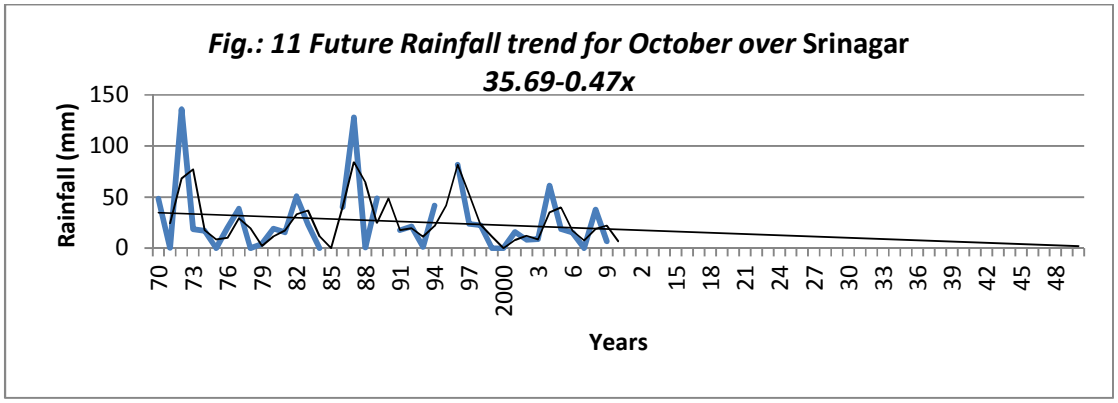


Fig.: 11 Future Rainfall trend for October over Srinagar
35.69-0.47x
Rainfall (mm)
150
100
50
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

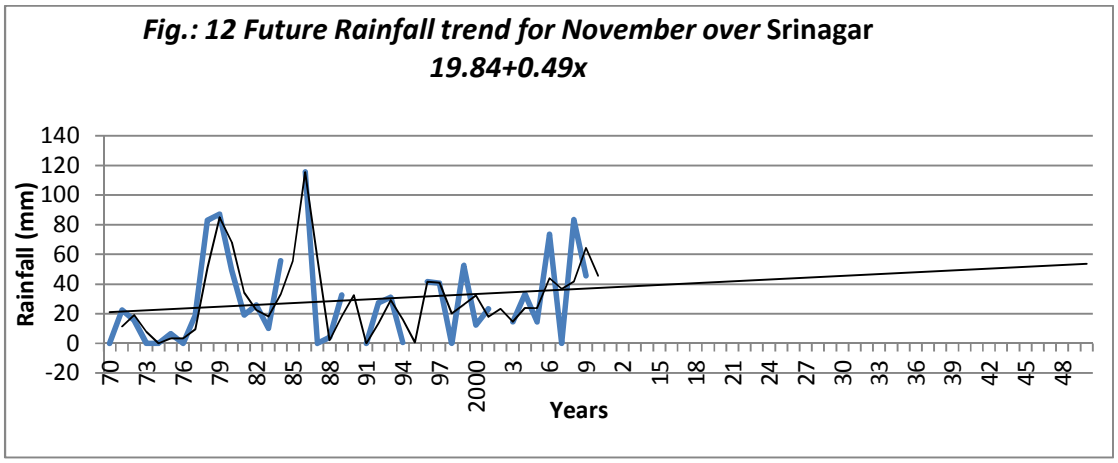


Fig.: 12 Future Rainfall trend for November over Srinagar
19.84+0.49x
Rainfall (mm)
140
120
100
80
60
40
20
0
-20
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 2 15 18 21 24 27 30 33 36 39 42 45 48
Years

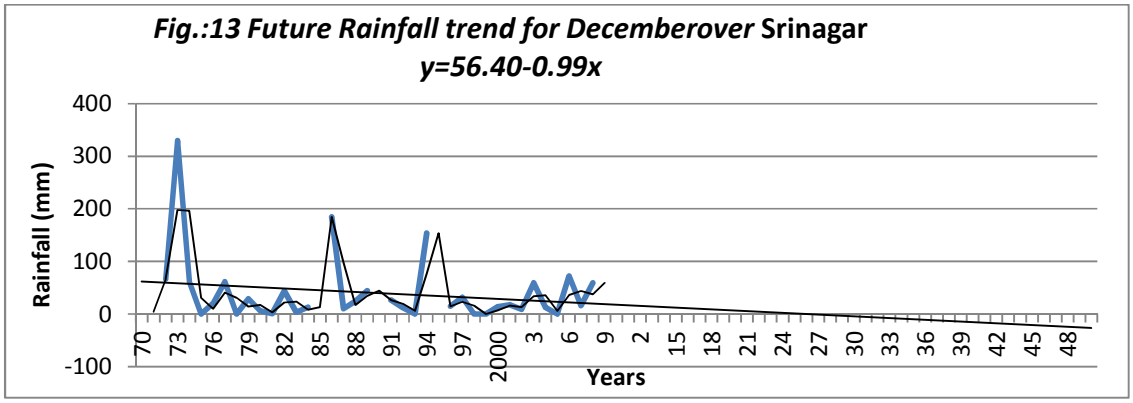


Fig.:13 Future Rainfall trend for Decemberover Srinagar
y=56.40-0.99x
Rainfall (mm)
Years

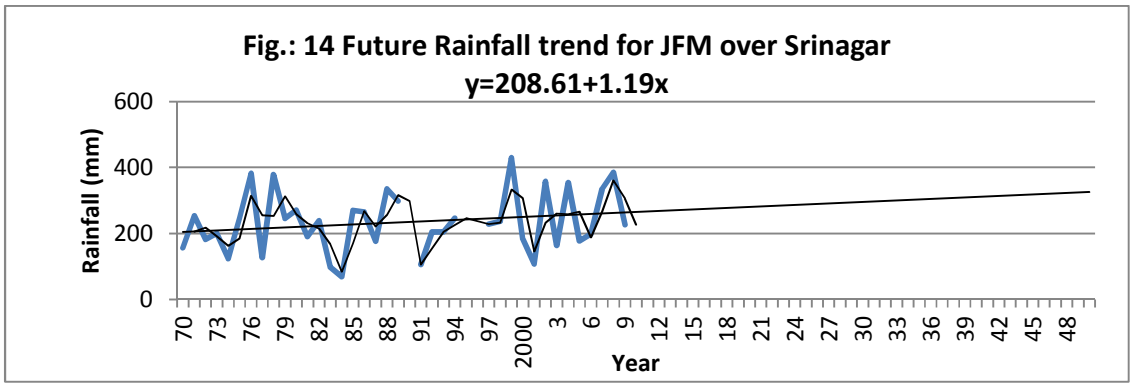


Fig.: 14 Future Rainfall trend for JFM over Srinagar
y=208.61+1.19x
Rainfall (mm)
Year

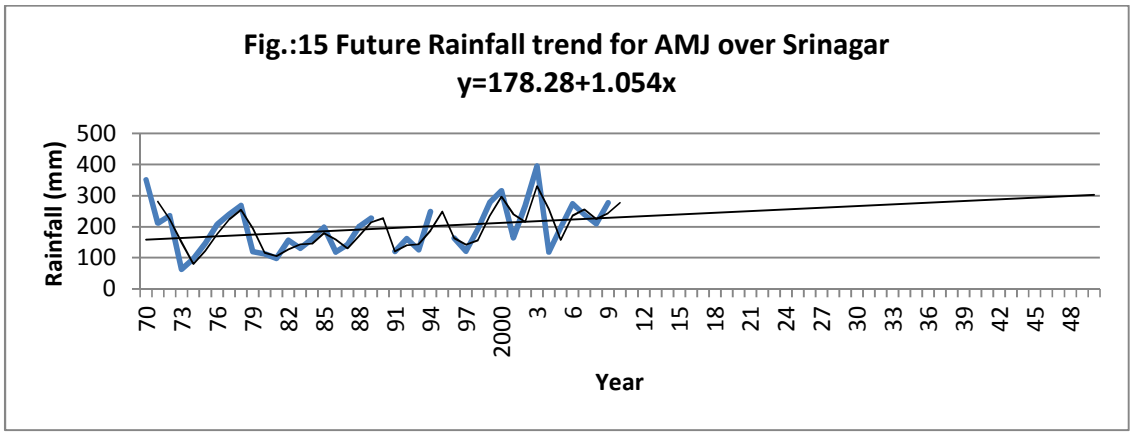


Fig.:15 Future Rainfall trend for AMJ over Srinagar
y=178.28+1.054x
Rainfall (mm)
Year

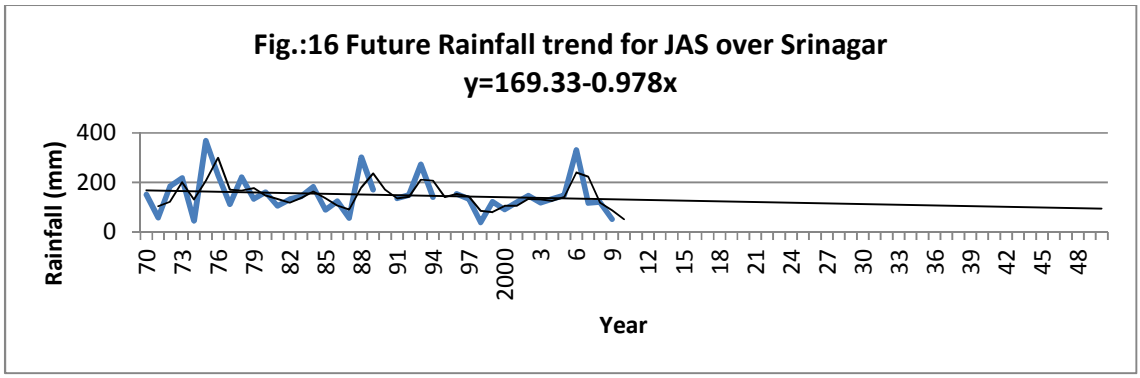


Fig.:16 Future Rainfall trend for JAS over Srinagar
y=169.33-0.978x
Rainfall (mm)
Year

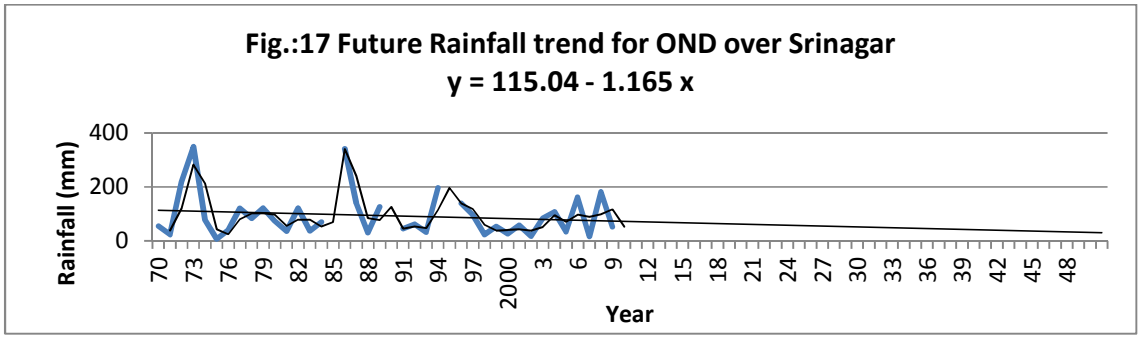


Fig.:17 Future Rainfall trend for OND over Srinagar
y = 115.04 - 1.165 x
Rainfall (mm)
400
200
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

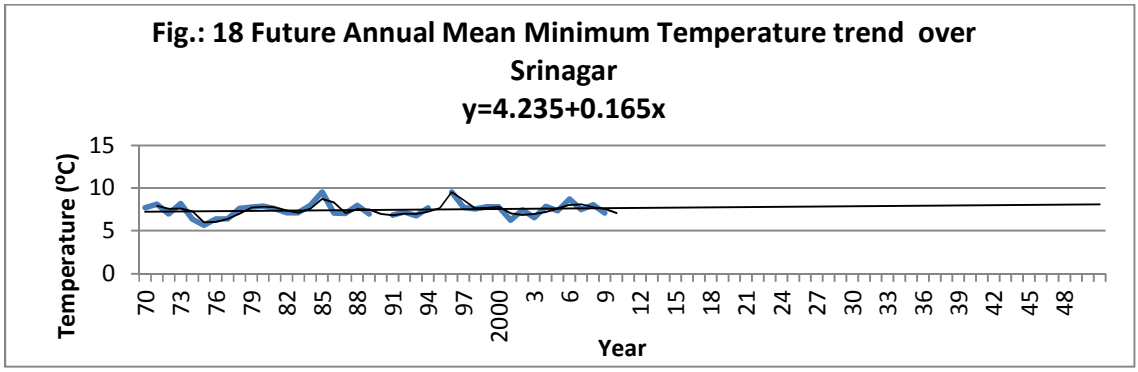


Fig.: 18 Future Annual Mean Minimum Temperature trend over Srinagar
y=4.235+0.165x
Temperature (°C)
15
10
5
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

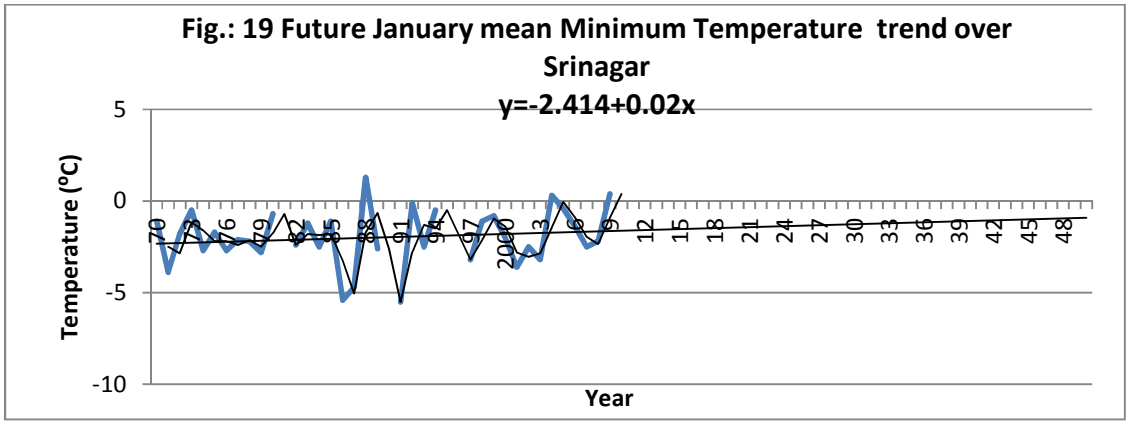


Fig.: 19 Future January mean Minimum Temperature trend over Srinagar
y=-2.414+0.02x
Temperature (°C)
5
0
-5
-10
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

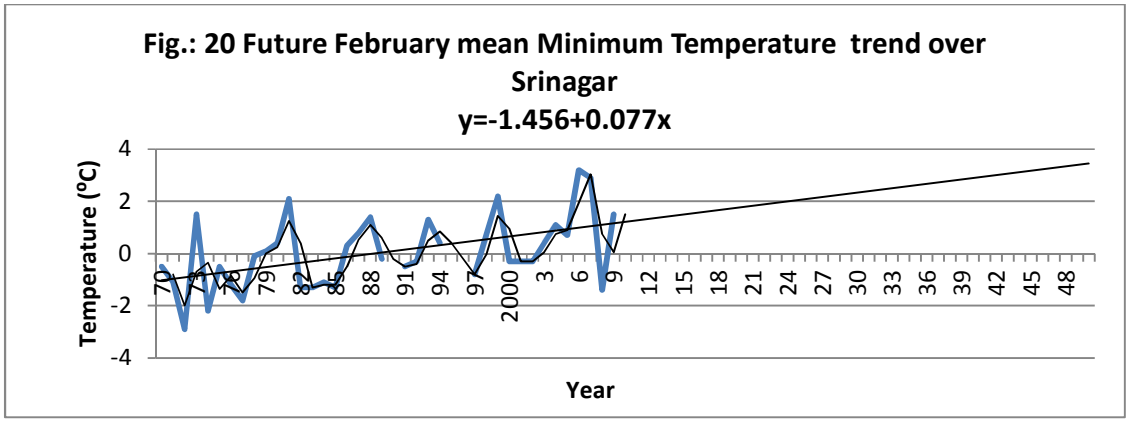


Fig.: 20 Future February mean Minimum Temperature trend over Srinagar
y=-1.456+0.077x
Temperature (°C)
4
2
0
-2
-4
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

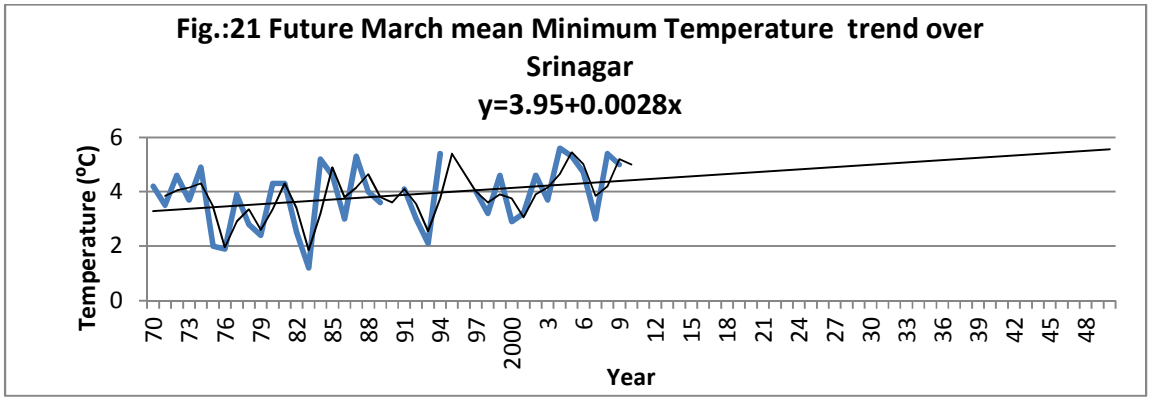


Fig.:21 Future March mean Minimum Temperature trend over Srinagar
y=3.95+0.0028x
Temperature (°C)
Year

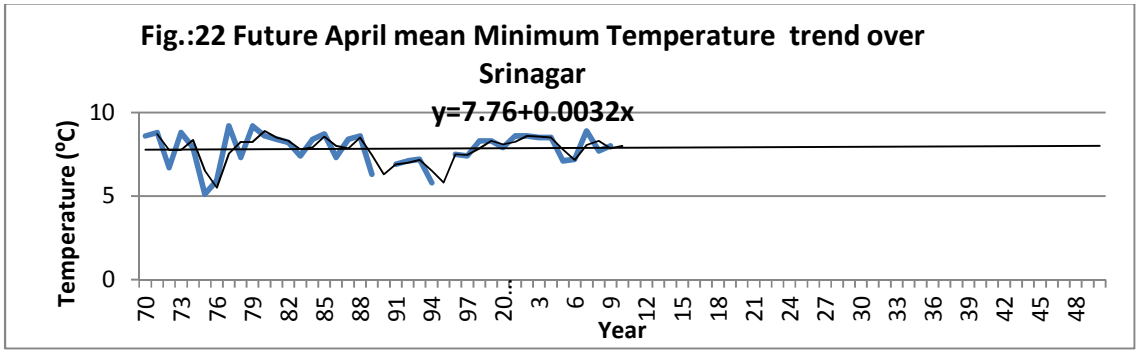


Fig.:22 Future April mean Minimum Temperature trend over Srinagar
y=7.76+0.0032x
Temperature (°C)
Year

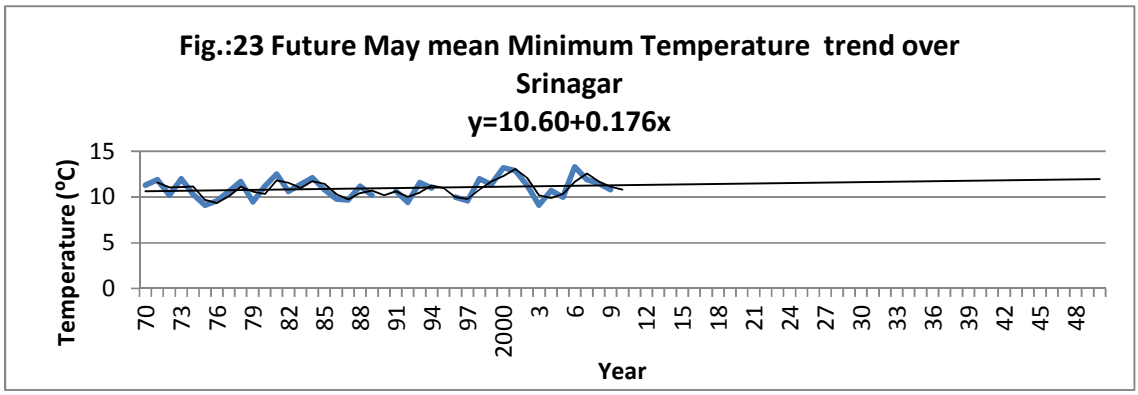


Fig.:23 Future May mean Minimum Temperature trend over Srinagar
y=10.60+0.176x
Temperature (°C)
Year

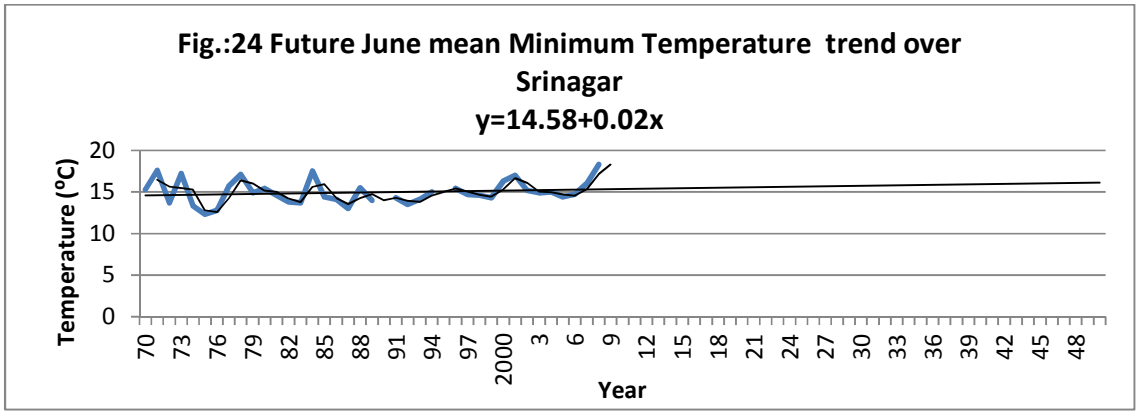


Fig.:24 Future June mean Minimum Temperature trend over Srinagar
y=14.58+0.02x
Temperature (°C)
Year

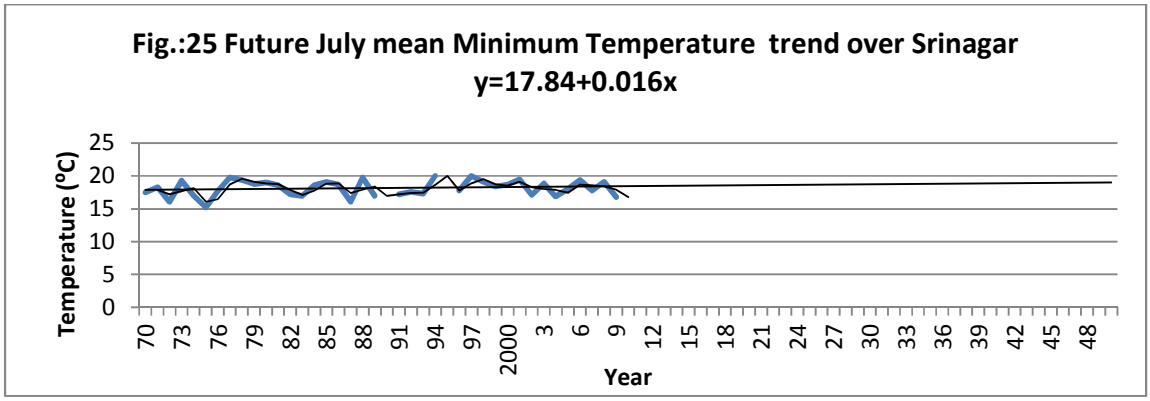


Fig.:25 Future July mean Minimum Temperature trend over Srinagar
y=17.84+0.016x
Temperature (°C)
Year

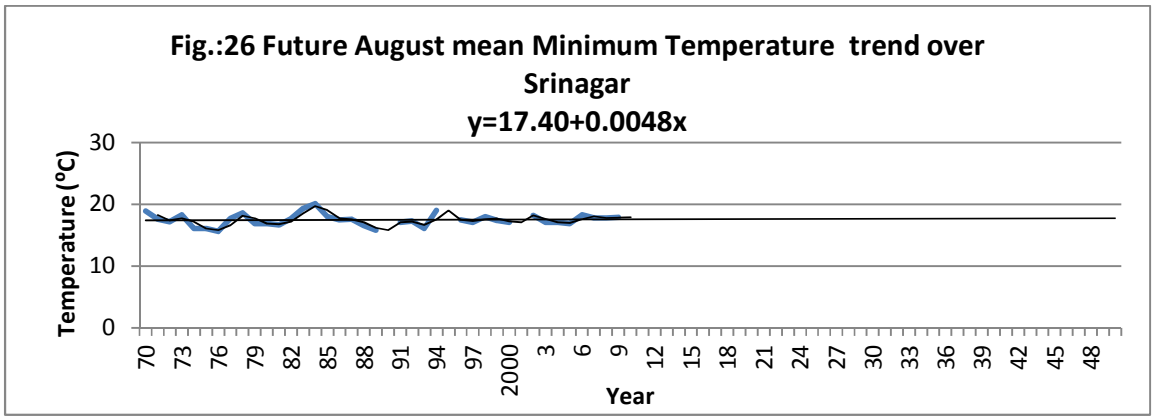


Fig.:26 Future August mean Minimum Temperature trend over Srinagar
y=17.40+0.0048x
Temperature (°C)
Year

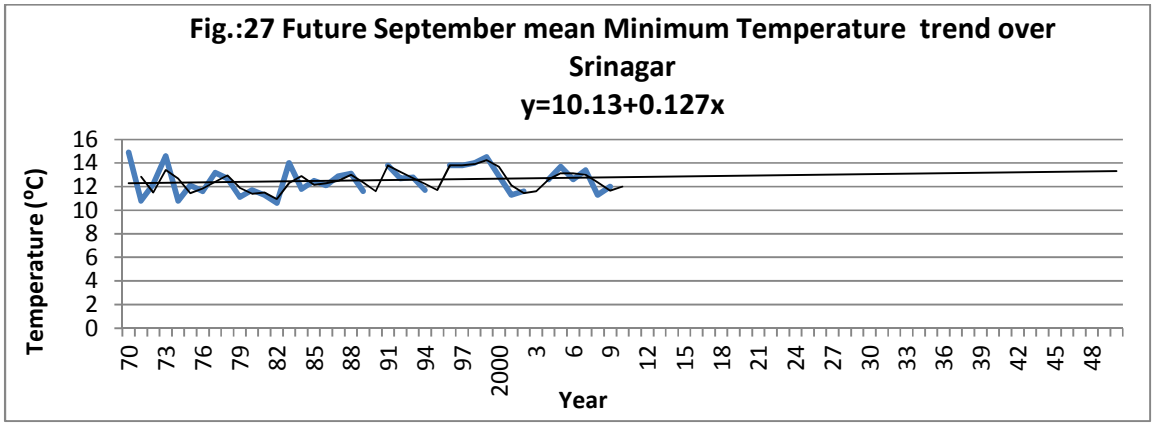


Fig.:27 Future September mean Minimum Temperature trend over Srinagar
y=10.13+0.127x
Temperature (°C)
Year

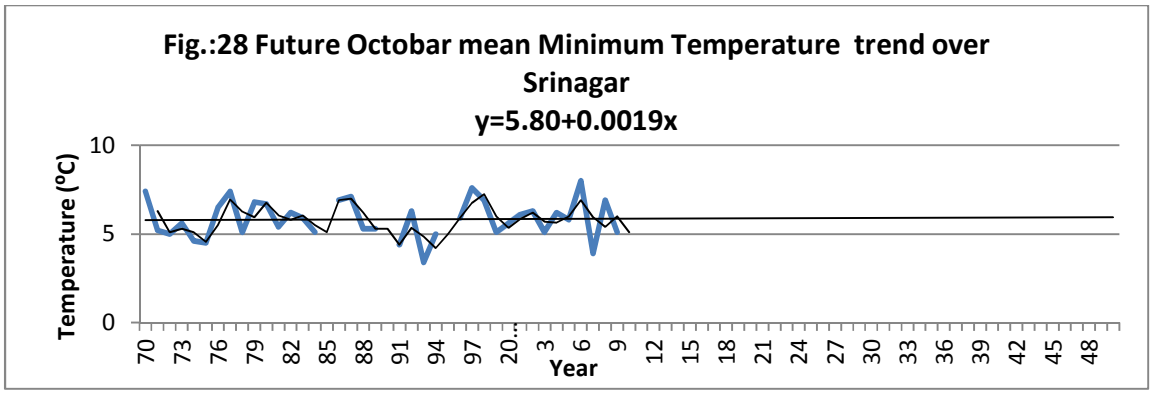


Fig.:28 Future Octobar mean Minimum Temperature trend over Srinagar
y=5.80+0.0019x
Temperature (°C)
Year

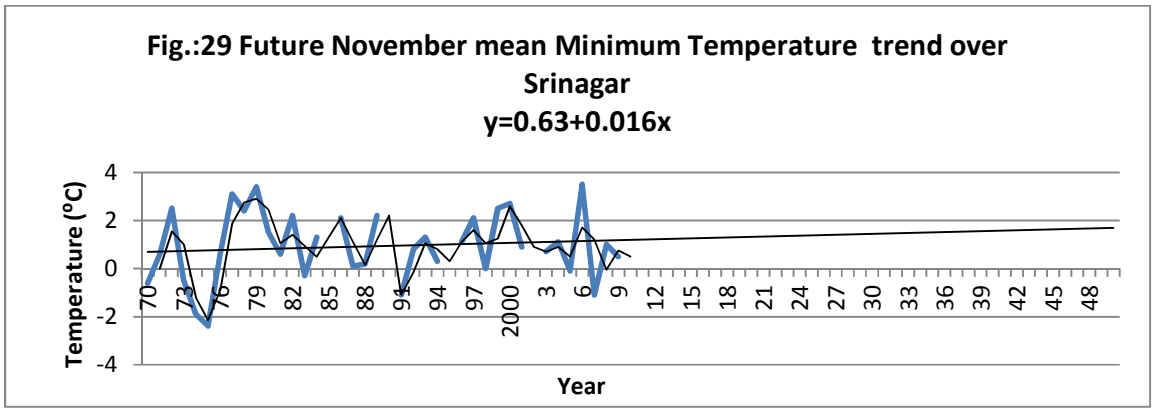


Fig.:29 Future November mean Minimum Temperature trend over Srinagar
y=0.63+0.016x
Temperature (°C)
Year

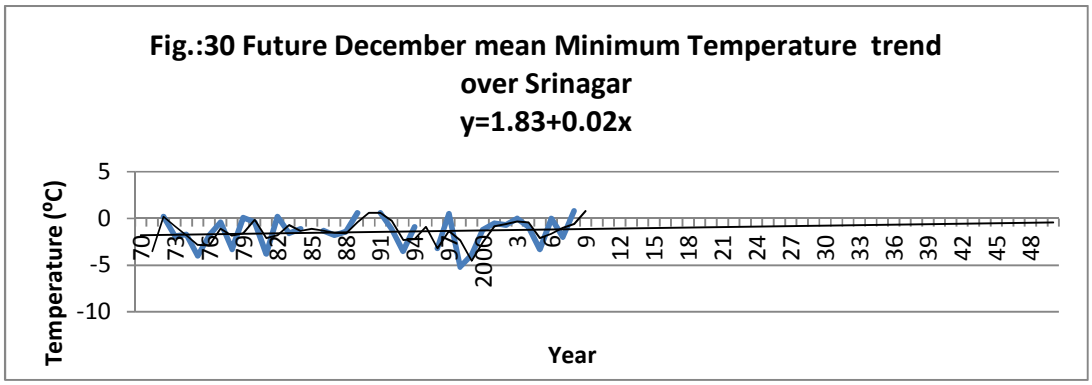


Fig.:30 Future December mean Minimum Temperature trend over Srinagar
y=1.83+0.02x
Temperature (°C)
Year

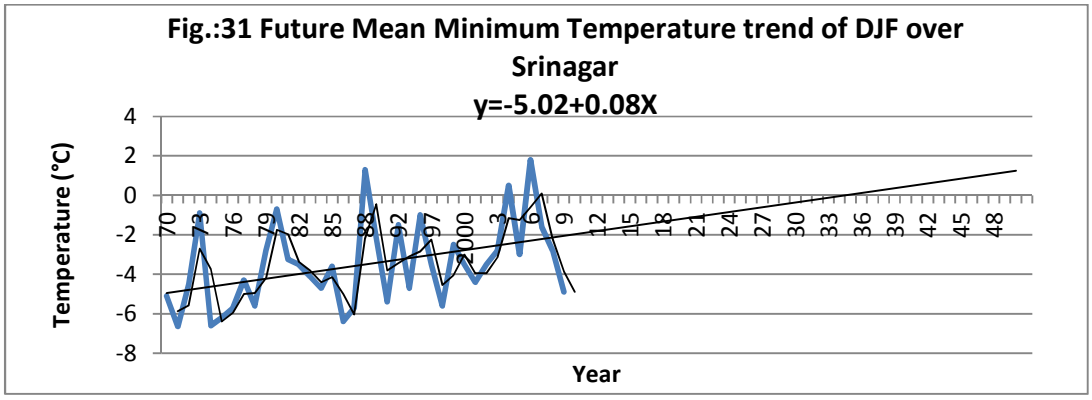


Fig.:31 Future Mean Minimum Temperature trend of DJF over Srinagar
y=-5.02+0.08X
Temperature (°C)
Year

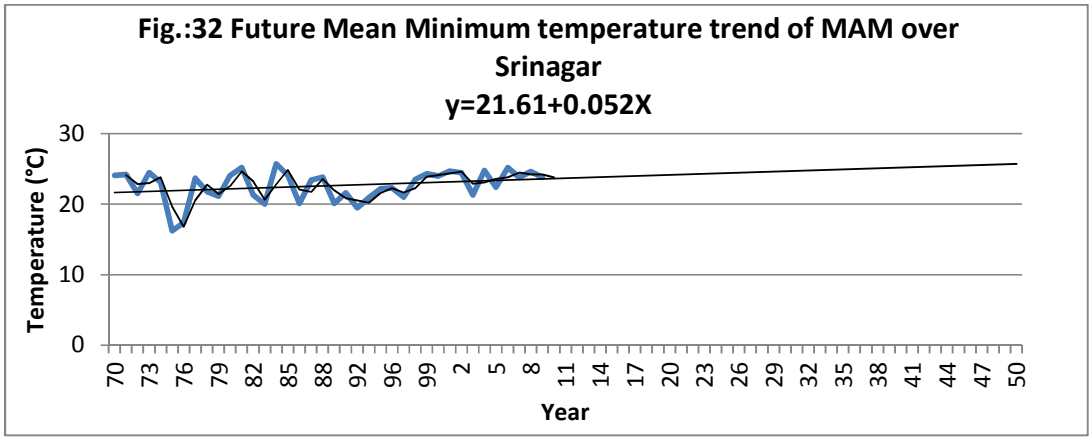


Fig.:32 Future Mean Minimum temperature trend of MAM over Srinagar
y=21.61+0.052X
Temperature (°C)
Year

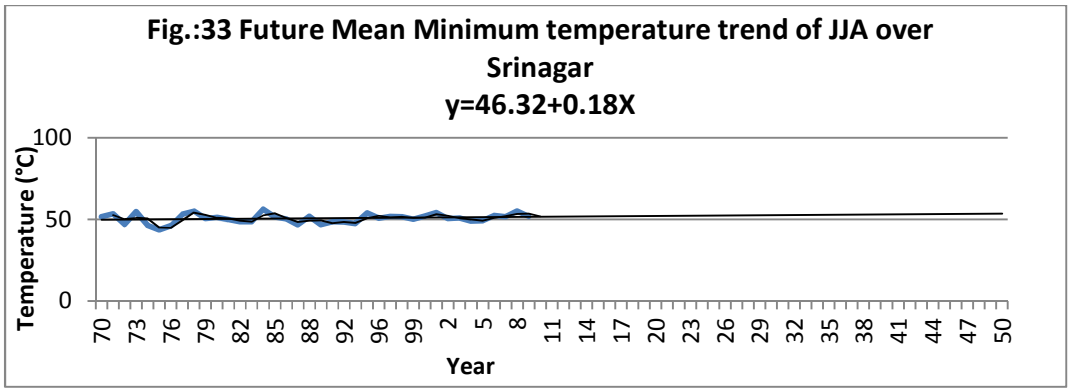


Fig.:33 Future Mean Minimum temperature trend of JJA over Srinagar
y=46.32+0.18X
Temperature (°C)
Year

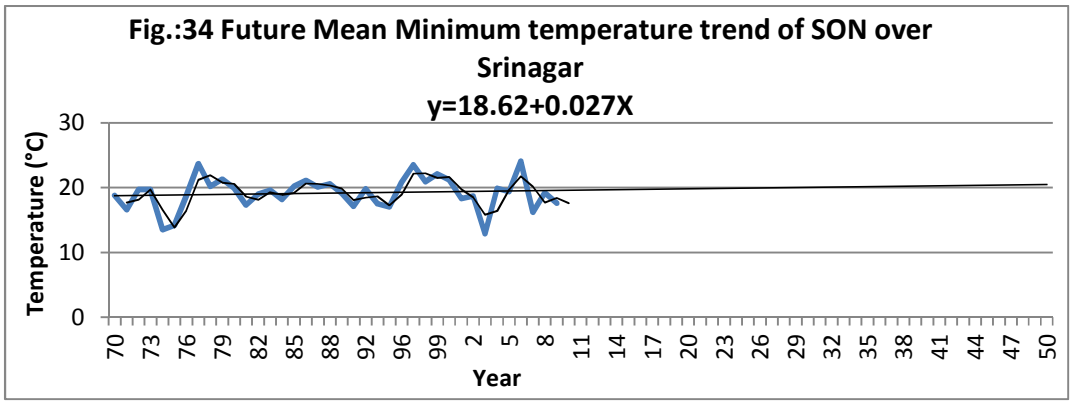


Fig.:34 Future Mean Minimum temperature trend of SON over Srinagar
y=18.62+0.027X
Temperature (°C)
Year

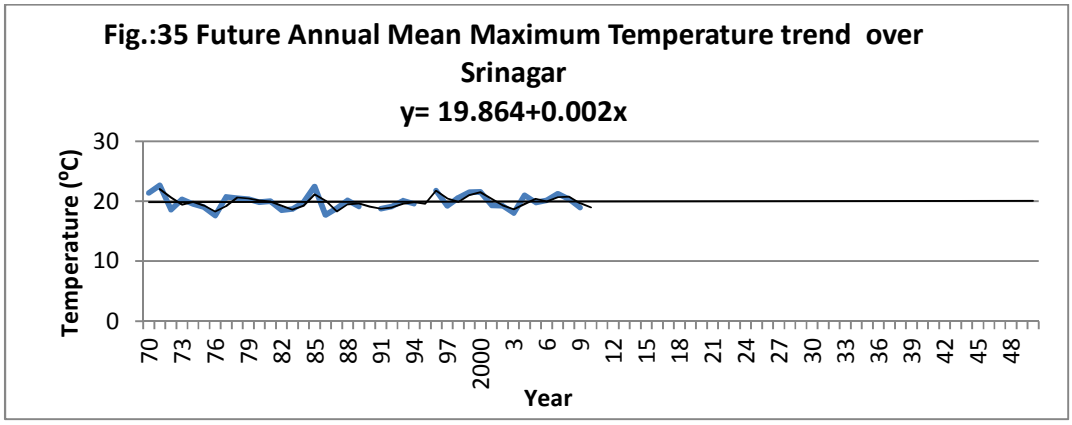


Fig.:35 Future Annual Mean Maximum Temperature trend over Srinagar
y= 19.864+0.002x
Temperature (°C)
30
20
10
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

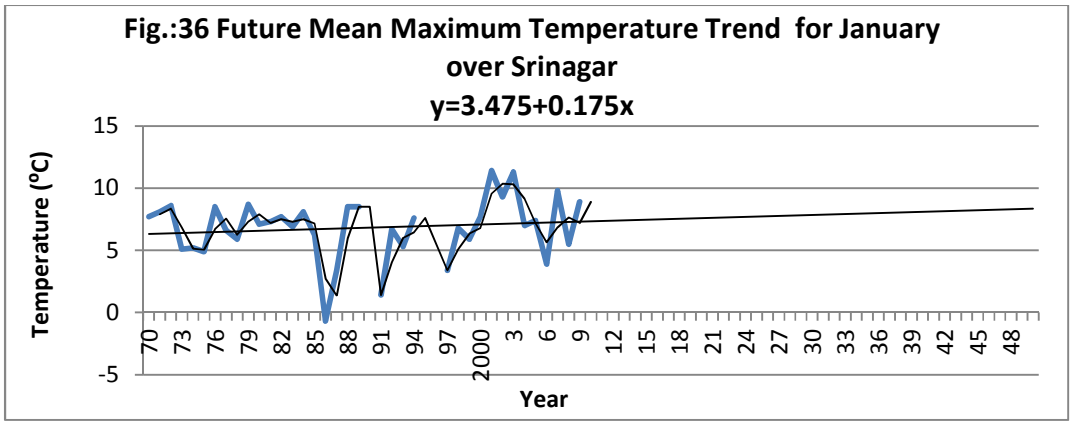


Fig.:36 Future Mean Maximum Temperature Trend for January over Srinagar
y=3.475+0.175x
Temperature (°C)
15
10
5
0
-5
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

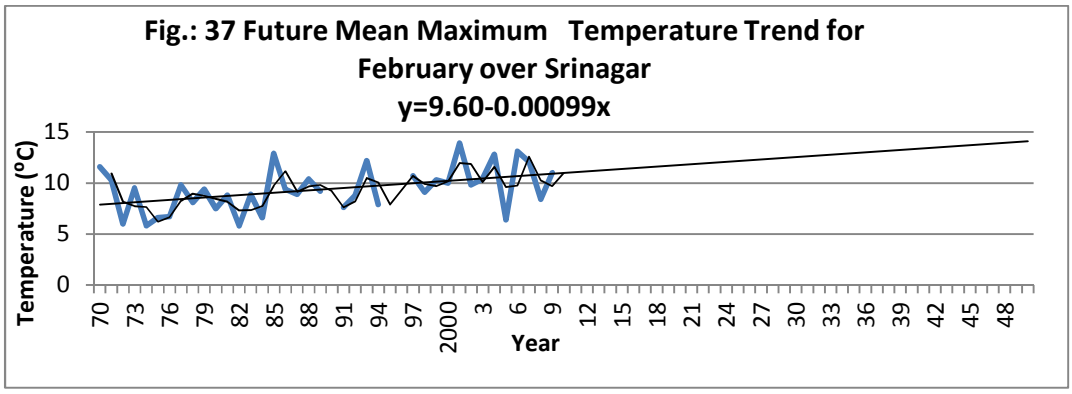


Fig.: 37 Future Mean Maximum Temperature Trend for February over Srinagar
y=9.60-0.00099x
Temperature (°C)
15
10
5
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

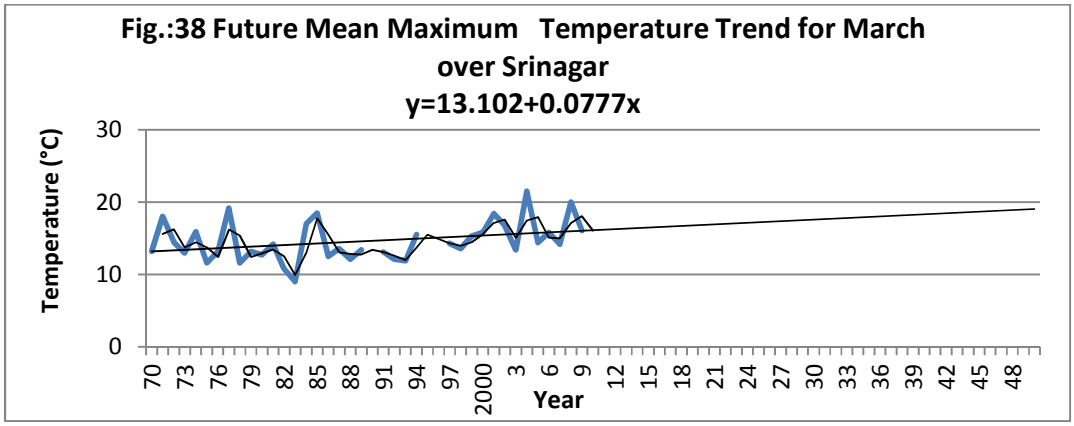


Fig.:38 Future Mean Maximum Temperature Trend for March over Srinagar
y=13.102+0.0777x
Temperature (°C)
30
20
10
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

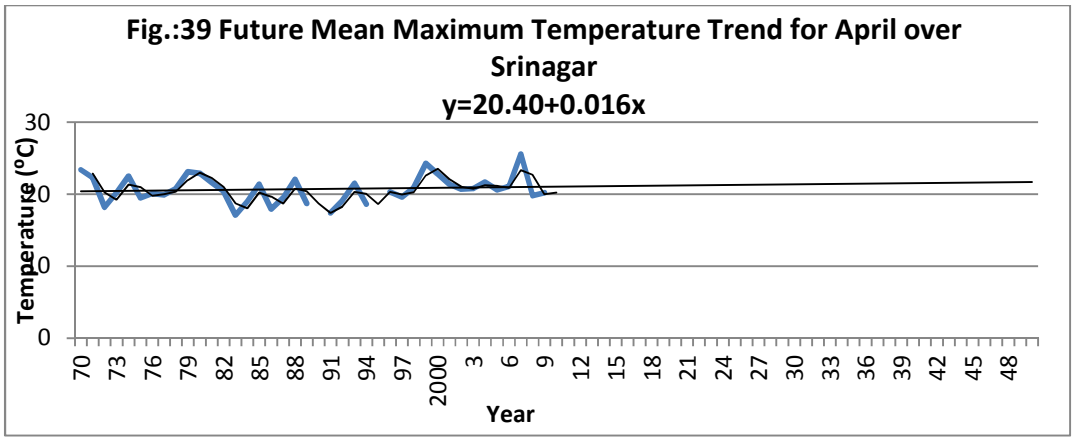


Fig.:39 Future Mean Maximum Temperature Trend for April over Srinagar
y=20.40+0.016x
Temperature (°C)
30
20
10
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

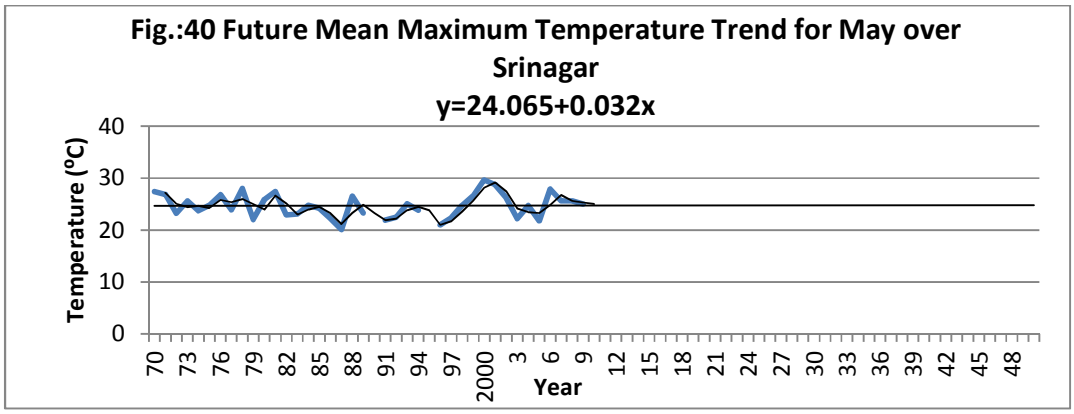


Fig.:40 Future Mean Maximum Temperature Trend for May over Srinagar
y=24.065+0.032x
Temperature (°C)
40
30
20
10
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

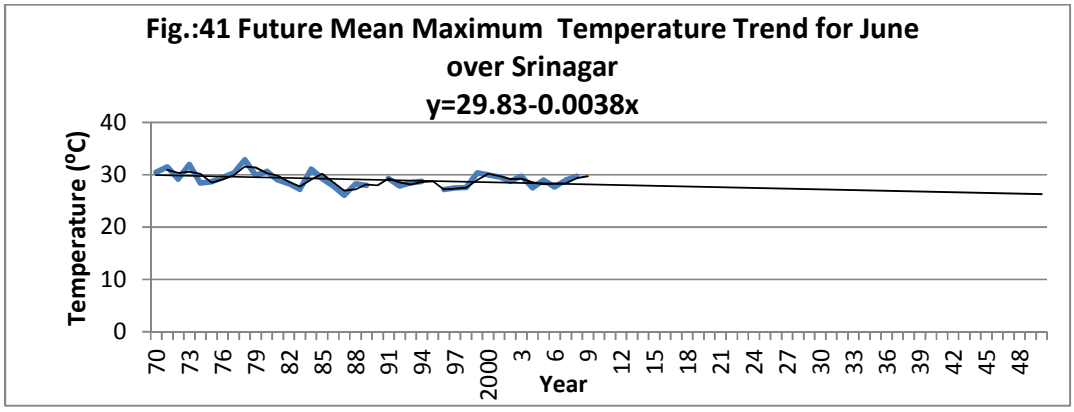


Fig.:41 Future Mean Maximum Temperature Trend for June over Srinagar
y=29.83-0.0038x
Temperature (°C)
40
30
20
10
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

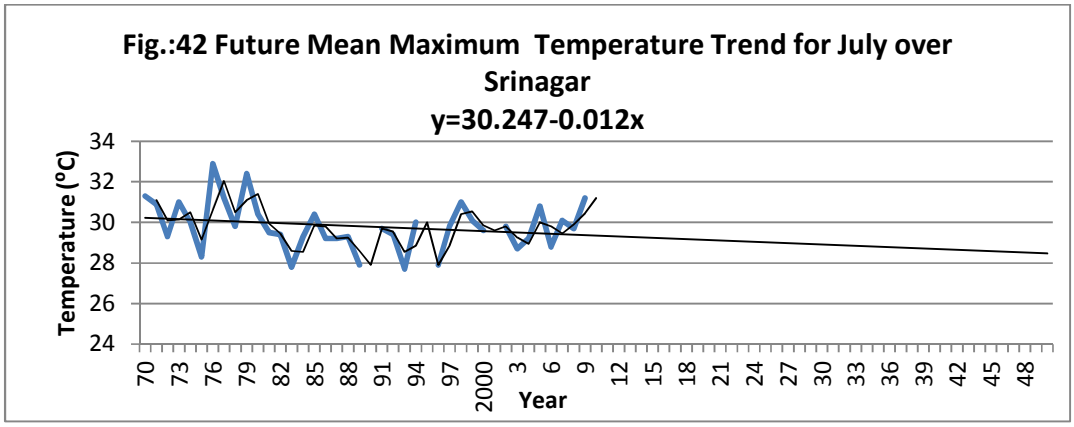


Fig.:42 Future Mean Maximum Temperature Trend for July over Srinagar
y=30.247-0.012x
Temperature (°C)
34
32
30
28
26
24
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

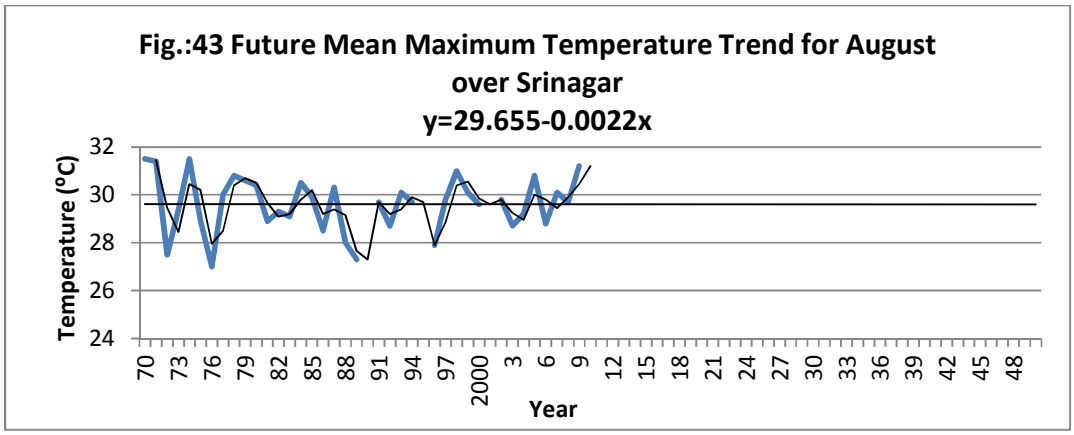


Fig.:43 Future Mean Maximum Temperature Trend for August over Srinagar
y=29.655-0.0022x
Temperature (°C)
32
30
28
26
24
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

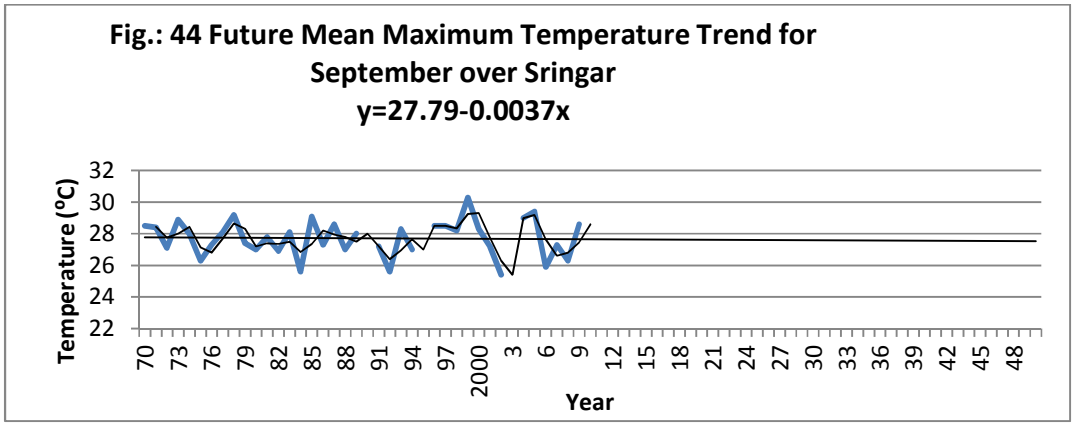


Fig.: 44 Future Mean Maximum Temperature Trend for September over Sringar
y=27.79-0.0037x
Temperature (°C)
32
30
28
26
24
22
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

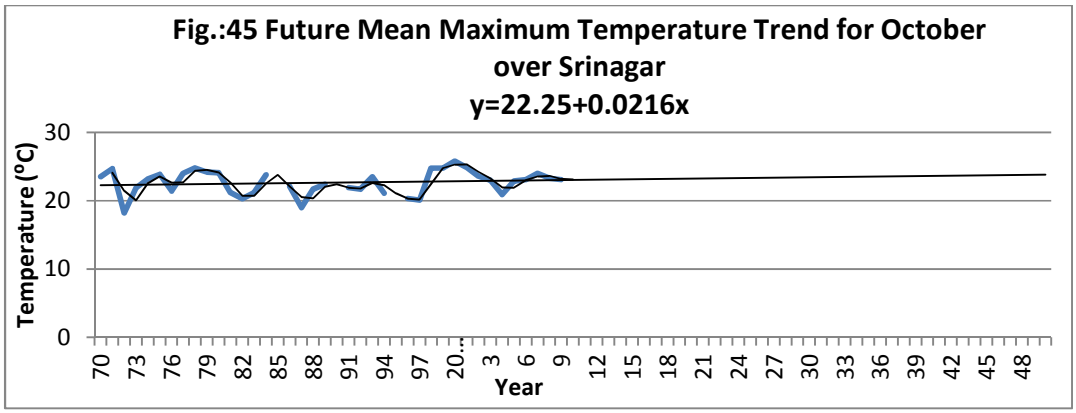


Fig.:45 Future Mean Maximum Temperature Trend for October over Srinagar
y=22.25+0.0216x
Temperature (°C)
30
20
10
0
70 73 76 79 82 85 88 91 94 97 20... 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

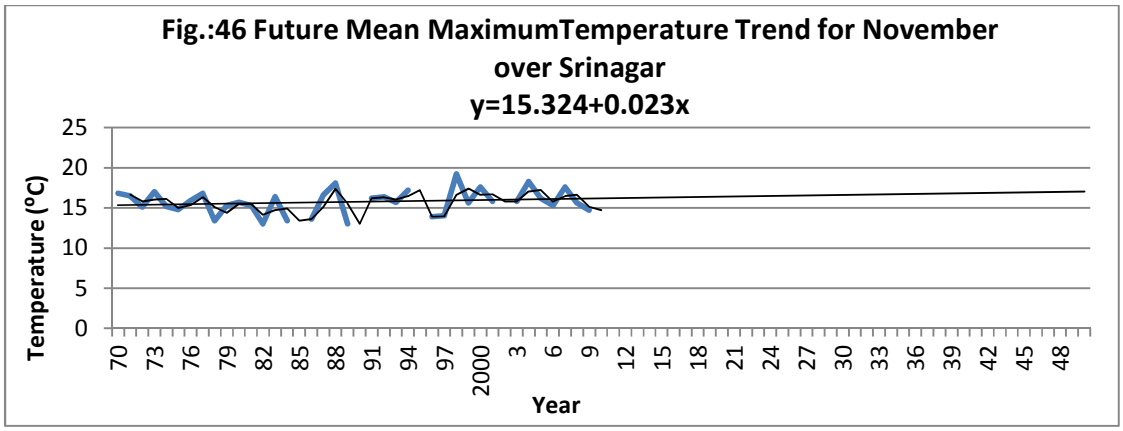


Fig.:46 Future Mean MaximumTemperature Trend for November over Srinagar
y=15.324+0.023x
Temperature (°C)
25
20
15
10
5
0
70 73 76 79 82 85 88 91 94 97 2000 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48
Year

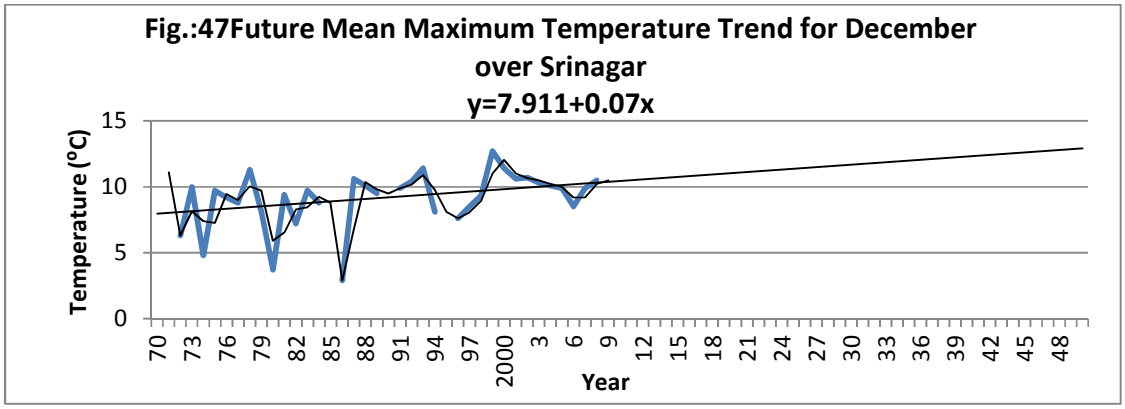


Fig.:47Future Mean Maximum Temperature Trend for December over Srinagar
y=7.911+0.07x
Temperature (°C)
Year

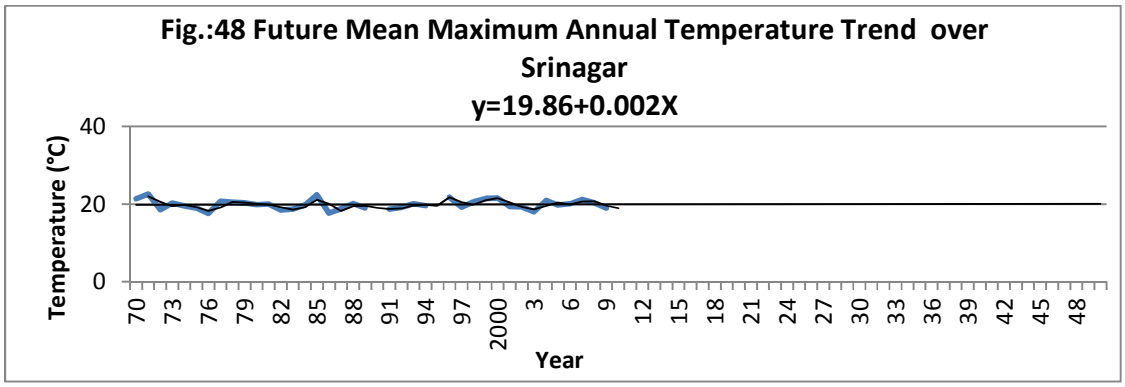


Fig.:48 Future Mean Maximum Annual Temperature Trend over Srinagar
y=19.86+0.002X
Temperature (°C)
Year

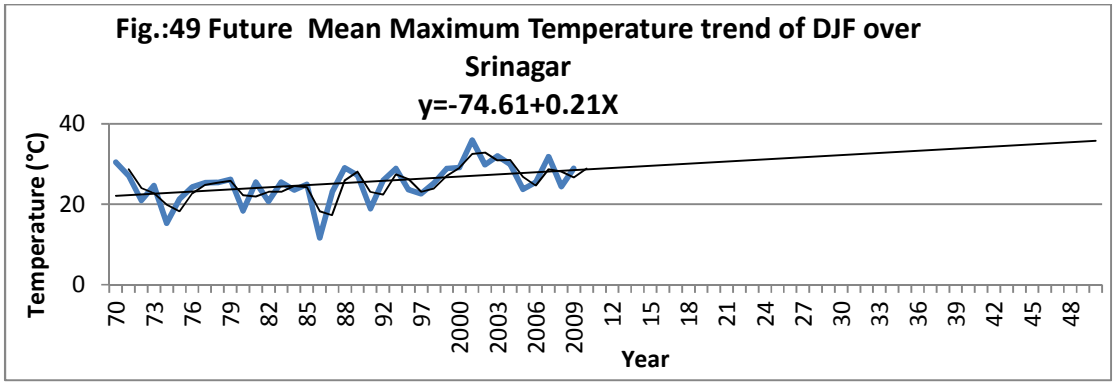


Fig.:49 Future Mean Maximum Temperature trend of DJF over Srinagar
y=-74.61+0.21X
Temperature (°C)
Year

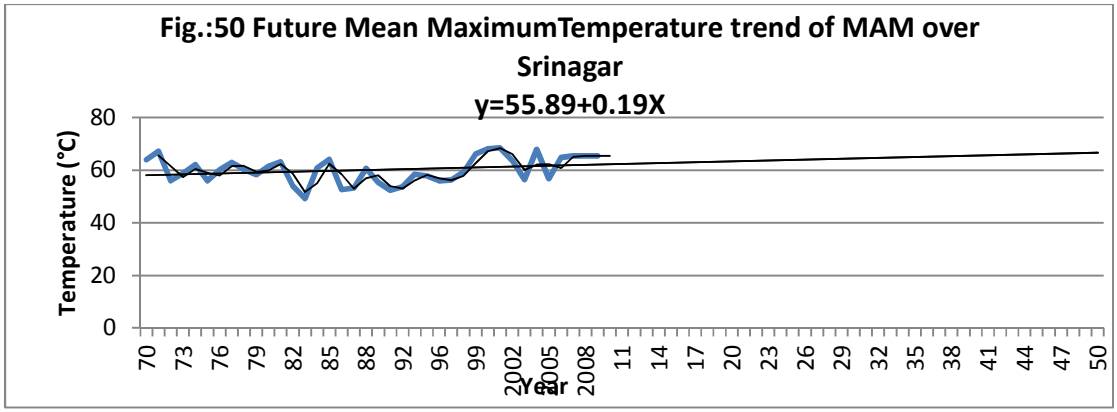


Fig.:50 Future Mean MaximumTemperature trend of MAM over Srinagar
y=55.89+0.19X
Temperature (°C)
Year

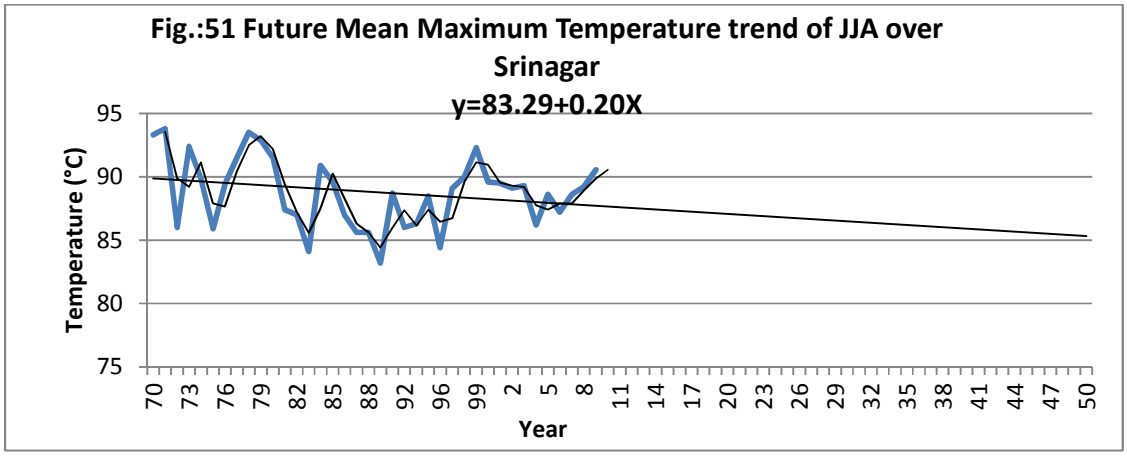


Fig.:51 Future Mean Maximum Temperature trend of JJA over Srinagar
y=83.29+0.20X
Temperature (°C)
95
90
85
80
75
70 73 76 79 82 85 88 92 96 99 2 5 8 11 14 17 20 23 26 29 32 35 38 41 44 47 50
Year

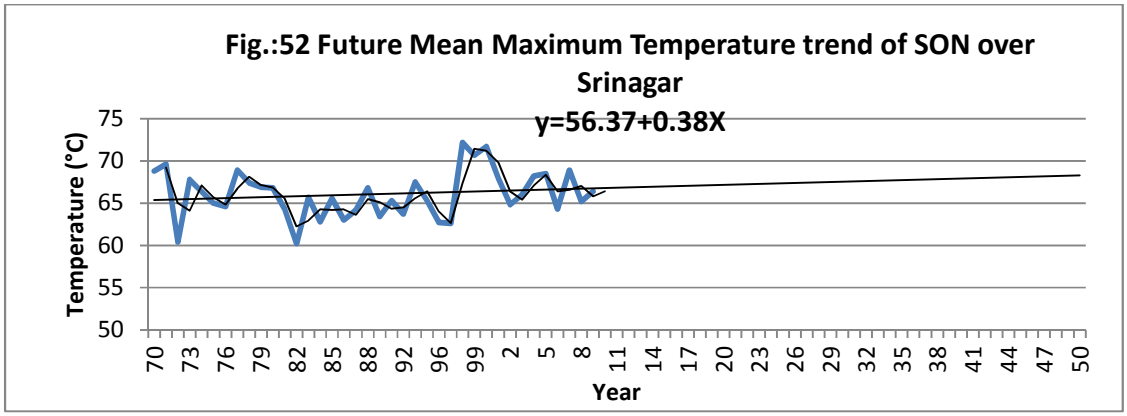


Fig.:52 Future Mean Maximum Temperature trend of SON over Srinagar
y=56.37+0.38X
Temperature (°C)
75
70
65
60
55
50
70 73 76 79 82 85 88 92 96 99 2 5 8 11 14 17 20 23 26 29 32 35 38 41 44 47 50
Year