

MET SQN BAF BASE BSR



CLIMATE OF BSR

PREFACE

Climate change has become a burning issue worldwide. The future life style is expected to be changed with the change of climate. To address the issue, Met Sqn, BAF BSR endeavors to utilize the recorded weather data for better understanding. Climate encompasses the statistics of temperature, humidity, atmospheric pressure, wind, and precipitation of a region over long periods. The standard average period of climate of a region is 30 years, as defined by the World Meteorological Organization (WMO). Climate of an area has significant implications on various fields. Considering the significance, Met Sqn, BSR started recording and compiling daily, monthly and yearly various climate data in order to develop a comprehensive climate data base of BAF BSR, since its establishment. Dte Met instructed all Met Sqn to prepare a booklet each on Climate information of Met Sqns for future reference of weather activities of respective areas and accordingly, Met Sqn BSR prepared this booklet. The 'Climate of BAF BSR' is the study of total 30 years data for obtaining average conditions of different weather elements like temp, fog, thunderstorm/Nor'wester, rainfall etc. A study of climate change (for temperature only) have also been included in this study using six set of climate data (six set of 30 years average). Content of this booklet will give an insight of average weather pattern to the users. Any suggestions /advice for improvement /increasing waitage of this booklet would be highly appreciated.

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ACKNOWLEDGEMENT

It is indeed a matter of great privilege and opportunity for me to serve as OIC Met Sqn, BSR since January 2017. BAF BSR performs the highest number of commitment missions apart from the normal flying programs than any other base and the Met Sqn plays a vital role in achieving that task. Met Sqn of BAF BSR is well equipped to collect and retain all the met data for not only daily forecasting but also long range forecast supported by valid climatological study. I sincerely acknowledge the professional support and hard work extended by all the members of Met Sqn, BAF BSR. I would like to convey my special felicitations to D Met (Gp Capt ABM Abdur Rab Chowdhury, psc) for his valuable guidance and inspiration to shape the booklet in reality.

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INTRODUCTION

1. BAF BSR is situated at the centre of Dhaka city. The latitude of Tejgaon airfield is **23.76N**, and the longitude is **90.39E**. Elevation is 24 ft form mean sea level . Met Sqn, BSR is responsible to Air Officer Commanding BAF BSR for Meteorological services at BSR airfield and 20 miles around. It provides weather forecast to all flights including BAF, Bangladesh Army, Bangladesh Navy and RAB operating from Tejgaon airfield as per laid down procedures of International Civil Aviation Organization (ICAO). **“Forecast for Operational Safety”** is the motto of Met Sqn, BAF BSR. Therefore, accurate forecasting is highly demanded from every corner for planning and accomplishment of different tasks. For that, we take hourly weather observations, view satellite and radar images, analyze different charts, consult Numerical Weather Prediction (NWP) model output etc to forecast accurately on time. Not only that, this Sqn also conducts different courses like Class II Forecaster Course, Initial Forecaster Course, Asst DFO Course for JCO's etc. The significance of climate of a region is acknowledged with due importance by the planners of various fields. Thereby, the average weather conditions of BAF BSR has been compiled and published its 1st edition as **“Climate of BSR”** in 2017 as an attempt for easy understanding of weather pattern for the users.

AIM

2. The aim of the booklet is to provide a comprehensive climatological information of BAF BSR.

DATA USED

3. Met Sqn, BAF BSR is having a data bank of about 30 years. Here a total of 30 years real time data (from 01 January 1981 to 31 December 2016) of major three elements: temperature, wind, precipitation and its product: fog and Thunderstorm/Nor'wester have been taken into consideration. The average temperature (35 years data) from internet source have also been used here to shoe the climate change condition. The round the clock data of those elements have been used in the following form:

- a. Hourly air temperature or dry-bulb temperature (°C)
- b. Daily maximum temperature (°C)
- c. Daily minimum temperature (°C)
- d. Monthly maximum temperature (°C)
- e. Monthly minimum temperature (°C)
- f. Monthly no of rainy days
- g. Monthly total amount of rainfall (mm)
- h. Monthly no of thunderstorm days
- j. Time of occurrence of thunderstorm
- k. Monthly no of days having temperature more than 38°C
- l. Monthly no of days having temperature less than 10°C
- m. Monthly no of foggy days (visibility less than 1000m)
- n. Monthly mean pressure (mbs)
- p. Monthly maximum wind direction and speed (kts)
- q. 35 years average temperature data from internet source

4. **Remarkable Extreme Weather.** Recorded remarkable different extreme weather elements over Dhaka within 1981-2016 are following:

Ser No	Met Element	Value	Time of Occurrence
a	Highest maximum temperature	42.4°C	24 April 2014
b	Lowest minimum temperature	6.5°C	03 Jan 1995
c	Highest Rainfall in a day	340 mm	13 Sep 2004
d	Highest Rainfall in a day	332 mm	27 July 2009
e	Maximum Rainfall in a month	824 mm	July 2007
f	Maximum Rainfall in a month	725 mm	June 2007
g	Monthly maximum rainy days	29 days	July 2004
h	Monthly maximum rainy days	27 days	August 1984
j	Maximum Rainfall in a year	3075 mm	2007
k	Maximum TS days in a month	20 days	May 2002
l	Highest Maximum wind	340/62 Kts	22 April 2003
m	Maximum foggy days in a month	29 Days	Dec-14, Jan-13 & Jan-09

MONTHLY MEAN MAXIMUM TEMPERATURE



Fig-1: Monthly mean maximum temperature for the period of 1981-2016

MONTHLY HIGHEST TEMPERATURE

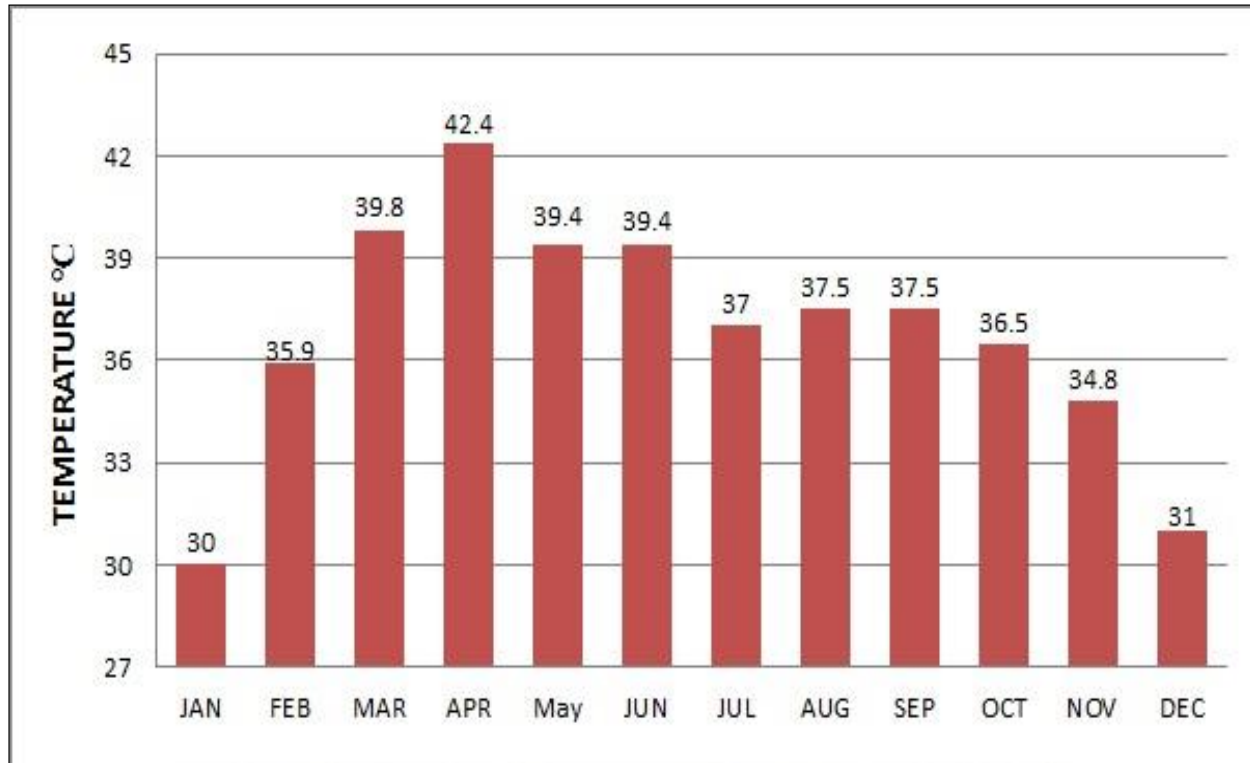


Fig-2: Monthly highest maximum temperature for the period of 1981-2016

MONTHLY MEAN MINIMUM TEMPERATURE

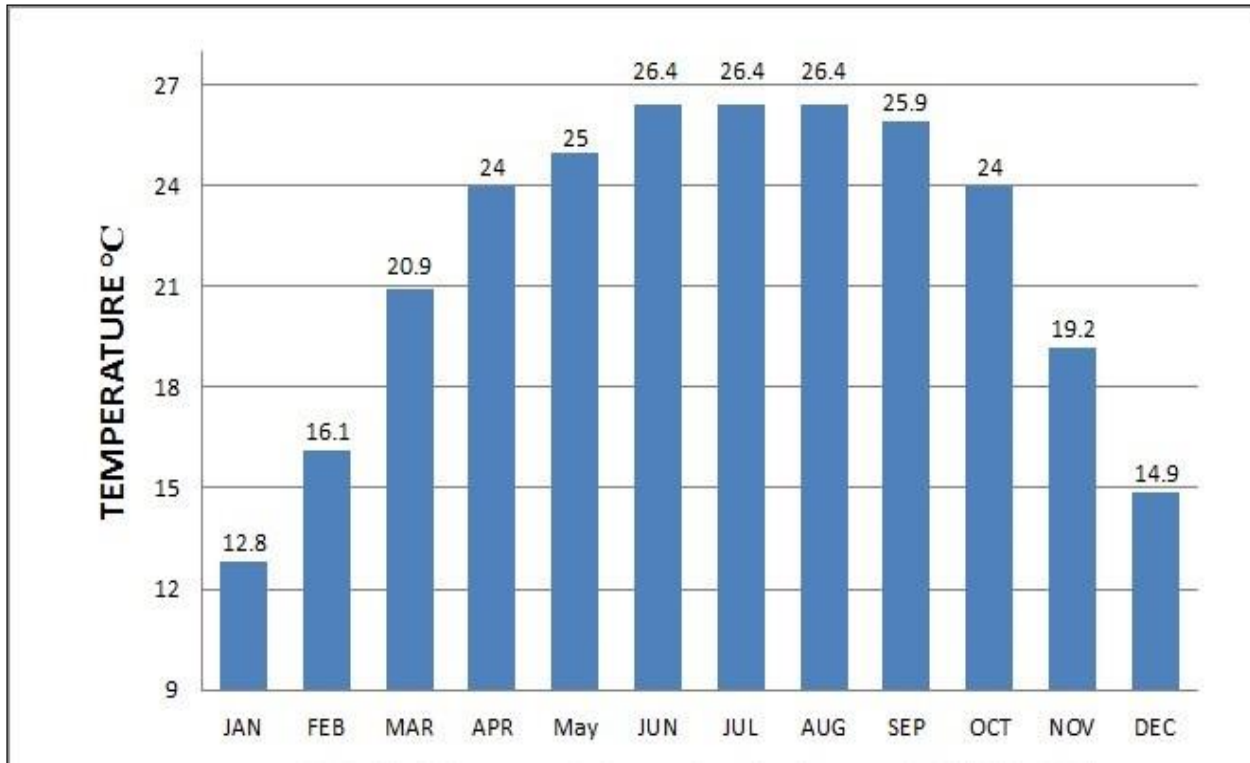


Fig-3: Monthly mean minimum temperature for the period of 1981-2016

MONTHLY LOWEST TEMPERATURE

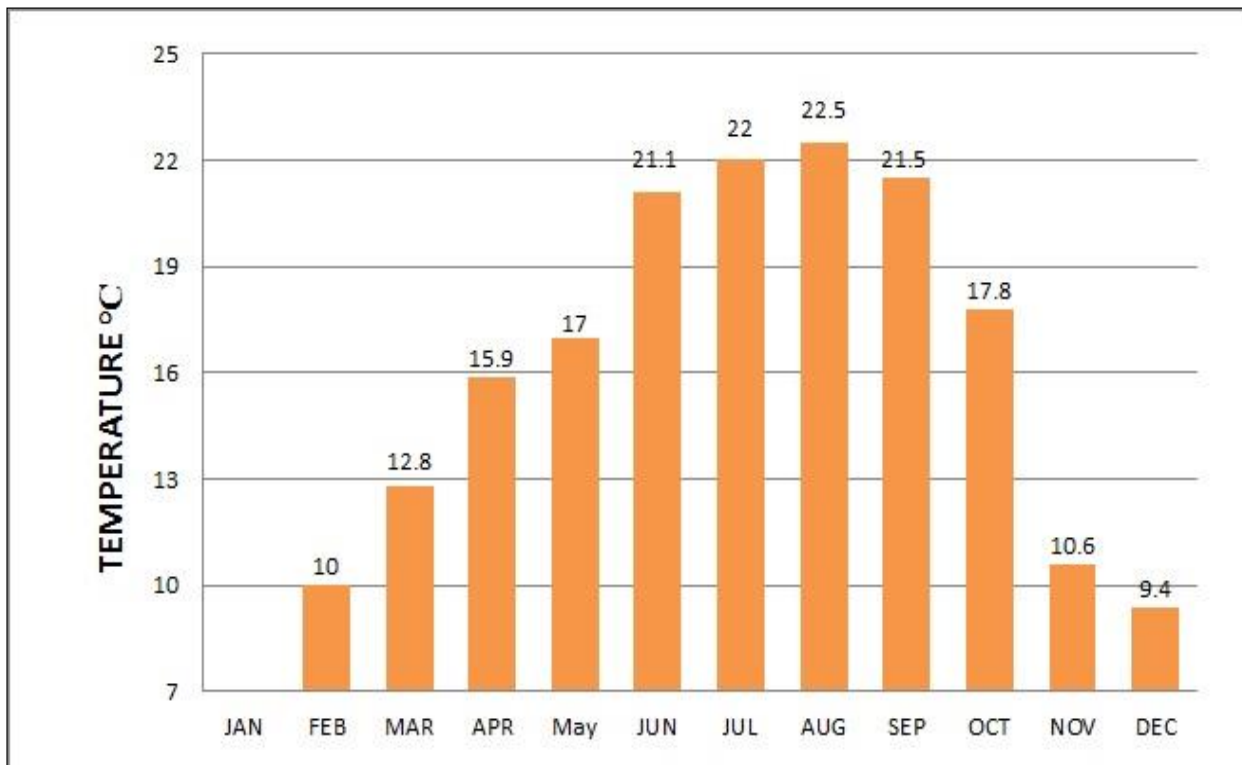


Fig-4: Monthly lowest minimum temperature for the period of 1981-2016

MONTHLY NO OF AVERAGE RAINY DAYS

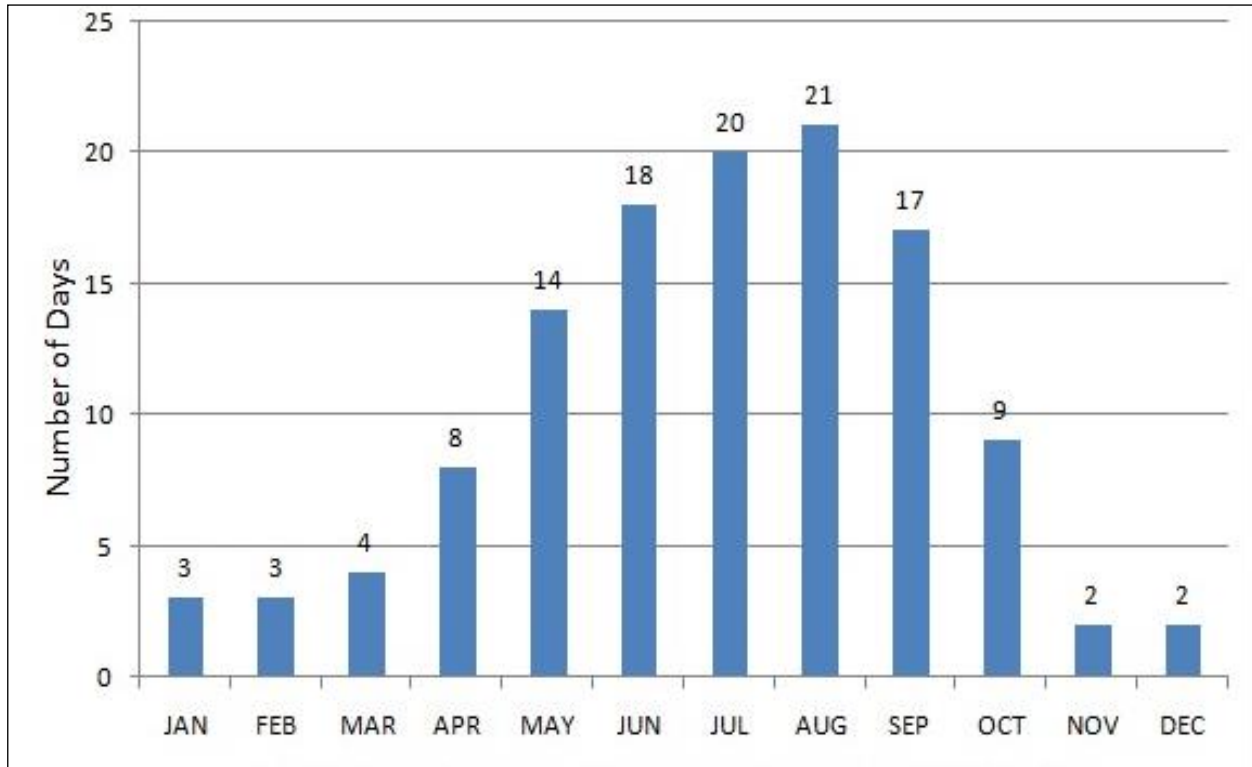


Fig-5: Monthly no of average rainy days for the period of 1981-2016

MONTHLY AVERAGE AMOUNT OF RAINFALL (MM)

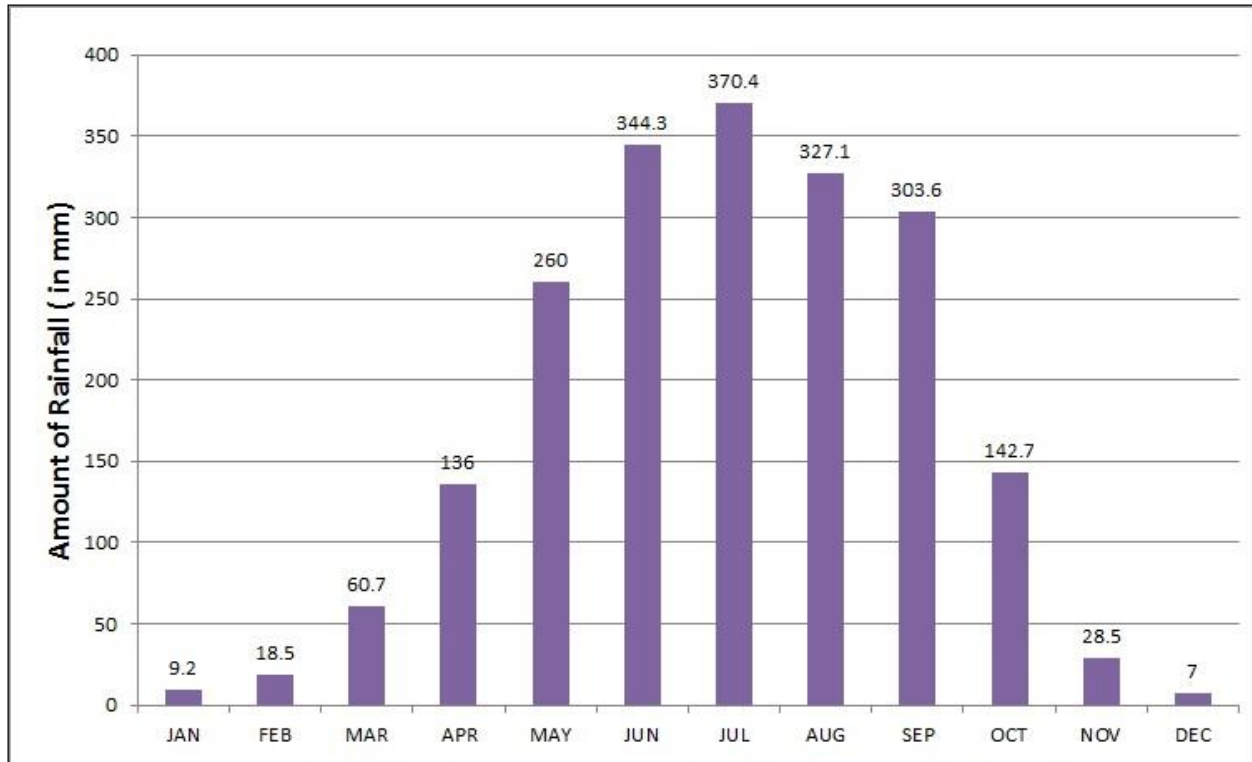


Fig-6: Monthly average amount of rainfall for the period of 1981-2016

YEARLY TOTAL AMOUNT OF RAINFALL (MM)

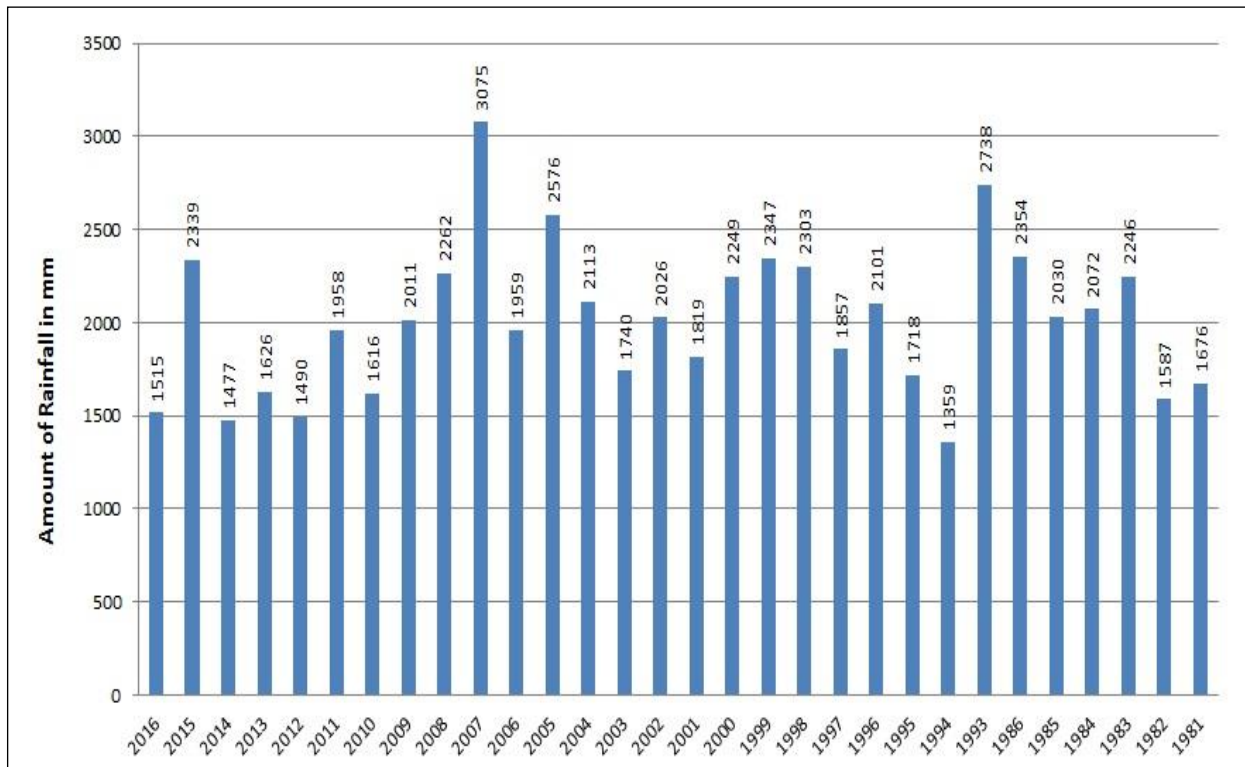


Fig-7: Yearly total amount of rainfall for the period of 1981-2016

YEARLY TOTAL NO OF RAINY DAYS

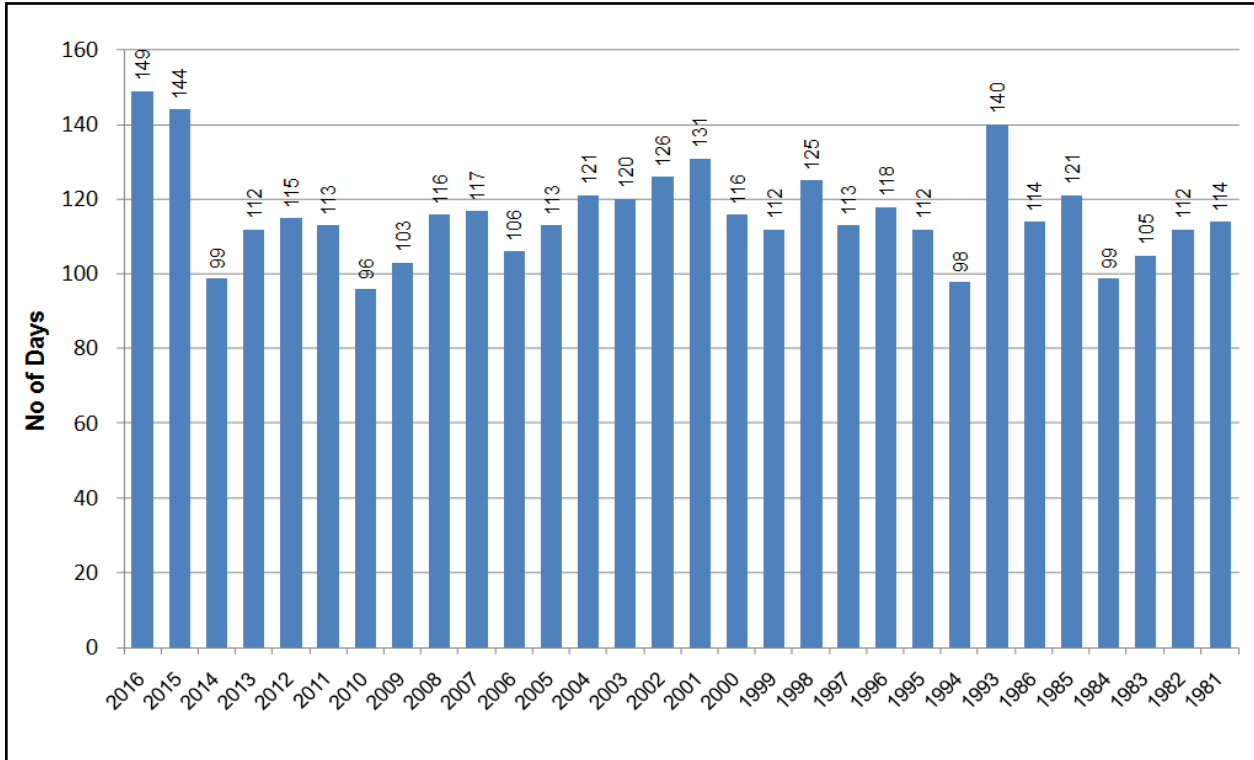


Fig-8: Yearly total no of Rainy days for the period of 1981-2016

MONTHLY AVERAGE NO OF TS DAYS

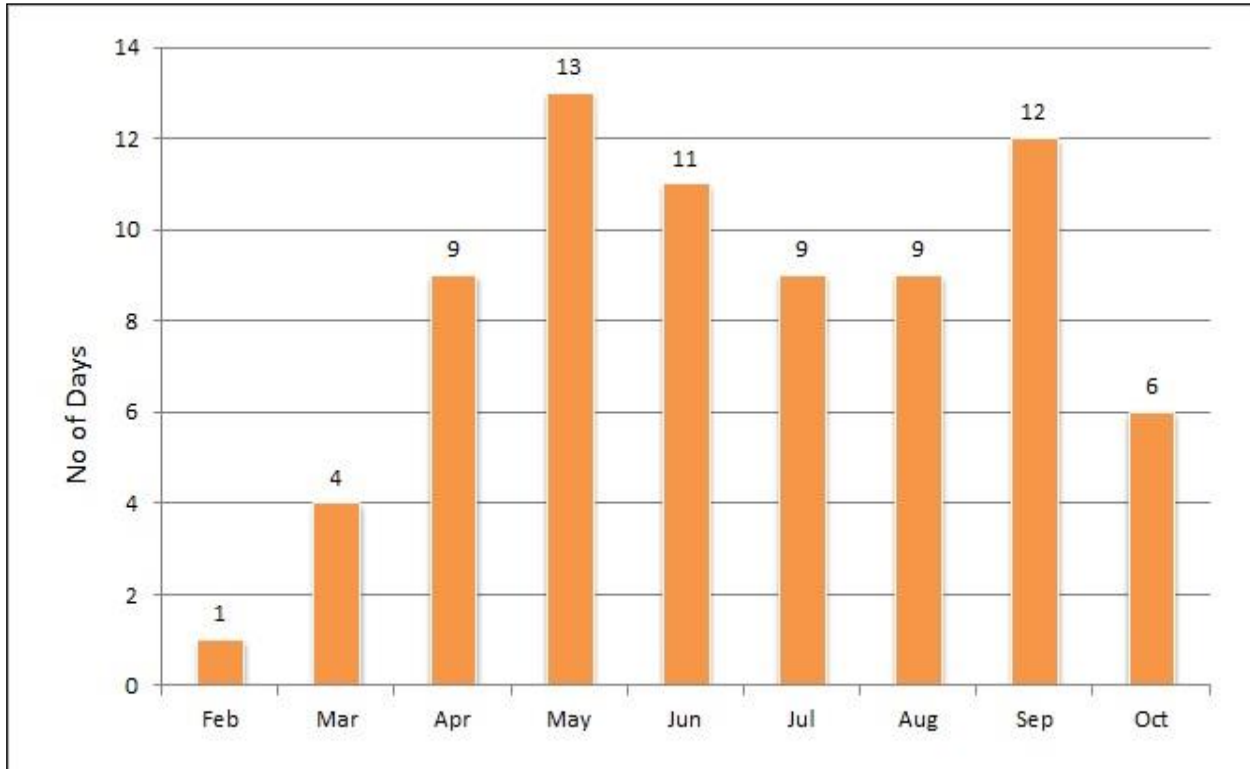


Fig-9: Monthly average no of thunderstorm days for the period of 1981-2016

MONTHLY AVERAGE NO OF DAYS HAVING TEMPERATURE ≥ 38

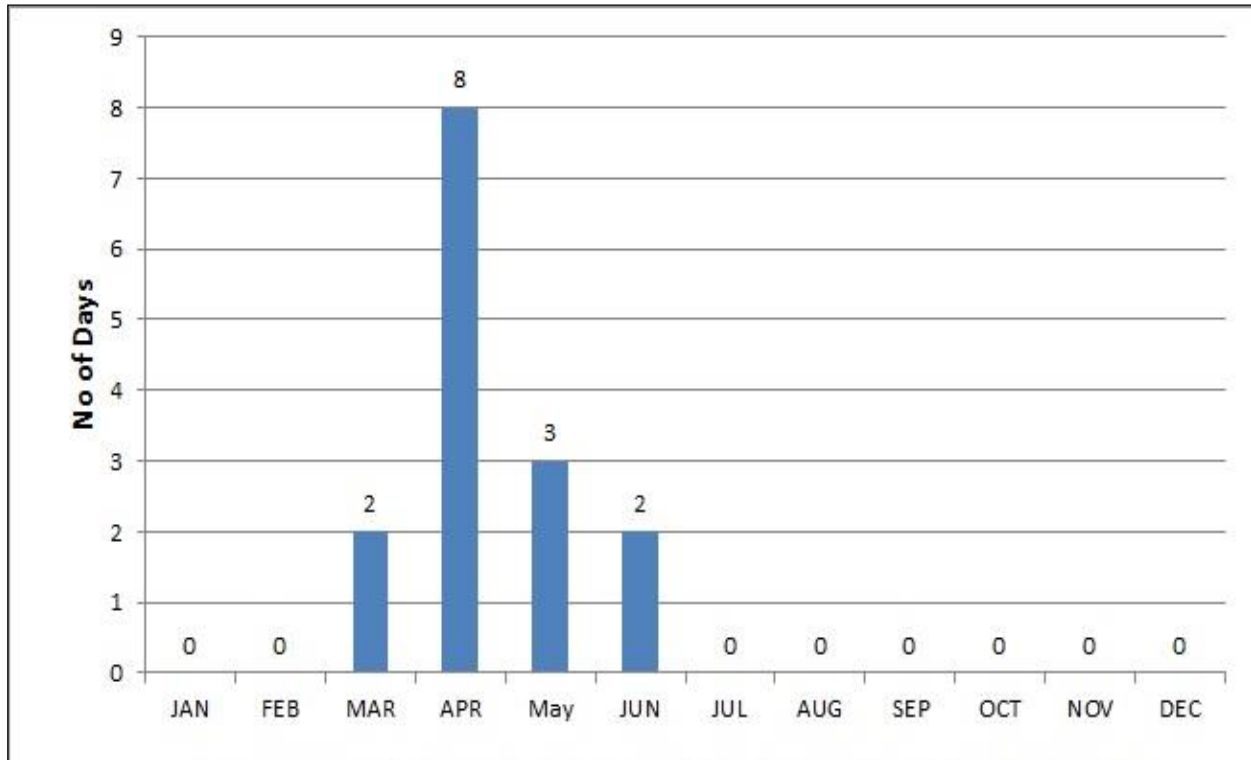


Fig-10: Monthly average no of days having Temp $\geq 38^{\circ}\text{C}$ for the period of 1981-2016

MONTHLY AVERAGE NO OF DAYS HAVING TEMPERATURE ≤ 10

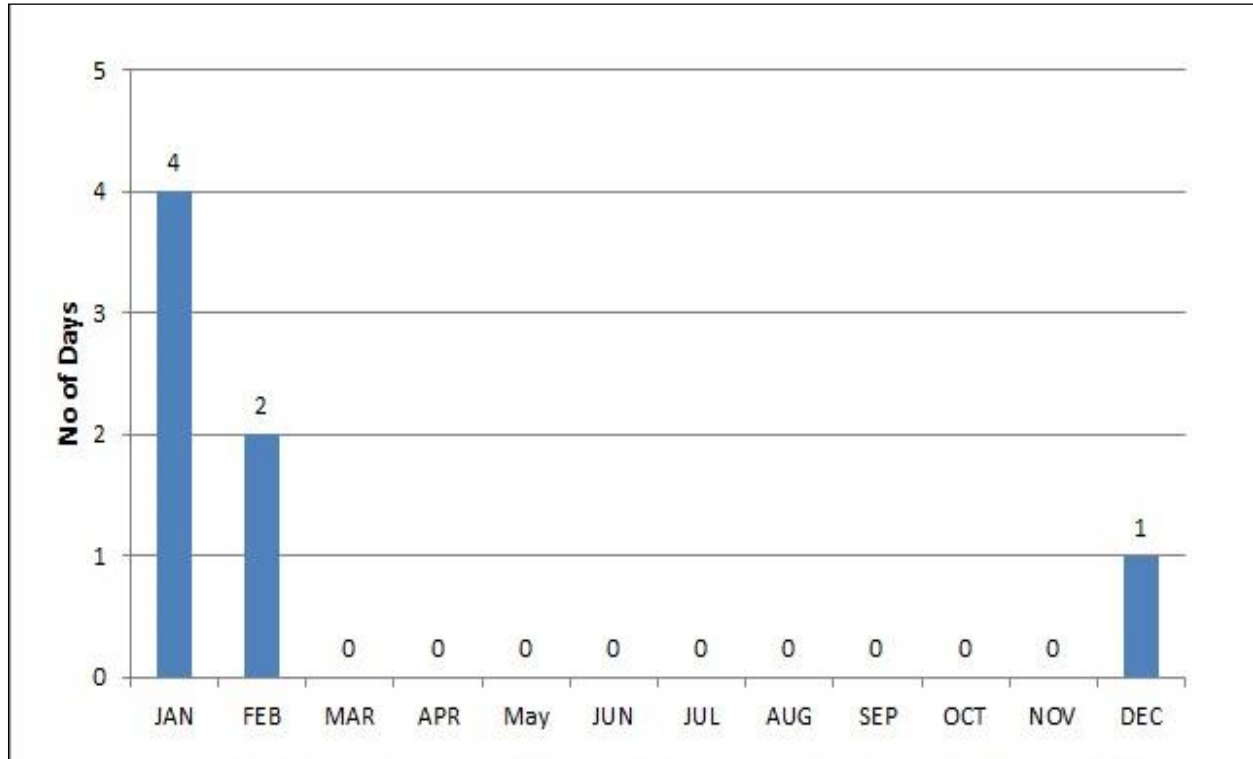


Fig-11: Monthly average no of days having Temp $\leq 10^{\circ}\text{C}$ for the period of 1981-2016

MONTHLY AVERAGE NO OF FOGGY DAYS

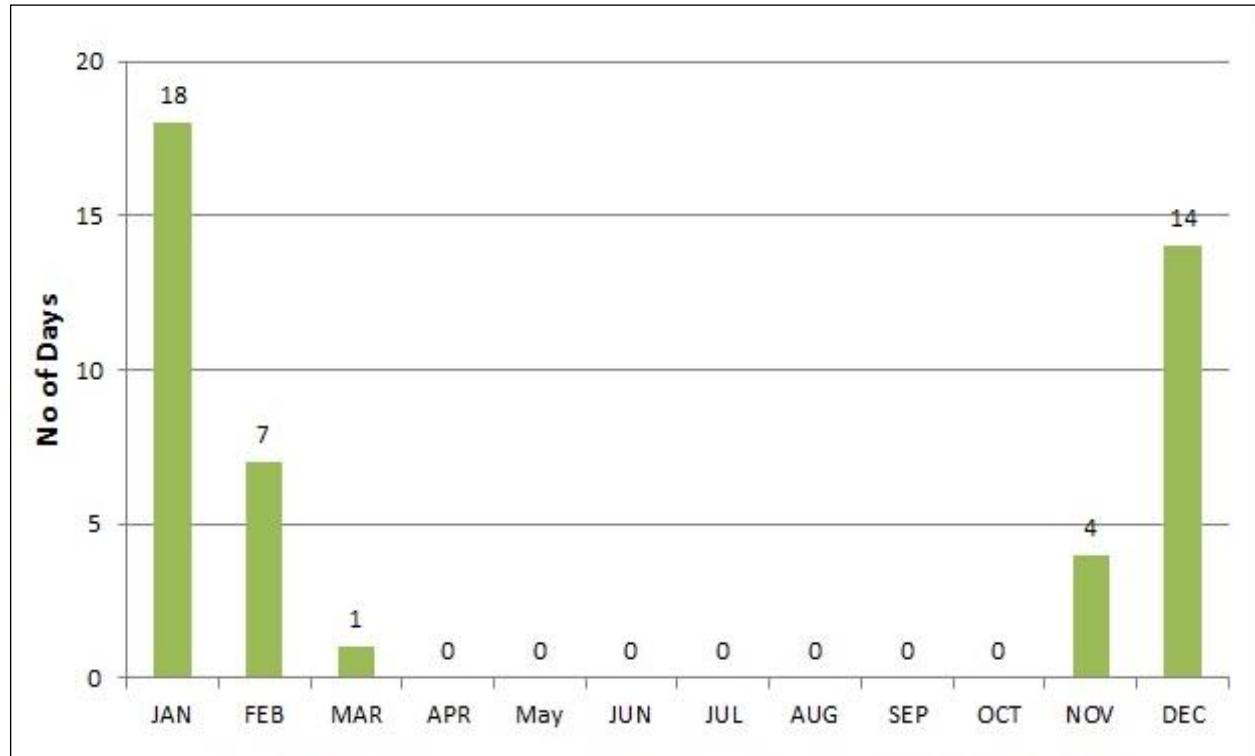


Fig-12: Monthly average no of foggy days for the period of 1981-2016

MONTHLY AVERAGE NO OF NOR'WESTER DAYS

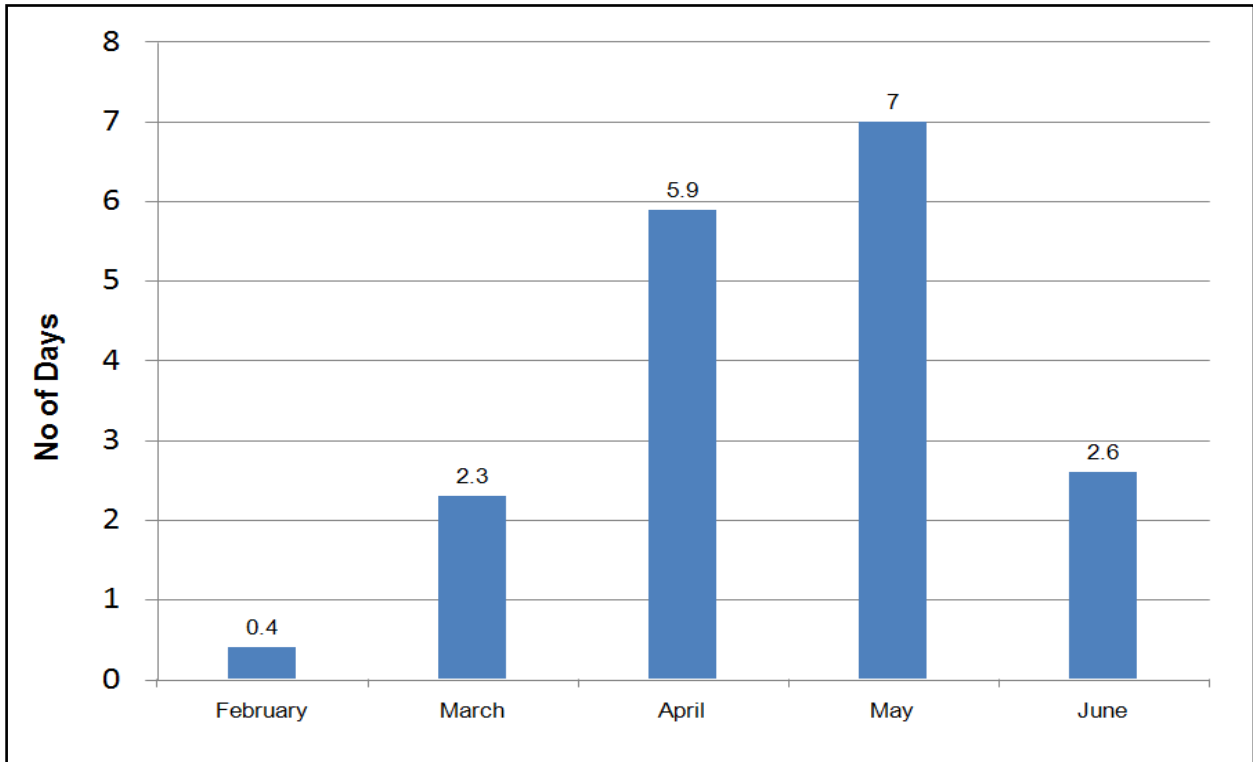


Fig-13: Monthly average no of Nor'wester (Wind>22kts) for the period of 1981-2016

CLIMATE CHANGE (TEMPERATURE) IN APRIL

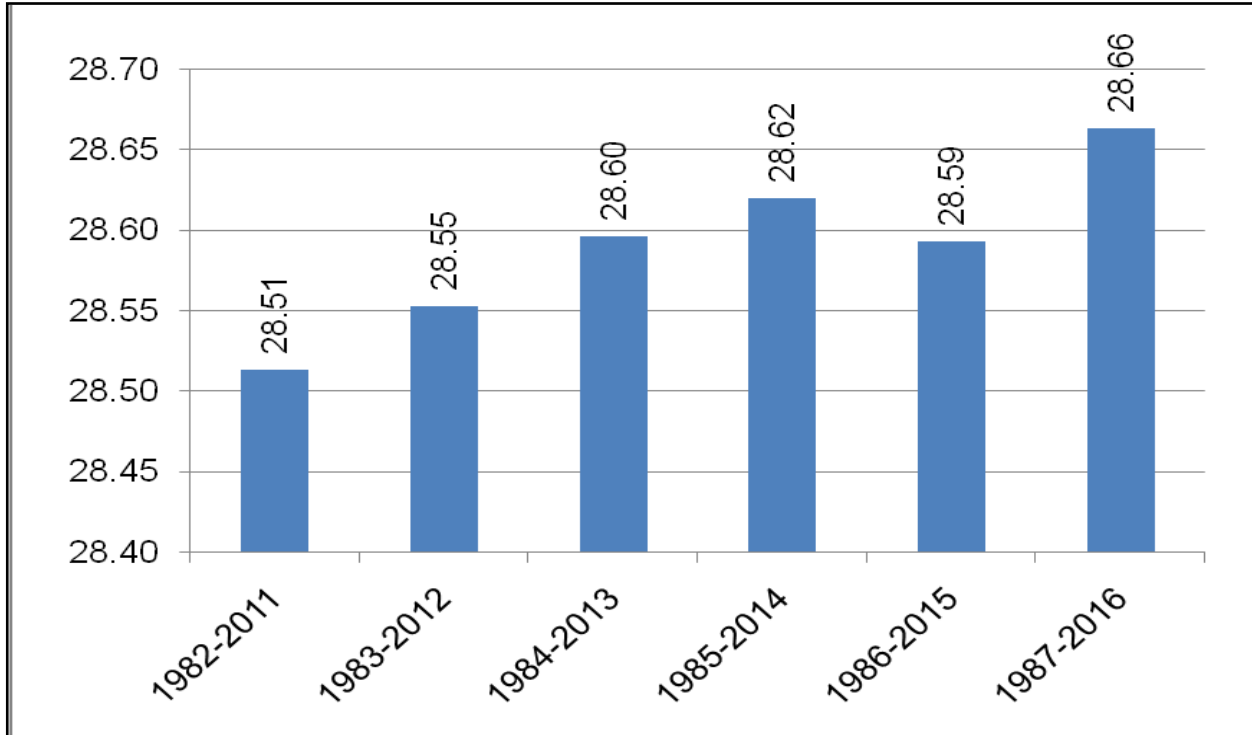


Fig-14: Climate change (Temperature) in April for the period of 1982-2016

CLIMATE CHANGE (TEMPERATURE) IN MAY

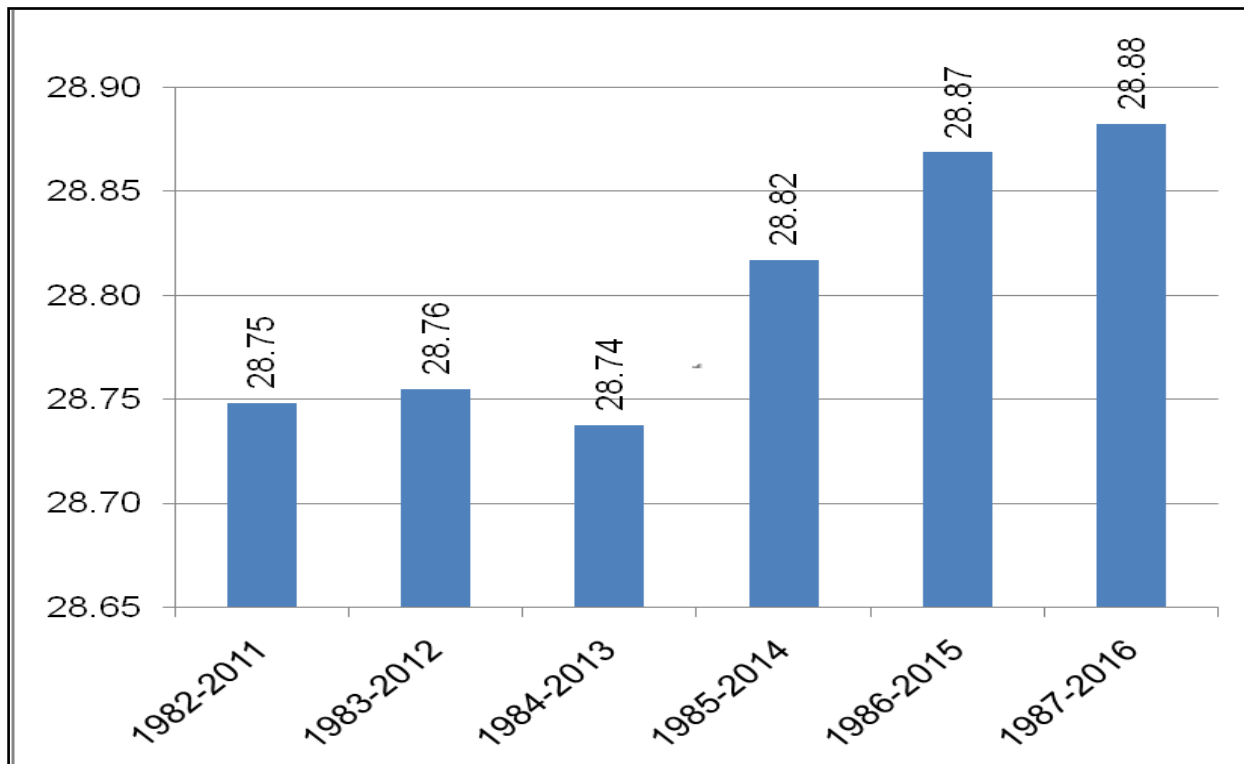


Fig-15: Climate change (Temperature) in May for the period of 1982-2016

5. **CLIMATE CHANGE**: Climate Change (temperature) data from January 1982 to December 2016 are shown in Table-1

	1982-2011	1983-2012	1984-2013	1985-2014	1986-2015	1987-2016
January	18.60	18.62	18.60	18.60	18.59	18.59
February	22.02	22.07	22.13	22.15	22.17	22.22
March	26.72	26.83	26.87	26.82	26.83	26.81
April	28.51	28.55	28.60	28.62	28.59	28.66
May	28.75	28.76	28.74	28.82	28.87	28.88
June	29.00	29.06	29.08	29.13	29.14	29.20
July	28.74	28.74	28.75	28.80	28.81	28.83
August	28.94	28.96	28.97	28.97	28.98	28.98
September	28.55	28.57	28.58	28.61	28.63	28.67
October	27.43	27.43	27.42	27.40	27.39	27.43
November	24.02	24.03	24.00	23.99	24.01	23.99
December	20.20	20.18	20.20	20.17	20.17	20.19

Table-1: Climate Change (temperature) data

6. **Maximum Wind Direction & Speed (In kts).** Monthly maximum Wind Direction & Speed (In Kts) from January 1996 to Dec 2016 are shown in Table-2:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	280/12	110/25	250/44	160/22	270/38	270/28	160/18	130/31	130/20	130/19	010/10	290/07
2015	300/16	260/20	190/30	250/42	280/40	140/28	100/24	250/26	120/20	260/18	040/08	170/10
2014	270/10	270/19	230/33	230/30	310/30	240/28	130/20	100/17	190/20	290/18	270/07	270/07
2013	270/10	300/12	320/32	260/30	280/44	200/24	140/20	030/22	120/26	160/28	230/08	350/08
2012	280/11	270/12	330/37	280/37	310/36	170/24	160/21	130/12	160/20	130/06	290/16	150/16
2011	270/10	260/07	350/36	340/56	290/40	030/18	120/19	110/16	170/18	360/10	190/16	270/08
2010	270/07	280/48	150/22	350/41	280/24	260/28	140/22	260/22	200/12	080/12	270/06	360/08
2009	260/10	340/12	240/24	280/32	350/40	280/29	110/23	250/17	100/08	210/20	360/10	360/17
2008	290/10	230/21	330/39	270/44	310/39	260/31	160/17	250/23	120/17	010/24	340/11	310/06
2007	290/10	280/17	290/19	160/26	290/29	330/24	170/19	160/17	130/18	160/29	120/10	340/06
2006	290/10	170/08	280/28	340/48	330/34	330/29	080/18	220/19	230/19	330/22	270/07	220/10
2005	110/10	260/28	290/44	300/44	320/40	310/24	160/19	170/22	090/22	030/16	350/05	280/06
2004	290/22	300/16	160/21	330/30	350/22	130/27	340/21	160/21	090/22	170/30	300/08	290/10
2003	270/10	310/28	280/28	340/62	280/56	280/32	320/20	160/19	160/19	160/19	350/10	270/12
2002	280/10	350/17	330/26	280/41	270/35	330/26	280/25	160/17	140/22	270/17	040/18	310/10
2001	270/11	270/11	280/40	200/37	270/34	130/26	150/21	120/17	170/17	180/17	290/10	330/10
2000	180/17	300/17	240/39	340/39	180/41	150/22	150/19	140/28	180/20	360/43	170/11	360/10
1999	330/18	270/11	160/09	260/34	360/28	170/22	260/19	270/21	340/28	170/21	340/10	270/10
1998	270/09	220/16	250/39	340/39	320/33	120/28	160/20	200/20	360/18	300/17	360/20	050/12
1997	270/17	260/16	330/29	270/34	230/39	010/28	270/24	160/25	340/24	320/19	360/10	300/11
1996	320/11	330/31	340/37	340/35	280/41	300/37	280/25	210/19	140/19	180/22	330/10	300/10

Table-2: Monthly maximum wind direction & speed.

7. **Rainfall.** Month-wise total amount of rainfall from January 1981 to December 2016 is shown in Table-3:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	2	10	95	26	207	249	520	181	133	82	10	0
2015	4	13	7	172	222	368	810	341	348	53	0	1
2014	0	10	11	72	153	355	210	464	151	51	0	0
2013	0	7	56	37	391	264	299	264	177	128	1	2
2012	10	2	38	315	192	134	248	301	116	40	90	4
2011	0	0	33	114	282	341	368	464	228	127	1	0
2010	0	37	19	35	199	319	193	354	177	206	0	77
2009	0	1	57	13	197	236	645	525	270	63	4	0
2008	20	56	44	86	211	450	528	318	280	269	0	0
2007	0	32	9	152	198	725	824	508	209	307	111	0
2006	0	0	0	193	208	303	337	169	638	107	4	0
2005	4	1	82	82	281	284	566	381	590	302	3	0
2004	0	0	9	161	165	480	304	212	563	219	0	0
2003	0	25	95	116	143	495	172	204	318	130	0	42
2002	22	4	60	119	262	388	421	350	144	50	206	0
2001	0	2	32	63	402	413	336	182	203	170	16	0
2000	13	44	172	189	608	164	201	428	157	273	0	0
1999	0	0	0	21	442	449	453	305	339	325	13	0
1998	51	2	84	178	374	87	517	564	248	115	83	0
1997	3	8	80	123	151	285	524	218	438	4	1	22
1996	0	17	55	225	208	360	283	339	257	357	0	0
1995	8	29	0	112	219	239	356	356	204	84	110	1
1994	16	51	109	201	108	272	152	239	152	44	15	0
1993	0	52	88	120	524	493	420	453	376	197	15	0
1986	4	0	40	212	165	356	365	192	699	209	112	0
1985	3	0	169	208	302	418	273	332	308	7	0	10
1984	12	0	6	105	326	580	216	312	448	67	0	0
1983	19	39	138	322	369	297	132	463	322	129	0	16
1982	6	20	78	133	132	397	145	237	291	90	58	0
1981	78	93	155	173	160	128	295	156	324	76	3	35

Table-3: Monthly total amount of rainfall (in mm)

8. **Rainy Days.** Monthly total numbers of rainy days from January 1981 to December 2016 are shown in Table-4:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	1	5	9	4	22	17	27	23	22	16	3	0
2015	5	3	4	15	17	21	25	22	17	13	0	2
2014	0	3	1	5	12	16	22	23	11	6	0	0
2013	0	1	5	5	18	13	18	21	17	12	1	1
2012	3	2	1	11	14	16	22	20	13	7	5	1
2011	0	0	4	9	20	17	16	19	18	9	1	0
2010	0	1	1	4	13	16	16	19	18	6	0	2
2009	0	1	4	3	16	13	20	20	17	8	1	0
2008	4	2	5	4	15	18	21	22	16	9	0	0
2007	0	5	2	10	12	20	24	19	13	10	2	0
2006	0	0	0	10	15	19	18	17	14	10	3	0
2005	2	1	5	5	11	14	21	22	17	14	1	0
2004	0	0	2	11	9	20	29	22	21	7	0	0
2003	0	4	8	7	10	17	20	17	23	10	0	4
2002	4	2	7	8	17	21	20	25	13	7	2	0
2001	0	2	4	6	16	23	22	22	15	15	6	0
2000	6	3	3	12	15	17	18	18	14	10	0	0
1999	0	0	0	4	16	17	22	24	16	12	1	0
1998	3	2	5	12	11	13	25	22	18	10	4	0
1997	2	3	5	9	13	16	20	22	18	2	1	2
1996	0	3	3	9	11	21	18	24	21	8	0	0
1995	3	2	0	8	9	16	23	20	18	8	4	1
1994	3	5	4	8	8	20	11	25	7	5	2	0
1993	0	4	5	10	18	18	24	24	19	17	1	0
1986	1	0	2	11	10	18	18	21	20	10	3	0
1985	1	0	5	10	17	24	23	19	19	2	0	1
1984	2	0	2	3	10	23	6	27	16	10	0	0
1983	5	5	7	9	11	17	13	17	18	2	0	1
1982	5	4	5	14	12	19	16	17	14	3	3	0
1981	4	5	10	10	13	11	19	20	16	2	1	3

Table-4: Monthly total no of rainy days

INFERENCE

9. Last 30 years (1981-2016) various weather elements are analyzed and discussed in the following paragraphs:

a. **Monthly Mean Maximum Temperature.** The above graph (Fig-1) reveals that the month April is having mean max temp 34°C, March and May is having mean max temp 33°C - 34°C, June to October is having mean max temp 32°C - 33°C and other months mean max temp is below 30°C. Therefore, **the month April is the hottest month of the year and the next hottest months are the March and May.** The max temp is almost similar in the months June - October. Thereafter, max temp starts falling and almost similar max temp prevail in the month January and February. The max temp in the month December is the lowest.

b. **Monthly Highest Maximum Temperature.** Monthly highest max temp was observed in the month of **April (42.4°C; 24 Apr 14)** and the next max temp was obtained in March (Fig-2).

c. **Monthly Mean Minimum Temperature.** It is revealed from the graph (Fig-3) that the month May to September is having mean minimum temp within 25°C - 27°C, the month April & October is having the mean min temp 24°C. The temp starts falling sharply from November till January and January is having mean minimum temp 12.8°C. Therefore, **January is the coldest month of the year.** The temp starts rising sharply from January till June.

d. **Monthly Lowest Temperature.** It is obtained from this graph (Fig-4) that the lowest minimum temp within last 30 years was recorded in the month of January **(6.5°C on 03 Jan 95)**. The lowest temp in the month of June to September was almost similar (within 20.6°C to 21.5°C). The temp starts falling sharply from October till January and thereafter rising gradually till August.

e. **Monthly no of Mean Rainy Days.** The rainfall may occur in every month of the year and the maximum average rainy days in **July & August are 20 & 21 days** respectively (Fig-5).

f. **Monthly Total Amount of Average Rainfall (mm).** The graph (Fig-6) shows that the maximum amount of rain occurred in **June & July, 344mm & 370mm** respectively. In August, average rainfall amount (**327mm**), in September (**303mm**). The amount of rainfall decreases sharply from October (**142 mm**).

g. **Yearly Total Amount of Rainfall.** The variability of total rainfall amount in each year is not much high except in very few years. The highest amount of rainfall was found **3075 mm in 2007** and the lowest amount of rain was found **1359 mm in 1994**. The yearly average amount of rainfall is **2008 mm** (Fig-7).

h. **Yearly Total no of Rainy days.** The variability in total rainy days also very less like amount of rain fall. The maximum no of rainy days was **149 days 2016** and the lowest rainy days in a year was **96 days 2010**. The yearly average number of rainy days is **116 days** (Fig-8).

j. **Monthly No of TS Days.** Thunderstorms occur from February to October and maximum no of Thunderstorm occurs in May (**13 days**). The average no of Thunderstorms occurs 01 day in February, 04 days in March, 09 days in April, 11 days in June, 09 days in July and August, 12 days in September and 06 days in October. The thunderstorms occur in pre-monsoon season (February to May), most of them are associated with Nor'wester but some of them may not be Nor'wester (Fig-9).

K. **Monthly Avg No of Days Having Temperature $\geq 38^{\circ}\text{C}$.** This graph (Fig-10) shows that the days are 08 in April, 03 in May, 02 in March and June. **April is the hottest month of the year and second hottest is May.**

l. **Monthly Avg No of Days Having Temperature $\leq 10^{\circ}\text{C}$.**

This graph (Fig-11) shows that the days having temp $\leq 10^{\circ}\text{C}$ are more in January. The average no of days are 1 days in December, 04 in January and 02 days in February. **January is the coldest month of the year.**

m. **Monthly Average no of Foggy Days.** The study of this graph (Fig-12) reveals that fog starts in November; no of days increases gradually till January and no of days decreases gradually from February to March. **Maximum no of foggy days are in January; it is average 18 days.**

n. **Monthly Avg No Of Nor'westers.** The frequency of Nor'wester increases gradually with the progress of month from February to May. The average no of Nor'wester occurs 0.4 in February, 2.3 in March, 5.9 in April, 7 in May and June 2.6. The occurrences of Nor'wester continue till onset of Monsoon; thus, Nor'wester may occur in the 1st week of June also (Fig-13).

p. **Climate Change (Temperature).** The climate change (in temperature) has been studied here using monthly average temperature. The average temperature of summer month (February-September) have been increased gradually, but the winter months (October-January), the average temperature is almost stagnant. In February, the average temperature of 1982-2011 is 22.02°C , which have become 22.22°C in the average of 1987-2016. It revealed that the average temperature within these five years has increased by 0.20°C , which may be significant for a long period. Similarly, for the month of March, the difference is 0.09°C , for April 0.15°C , for May 0.13°C , for June 0.20°C , for July 0.09°C , for August 0.04°C , for September 0.12°C . Here, change may show very small within six years but it would be significant if we consider for 50 years or 100 years (Fig-14,15 & Table-1).

CONCLUSION

10. Weather forecasting has enormous importance in all areas of military operations as well as their supporting personnel and equipments. The accuracy of weather forecast of a particular area depends largely upon the knowledge of the forecaster about the prevailing weather conditions and the climatology of that area. For providing reliable climatology of different weather elements, 30 years real time data have been analyzed for obtaining average conditions of different weather elements like temp, fog, thunderstorm/Nor'wester, rainy days etc. These weather elements are indispensable for planning of flying effort, air operations, ground operations, ceremonial planning etc and their executions throughout the year. Other than climate, extreme conditions of different weather elements found within last 30 years have also been shown in the table. The study of climate change (temperature) shows that the average temperature is increasing gradually which may affect other weather elements also, like Thunderstorm/Nor'wester, Tropical cyclone, Flood etc.