


TECHNICAL REPORT

Title:	Climatology Report for UNICEF
Date:	23 rd October 2012
Keywords:	climatology, Wind, Temperature, Precipitation, Lebanon

Author:	<i>Jean-François Bonnin</i>
Checked:	<i>Rudy Magne</i>
Authorised:	<i>Jean-François Bonnin</i> 

1 GENERAL INFORMATION

1.1 Data sources

Table 1 presents the different sources of data available in MeteoGroup Offshore.

Table 1: Sources of data available in MeteoGroup Offshore

Sources of data	Temporal resolution	Spatial resolution	Time-Range	Parameters	Main advantage
CFSR from NOAA	1h	0.312°	1979-2009	30 years time series of U10, V10, U05, V05, U015 and V015	1. Hourly output: better representation of extreme peak compared to a 3 or 6-hours model output 2. Higher resolution compared to other reanalysis 3. Coupled ocean-atmosphere model 4. 30 years of data
ERA-Interim from ECMWF	3h	0,7° for wind / 1° for wave	1989-2011	20 years time series of U10,V10, Hs, Tp and Dirp	1. Wind-wave coupling 2. Latest ECMWF atmospheric model 3. Wave output, including spectral data
WW3-NOAA from NOAA	3h	1/1.25°	1997-2011	13 years time series of U10,V10, Hs, Tp and Dirp	1. Altimeter/SAR assimilations
MG Metocean wave hindcast	1h	1°	1991-2011	Hs, Tp, Tz, Tm02, fp, fmean, Dir spread for total wave height, wind sea, swell1 and swell 2	1. Hourly output: 2. Forced with ERA interim 3. Many parameters available
HYCOM	24h	1/12°	2003-2011	Current velocity	1. Current velocity through the water column
Altimeter from globwave project, ESA	Along the track	Along the track	1992-2011	20 years time series of Hs and wind speed	1. Data along the track, co-location with wave model to derive statistics and debiased the model data if needed 2. High quality data
Scatterometer (gridded product) from CCMP NASA	6h	0.25°	1978-2009	30 years time series of U10 and V10	
MeteoGroup historical database (GTS in-situ stations)	1h		1996-2011	16 years time series of U10 and V10	

With

U10 and V10: 10-min mean wind speed at 10m

U05 and V05: surface current at 5m below the free surface

U15 and V15: surface current at 15m below the free surface

Hs: significant wave height

Tp: peak period

Dirp: peak direction of the significant wave height

MeteoGroup have also created a 0.1° regional wave hindcast for the same period which is used for this study

MeteoGroup Offshore has carried out climate analysis for Lebanon



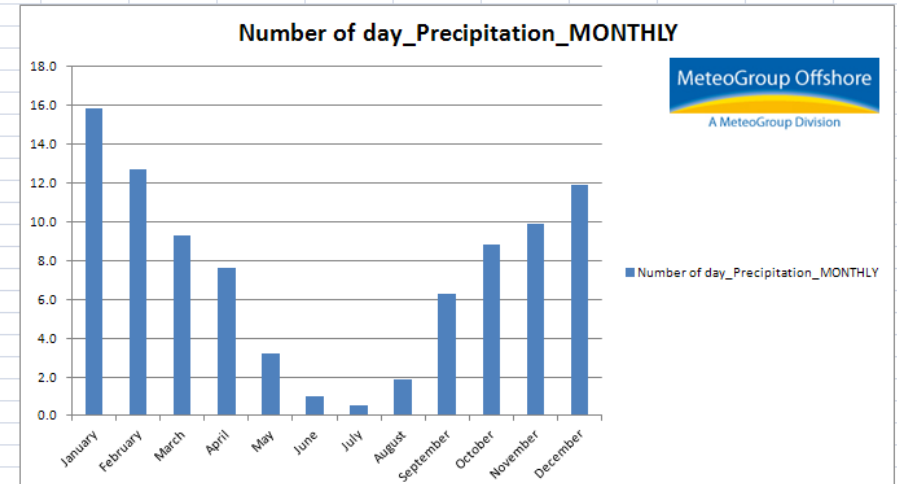
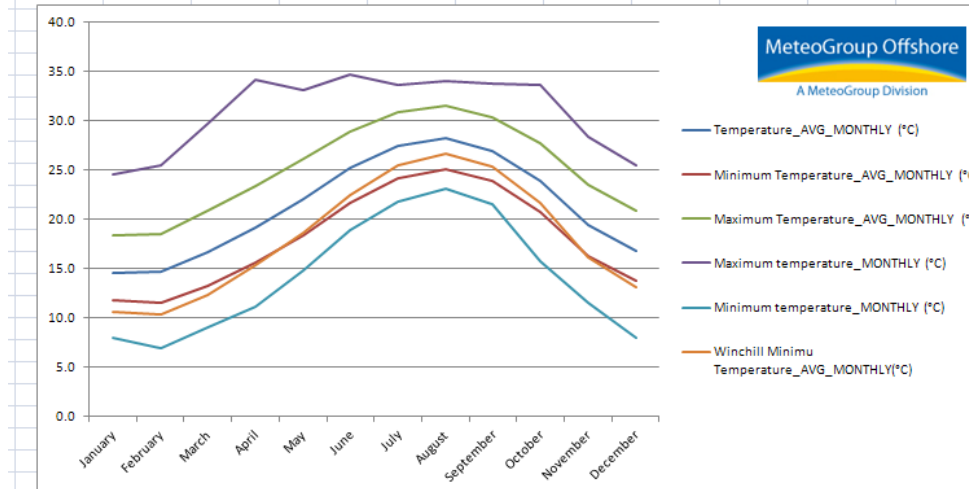
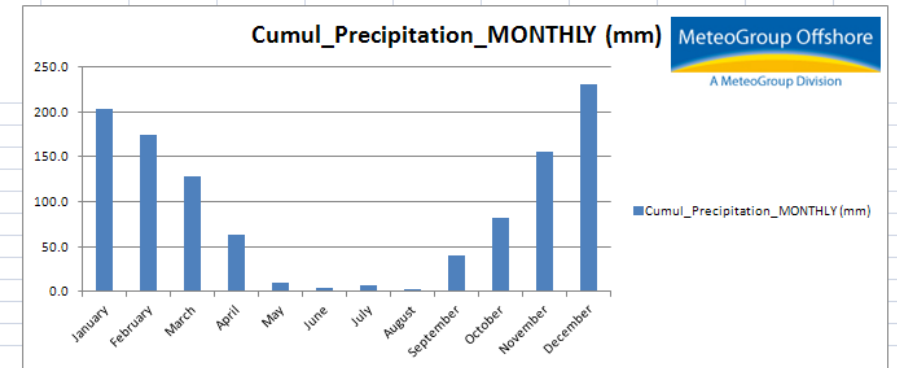
Figure 1.1: Location of interest.

Data from in-situ observation are coming from different station

Station ID	Name
40100	Beirut (Lebanon)
40110	Dahr Baidar (Lebanon)
40101	Houche-Al-Oumara (Lebanon)
40102	Rayack (Lebanon)
40105	Al Arz (Lebanon)
40103	Tripoli (Lebanon)
40066	Safita (Syria)
40083	Nabk (Syria)
40104	Merdjayoun (Lebanon)

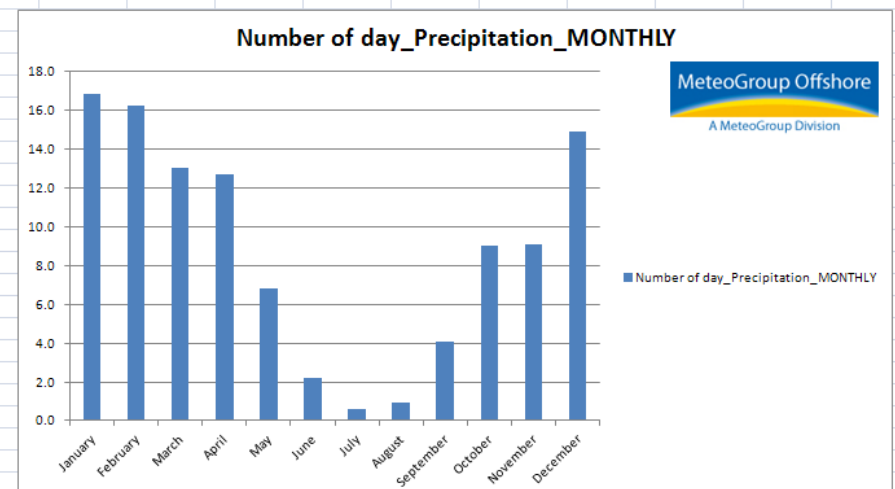
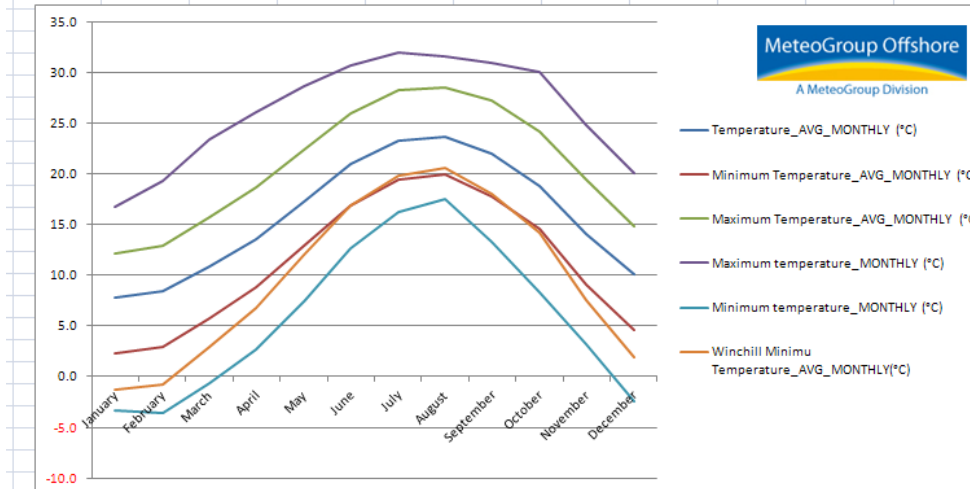
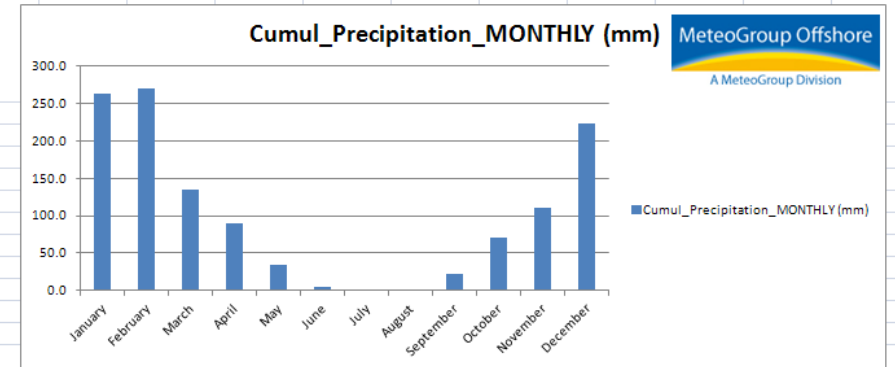
BEIRUT

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Beirut	January	14.6	11.7	18.4	24.5	8.0	10.6	10.7	203.0	15.8
Beirut	February	14.7	11.6	18.4	25.4	7.0	10.4	10.9	174.5	12.7
Beirut	March	16.6	13.2	20.8	29.7	9.0	12.3	11.1	127.9	9.3
Beirut	April	19.1	15.6	23.4	34.1	11.1	15.3	10.4	63.8	7.6
Beirut	May	22.0	18.3	26.1	33.1	14.8	18.6	10.4	9.0	3.2
Beirut	June	25.1	21.6	28.8	34.6	18.9	22.4	10.8	3.1	1.0
Beirut	July	27.4	24.1	30.8	33.6	21.8	25.4	10.8	6.8	0.5
Beirut	August	28.1	25.0	31.5	33.9	23.1	26.6	10.2	1.9	1.9
Beirut	September	26.8	23.9	30.2	33.7	21.5	25.2	9.2	40.3	6.3
Beirut	October	23.9	20.7	27.6	33.6	15.8	21.6	8.8	82.5	8.8
Beirut	November	19.3	16.2	23.4	28.3	11.5	16.1	8.9	155.3	9.9
Beirut	December	16.7	13.7	20.8	25.4	7.9	13.1	9.6	230.6	11.9



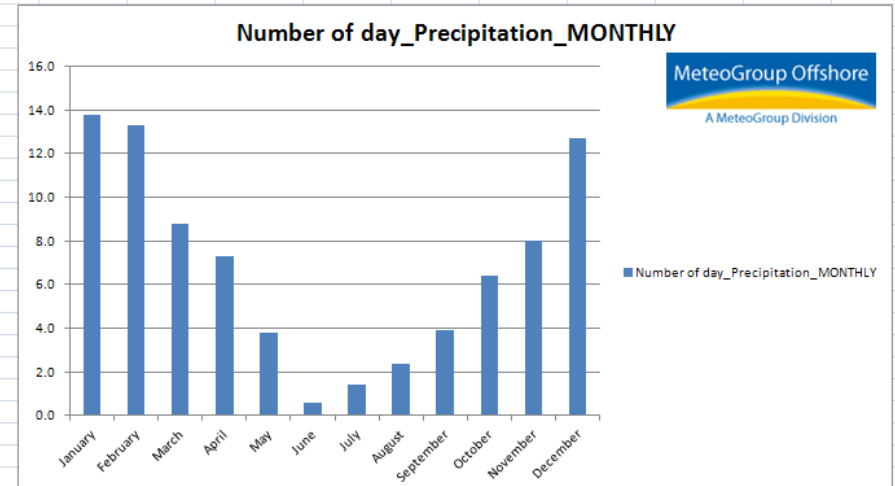
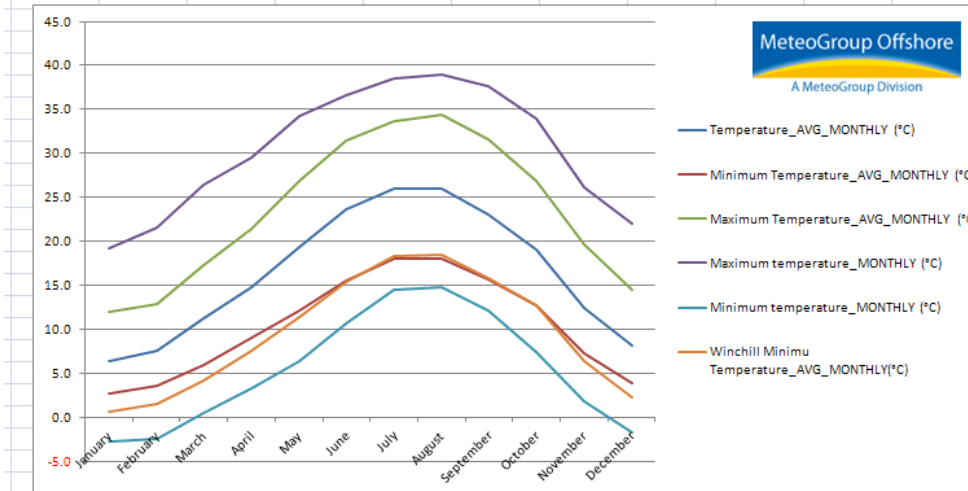
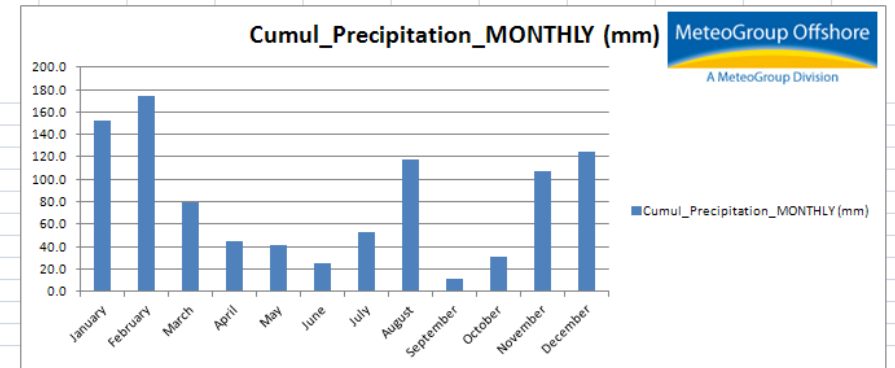
DAHR BAIDAR

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Dahr Baidar	January	7.7	2.4	12.2	16.8	-3.3	-1.2	13.5	263.7	16.8
Dahr Baidar	February	8.5	3.0	12.9	19.3	-3.5	-0.7	14.7	270.0	16.2
Dahr Baidar	March	10.8	5.8	15.7	23.4	-0.6	2.9	13.7	134.8	13.0
Dahr Baidar	April	13.5	8.8	18.6	26.1	2.7	6.7	12.9	89.1	12.7
Dahr Baidar	May	17.3	12.9	22.4	28.6	7.4	12.0	11.2	33.3	6.8
Dahr Baidar	June	21.0	16.9	26.0	30.6	12.6	16.8	10.9	4.9	2.2
Dahr Baidar	July	23.2	19.4	28.2	31.9	16.2	19.8	10.7	1.1	0.6
Dahr Baidar	August	23.7	19.9	28.5	31.6	17.5	20.5	9.8	1.1	0.9
Dahr Baidar	September	22.0	17.8	27.2	30.9	13.2	18.0	9.2	21.0	4.1
Dahr Baidar	October	18.8	14.6	24.1	30.0	8.3	14.2	9.1	69.7	9.0
Dahr Baidar	November	14.1	9.1	19.4	24.8	3.2	7.6	10.0	109.9	9.1
Dahr Baidar	December	10.1	4.7	14.8	20.0	-2.5	1.9	11.9	223.8	14.9



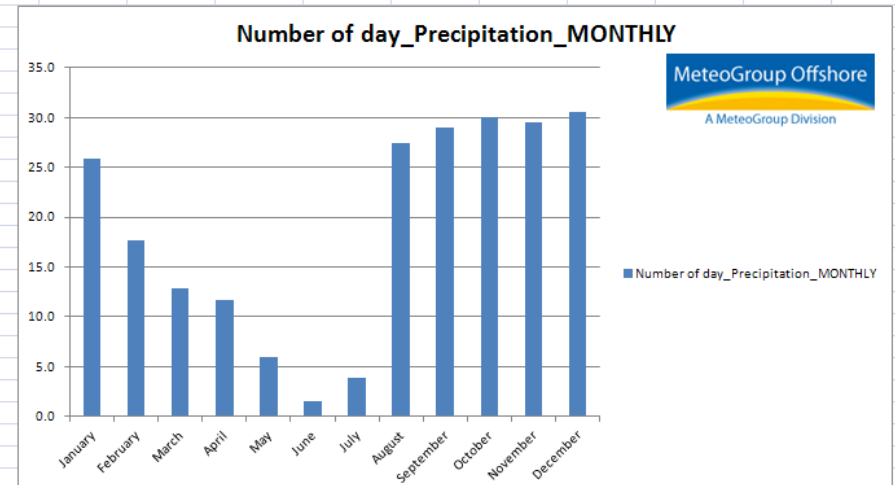
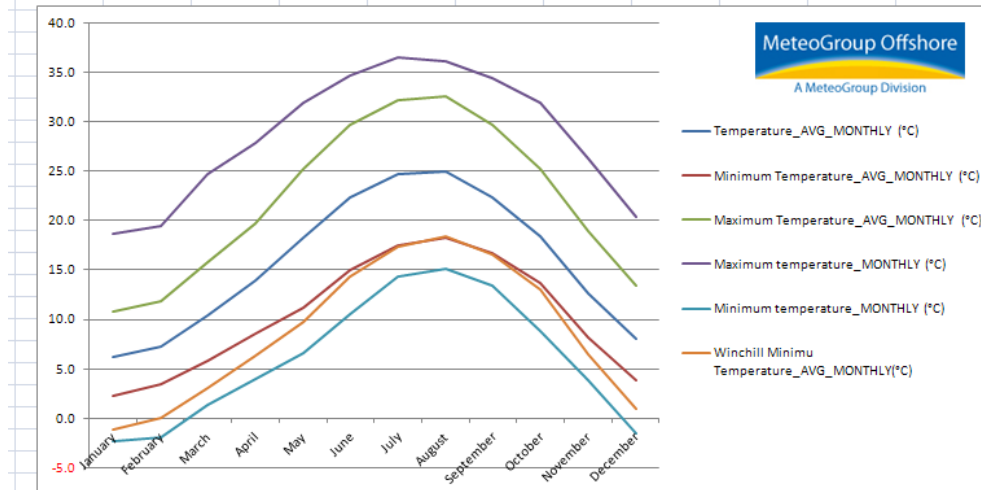
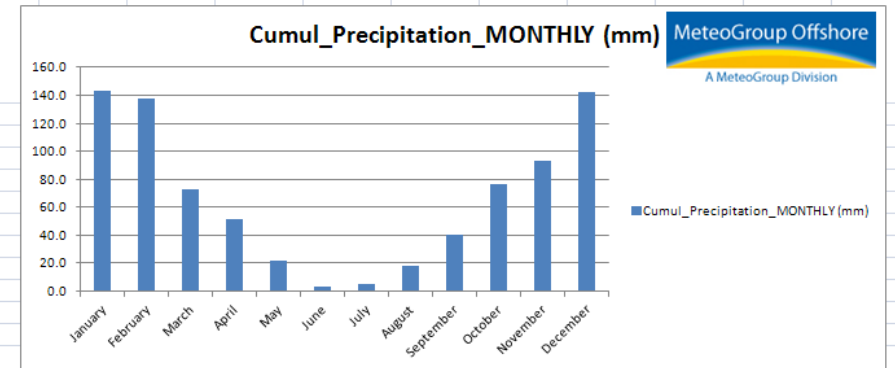
HOUCHE AL OUMARA

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Houche-Al-O	January	6.4	2.7	11.9	19.3	-2.8	0.7	7.1	152.3	13.8
Houche-Al-O	February	7.6	3.6	12.9	21.5	-2.5	1.4	8.3	174.0	13.3
Houche-Al-O	March	11.2	6.0	17.3	26.4	0.5	4.1	8.7	79.6	8.8
Houche-Al-O	April	14.8	9.0	21.5	29.5	3.3	7.6	9.1	45.1	7.3
Houche-Al-O	May	19.4	12.1	26.9	34.3	6.4	11.3	8.7	40.9	3.8
Houche-Al-O	June	23.6	15.5	31.5	36.7	10.7	15.4	9.1	24.7	0.6
Houche-Al-O	July	26.0	18.0	33.6	38.6	14.5	18.3	9.0	53.3	1.4
Houche-Al-O	August	26.0	18.1	34.3	38.9	14.8	18.4	8.1	117.7	2.4
Houche-Al-O	September	23.1	15.7	31.5	37.7	12.2	15.8	7.3	10.6	3.9
Houche-Al-O	October	19.1	12.8	26.9	34.0	7.5	12.7	5.9	30.8	6.4
Houche-Al-O	November	12.4	7.3	19.6	26.2	1.8	6.4	5.8	107.1	8.0
Houche-Al-O	December	8.1	3.9	14.5	22.1	-1.8	2.3	6.5	124.9	12.7



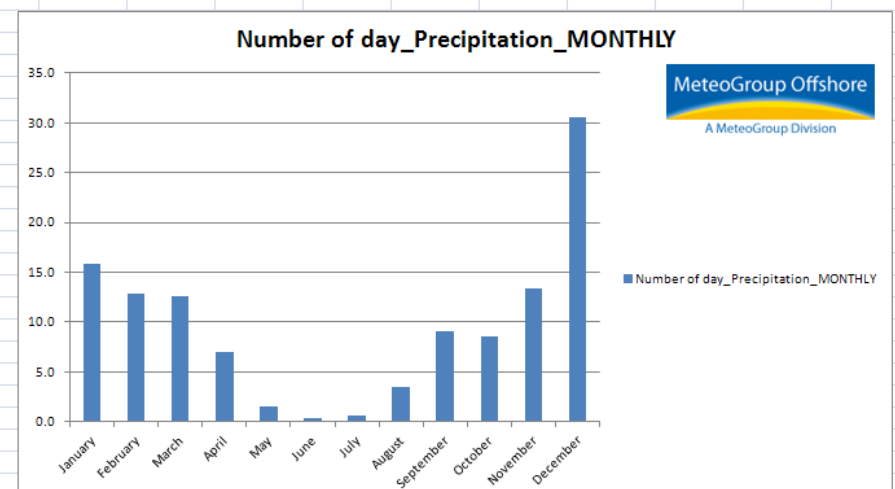
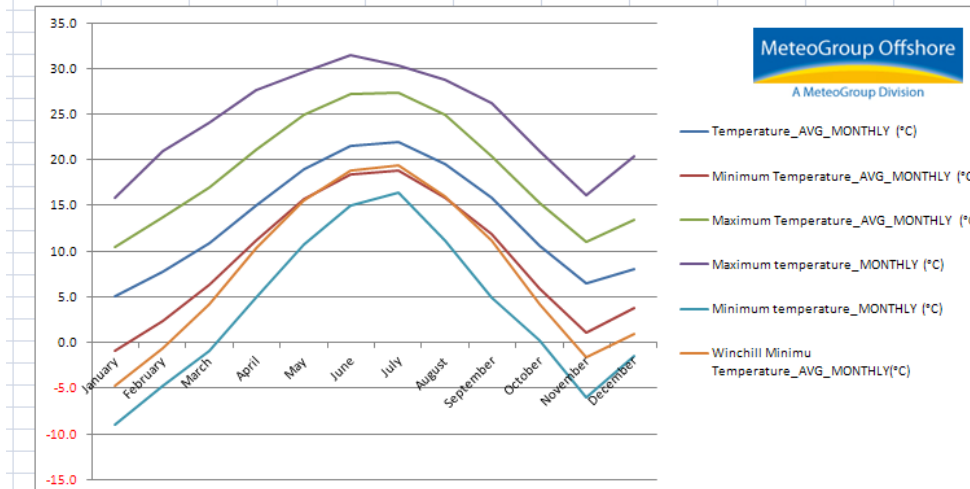
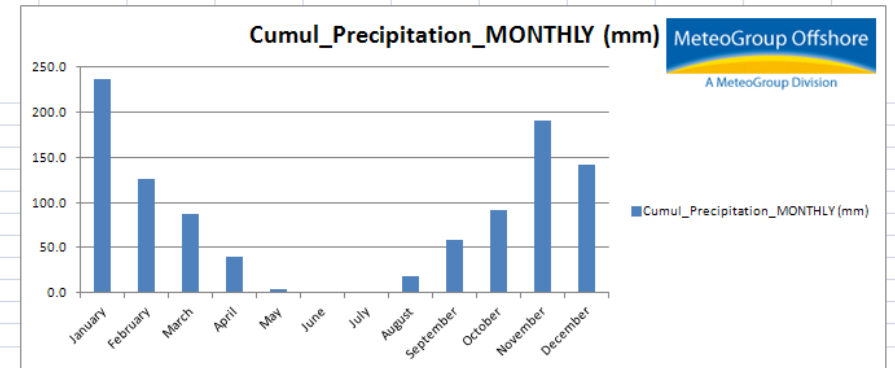
RAYACK

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Rayack	January	6.1	2.3	10.8	18.7	-2.3	-1.1	12.3	143.3	25.8
Rayack	February	7.2	3.4	11.8	19.4	-1.9	0.0	13.8	137.4	17.7
Rayack	March	10.4	5.9	15.8	24.7	1.4	3.1	13.2	72.8	12.8
Rayack	April	13.9	8.5	19.7	27.8	4.0	6.4	13.0	51.0	11.7
Rayack	May	18.3	11.2	25.2	31.8	6.5	9.8	11.8	21.8	6.0
Rayack	June	22.3	15.0	29.7	34.6	10.5	14.3	12.1	3.4	1.5
Rayack	July	24.7	17.4	32.2	36.5	14.3	17.3	11.7	4.7	3.9
Rayack	August	25.0	18.3	32.5	36.0	15.1	18.4	11.1	18.6	27.4
Rayack	September	22.3	16.7	29.6	34.4	13.4	16.5	10.8	40.0	28.9
Rayack	October	18.4	13.6	25.2	31.8	8.8	13.0	10.2	76.6	30.0
Rayack	November	12.7	8.2	18.9	26.3	3.9	6.4	10.3	93.3	29.5
Rayack	December	8.1	3.8	13.4	20.4	-1.5	1.0	11.4	142.4	30.5



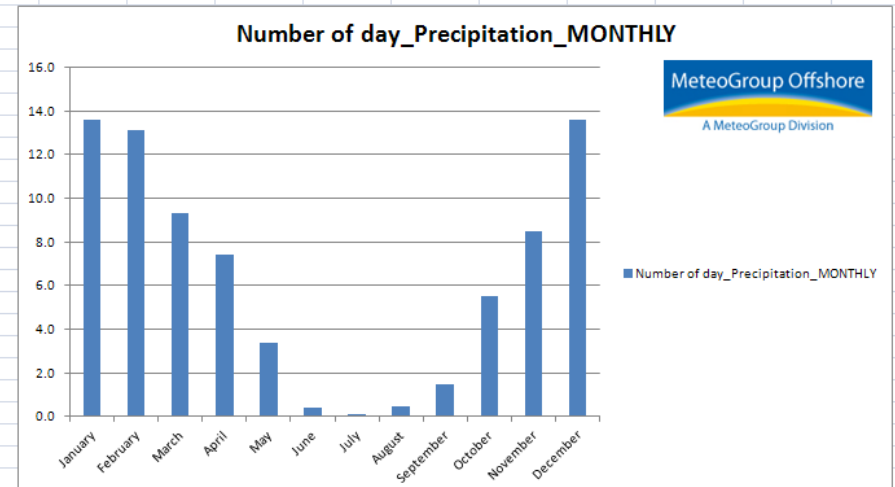
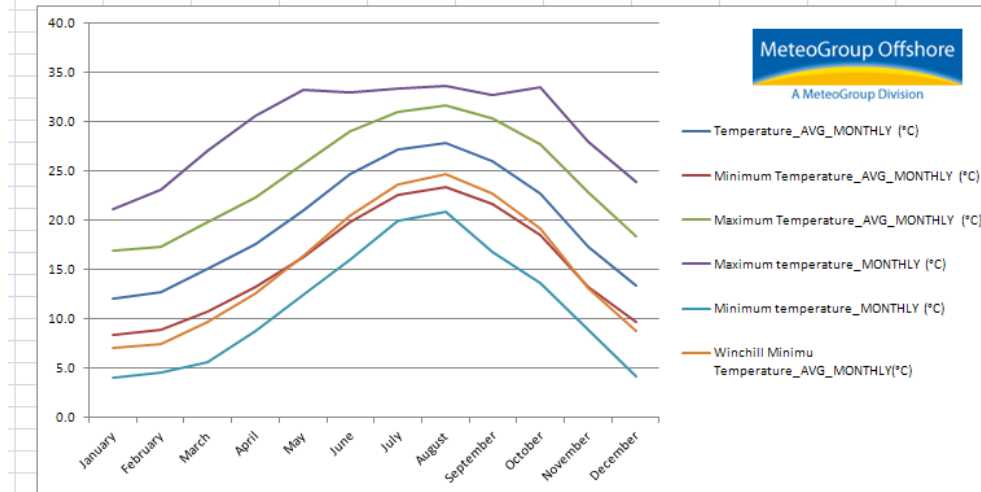
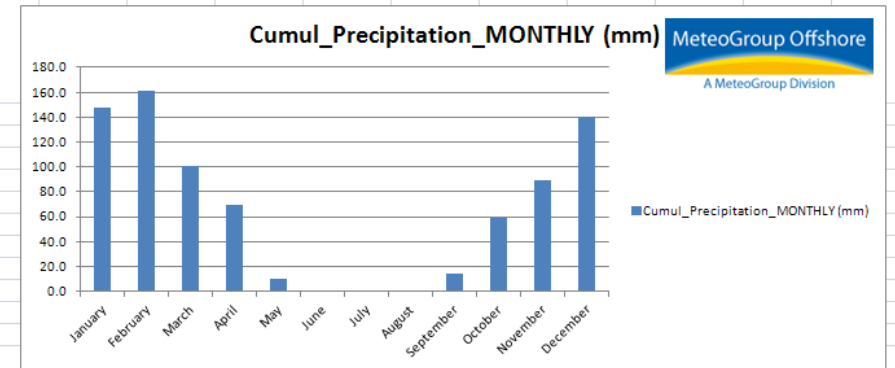
AL ARZ

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Al-Arz	January	5.1	-1.0	10.5	15.9	-9.0	-4.7	10.8	237.0	15.9
Al-Arz	February	7.8	2.3	13.8	21.0	-4.8	-0.6	10.3	126.1	12.8
Al-Arz	March	10.9	6.3	16.9	24.1	-1.0	4.3	9.7	87.1	12.6
Al-Arz	April	15.0	11.1	21.1	27.7	5.0	10.2	8.5	39.5	7.0
Al-Arz	May	18.9	15.6	25.0	29.6	10.7	15.6	8.0	4.3	1.6
Al-Arz	June	21.5	18.3	27.2	31.5	15.0	18.8	7.8	0.7	0.4
Al-Arz	July	21.9	18.8	27.4	30.3	16.4	19.4	7.3	0.7	0.6
Al-Arz	August	19.5	15.9	24.9	28.7	11.1	16.0	7.4	17.6	3.5
Al-Arz	September	15.8	11.8	20.4	26.2	4.9	11.2	7.7	58.8	9.1
Al-Arz	October	10.6	5.9	15.3	21.0	0.2	4.1	8.0	91.6	8.6
Al-Arz	November	6.5	1.1	11.1	16.1	-6.1	-1.7	8.8	191.4	13.4
Al-Arz	December	8.1	3.8	13.4	20.4	-1.5	1.0	11.4	142.4	30.5



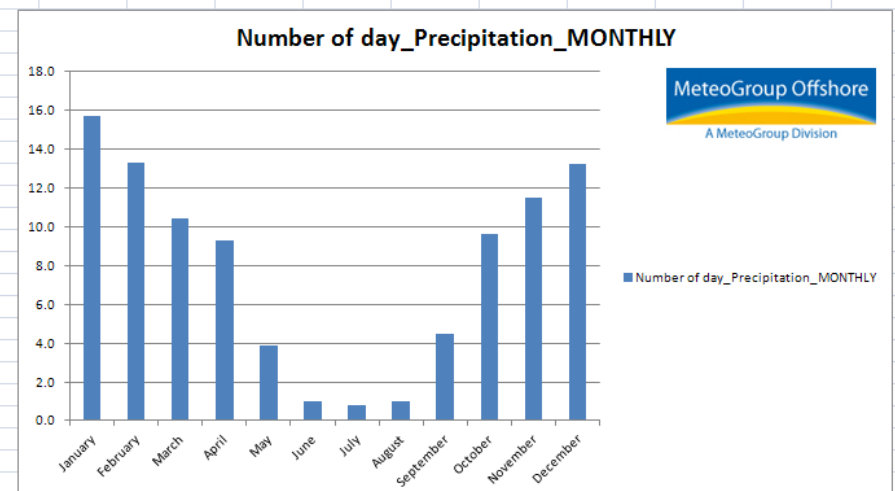
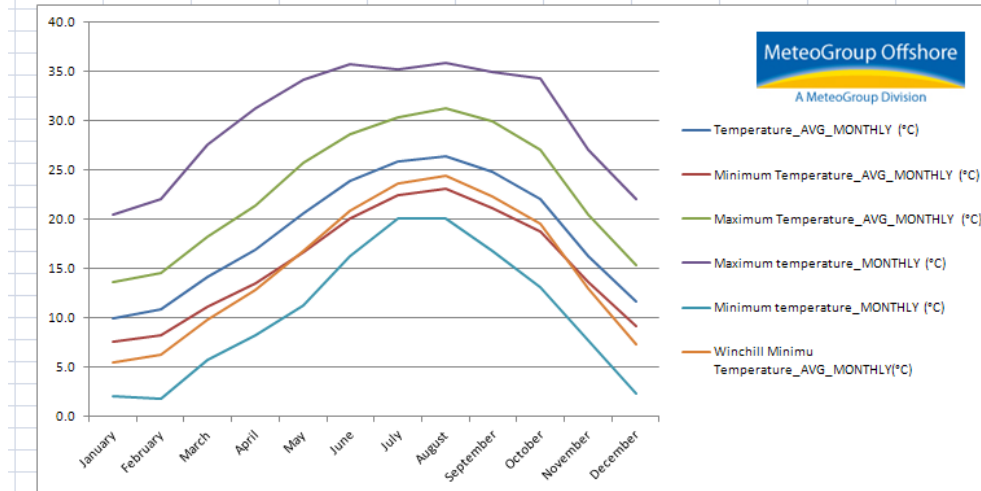
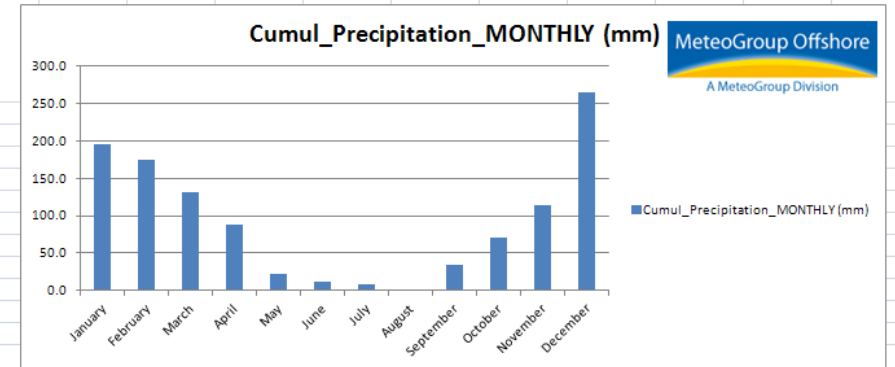
TRIPOLI

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Tripoli	January	12.0	8.3	16.8	21.1	4.0	7.1	7.8	147.6	13.6
Tripoli	February	12.7	8.9	17.3	23.1	4.6	7.4	9.2	161.0	13.1
Tripoli	March	15.0	10.7	19.8	27.0	5.6	9.6	8.9	100.3	9.3
Tripoli	April	17.6	13.2	22.2	30.5	8.8	12.6	8.9	68.9	7.4
Tripoli	May	21.0	16.3	25.7	33.1	12.4	16.3	8.1	9.8	3.4
Tripoli	June	24.7	19.8	28.9	32.9	15.9	20.5	8.7	0.6	0.4
Tripoli	July	27.1	22.5	30.9	33.3	19.9	23.6	9.0	0.1	0.1
Tripoli	August	27.8	23.3	31.6	33.6	20.9	24.6	8.8	0.5	0.5
Tripoli	September	26.0	21.6	30.3	32.6	16.7	22.6	7.9	14.3	1.5
Tripoli	October	22.7	18.5	27.6	33.5	13.6	19.2	6.7	58.8	5.5
Tripoli	November	17.3	13.2	22.8	27.9	8.9	13.0	6.6	88.7	8.5
Tripoli	December	13.3	9.6	18.4	23.9	4.1	8.7	7.2	140.4	13.6



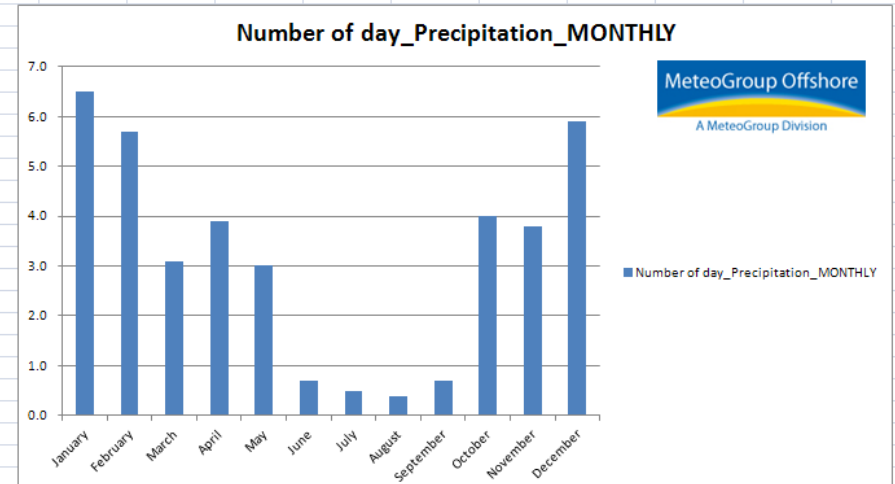
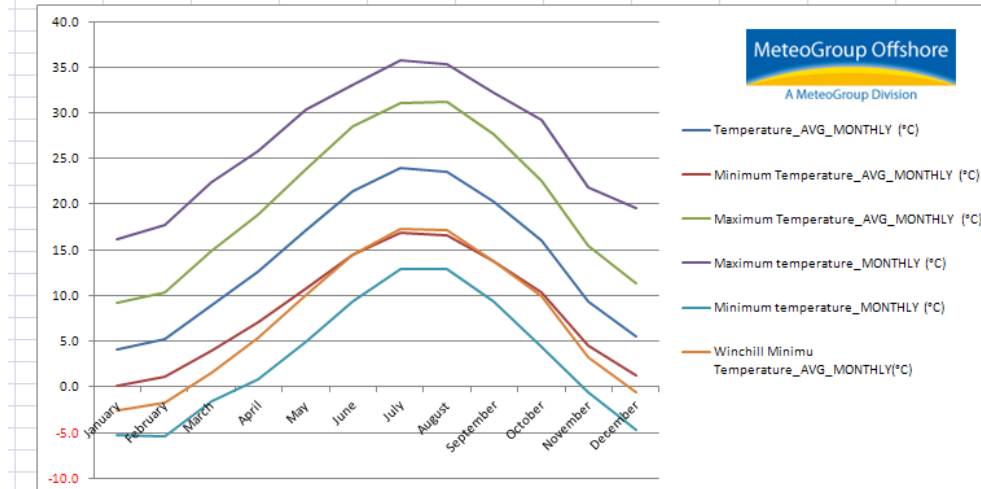
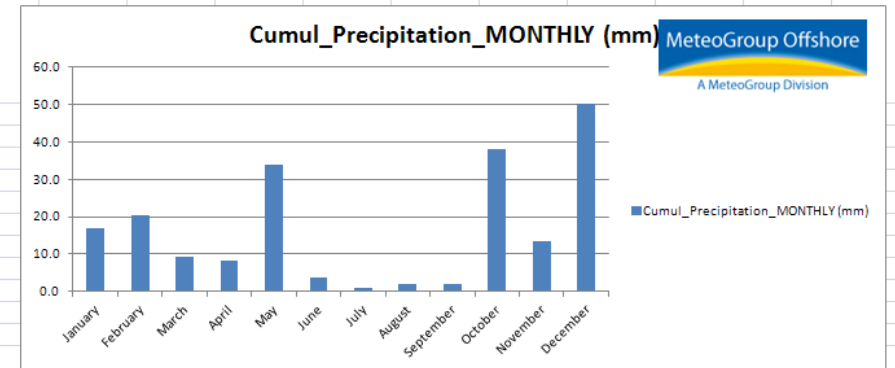
SAFITA

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Safita	January	9.9	7.6	13.6	20.4	2.0	5.5	11.4	195.6	15.7
Safita	February	10.9	8.2	14.5	22.0	1.8	6.2	11.7	174.3	13.3
Safita	March	14.1	11.1	18.2	27.6	5.7	9.8	10.5	130.9	10.4
Safita	April	16.9	13.5	21.3	31.2	8.3	12.8	10.1	88.5	9.3
Safita	May	20.6	16.6	25.7	34.1	11.2	16.8	8.0	21.3	3.9
Safita	June	23.8	20.0	28.6	35.6	16.2	20.8	7.1	11.2	1.0
Safita	July	25.8	22.3	30.3	35.1	20.1	23.6	6.8	7.5	0.8
Safita	August	26.4	23.0	31.2	35.8	20.0	24.4	6.2	1.0	1.0
Safita	September	24.7	21.1	29.9	34.9	16.8	22.3	5.8	33.6	4.5
Safita	October	22.0	18.7	27.0	34.3	13.1	19.5	5.7	70.7	9.6
Safita	November	16.3	13.6	20.5	27.0	7.6	13.0	9.8	113.6	11.5
Safita	December	11.6	9.1	15.3	22.0	2.3	7.3	11.8	265.1	13.2



SAFITA

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Nabk	January	4.0	0.2	9.2	16.1	-5.2	-2.6	8.4	17.0	6.5
Nabk	February	5.2	1.1	10.3	17.8	-5.4	-1.7	9.2	20.4	5.7
Nabk	March	9.0	3.9	14.9	22.4	-1.7	1.6	9.0	9.4	3.1
Nabk	April	12.6	7.0	18.9	25.8	0.8	5.4	8.3	8.4	3.9
Nabk	May	17.1	10.8	23.8	30.3	4.9	10.0	7.4	34.0	3.0
Nabk	June	21.4	14.5	28.6	33.1	9.3	14.4	7.0	3.5	0.7
Nabk	July	23.9	16.9	31.1	35.7	12.8	17.2	6.9	0.9	0.5
Nabk	August	23.6	16.6	31.2	35.4	13.0	17.1	5.6	2.0	0.4
Nabk	September	20.2	13.7	27.7	32.2	9.3	13.7	5.8	2.1	0.7
Nabk	October	16.0	10.4	22.6	29.2	4.4	9.9	5.9	38.0	4.0
Nabk	November	9.3	4.6	15.4	21.8	-0.6	3.3	5.9	13.4	3.8
Nabk	December	5.4	1.3	11.3	19.5	-4.7	-0.6	6.3	50.1	5.9



MERDJAYOUN

Station ID	Month	Temperature_AVG_MONTHLY (°C)	Minimum Temperature_AVG_MONTHLY (°C)	Maximum Temperature_AVG_MONTHLY (°C)	Maximum temperature_MONTHLY (°C)	Minimum temperature_MONTHLY (°C)	Winchill Minimum Temperature_AVG_MONTHLY (°C)	Windspeed_AVG_MONTHLY (km/h)	Cumul_Precipitation_MONTHLY (mm)	Number of day_Precipitation_MONTHLY
Merdjayoun	January	9.9						13.5	244.5	17.0
Merdjayoun	February	10.6						14.4	244.9	16.0
Merdjayoun	March	12.8						13.4	111.6	13.1
Merdjayoun	April	15.4						12.5	76.2	11.5
Merdjayoun	May	18.8						11.3	22.0	7.3
Merdjayoun	June	22.1						10.9	4.6	2.7
Merdjayoun	July	24.2						10.3	1.9	1.2
Merdjayoun	August	24.5						9.8	1.6	1.6
Merdjayoun	September	23.1						9.2	18.9	4.5
Merdjayoun	October	20.3						9.4	62.6	8.9
Merdjayoun	November	15.9						10.1	99.3	9.2
Merdjayoun	December	11.9						12.0	222.3	14.9

