



Annual bulletin

- 2015 -

Overview:

- 2015 was warmer than normal over the entire North African region.
- The year 2015 was the eighth warmest since 1950 with an anomaly of 0.4°C above the reference period 1981–2010.
- For 2015, annual precipitation was near to slightly below the normal 1981-2010.
- In February, heavy rain affected Morocco, Algeria and Tunisia. Alhoceima, Morocco received 206.1 mm, 574 percent of its average monthly precipitation.
- In 2015, significant drought affected many parts of North African countries (all of Egypt, most part of Libya and Algeria).

The following products are based on NCDC observed stations data and the NCEP/NCAR Reanalysis data.

Temperature

The graph n°1 shows the annual trend in anomaly air temperature in degrees Celsius since 1981 through 2015. For each year, the positive anomaly is indicated by the red vertical bars and the negative anomaly is indicated by the blue vertical bars. The black line tracks the changes in the trend over time.

In 2015, the land mean temperature of the region was the eighth highest since 1950, at 0.4°C above the normal 1981-2010. The warming rate of about 0.21°C per decade.

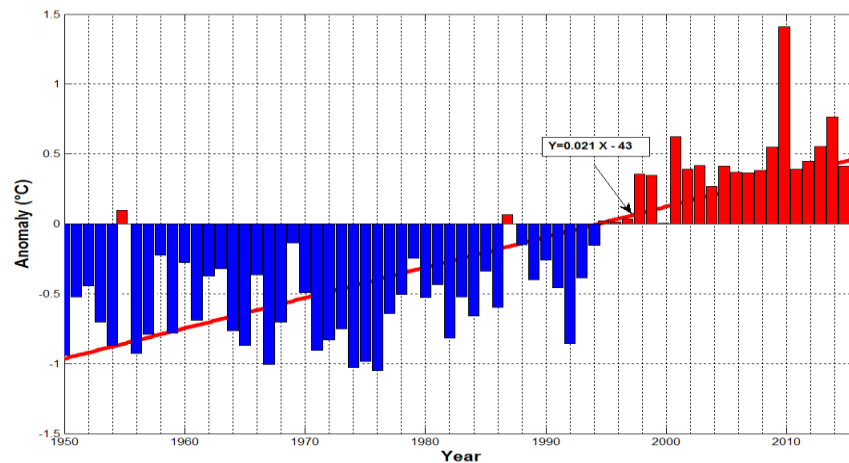


Figure 1: Annual anomaly mean temperature time series plots with trend line

(Data source: <https://www.ncdc.noaa.gov>)

The annual mean air temperature during 2015 ranged between 14°C in the north of Morocco and 27 °C over the extreme southern of Algeria.

2015 was warmer than normal over the all of the North Africa land areas (figure 3). The highest anomalies were reported for eastern Egypt (more than +1°C) and southern Morocco (more than +1.5°C). In Tunisia, Libya and Algeria anomalies ranged between 0 and °C.

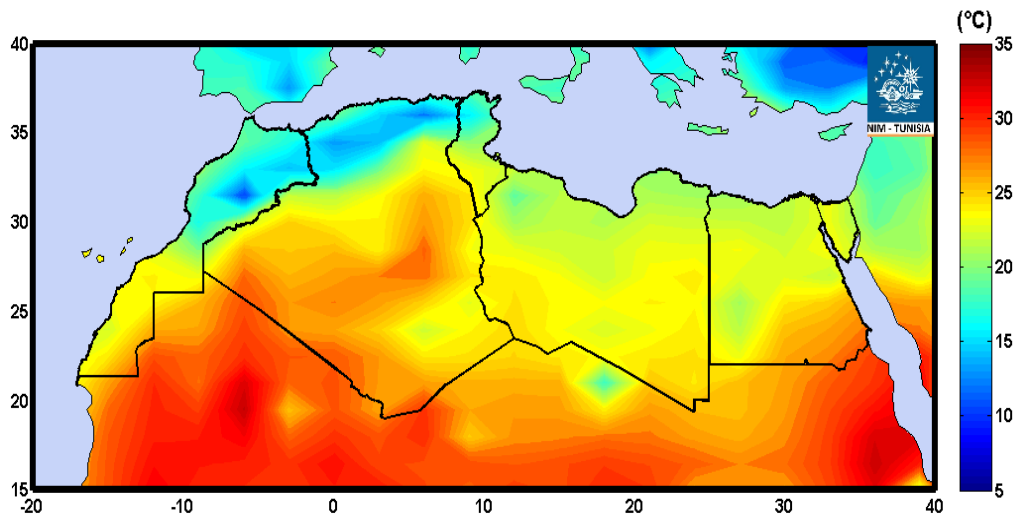


Figure 2: Mean Temperature in 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

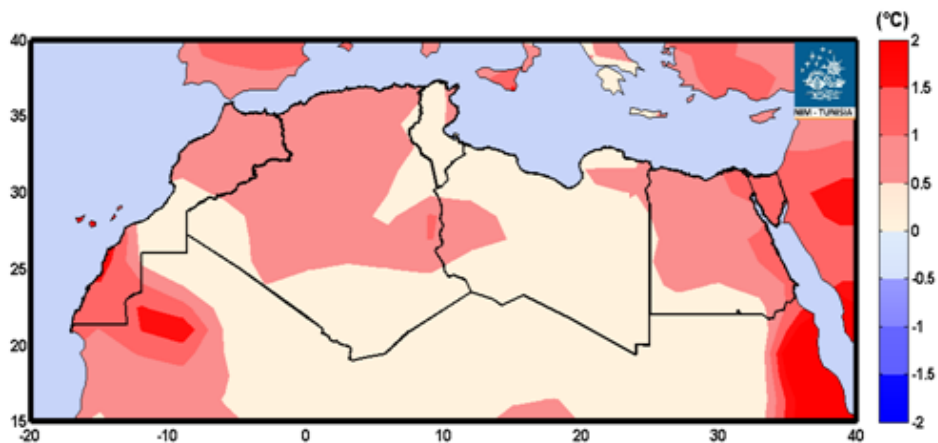


Figure 3: Temperature anomaly (Reference 1981-2010) for the year 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

Precipitation

The annual amounts of precipitation were at its minimum in the south of Egypt and Libya and at its maximum in the extreme North West of Tunisia.

2015 annual total of precipitation was less than 500 mm over Egypt, Libya, Morocco and most of Algeria.

Within the RA I- North Africa Region, much of the land area was drier than normal in 2015. Some places in Libya, Tunisia and Algeria reported a wettest year on record. Wet periods did not occurred throughout the whole year, with

Some extraordinarily wet spells in February in Tunisia and over the southern Algeria and Tunisia in September, August in Morocco (flooding events).

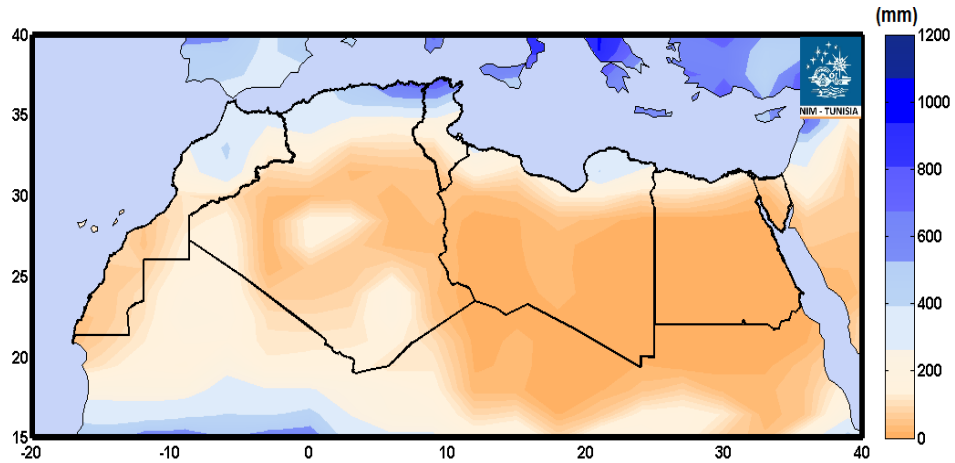
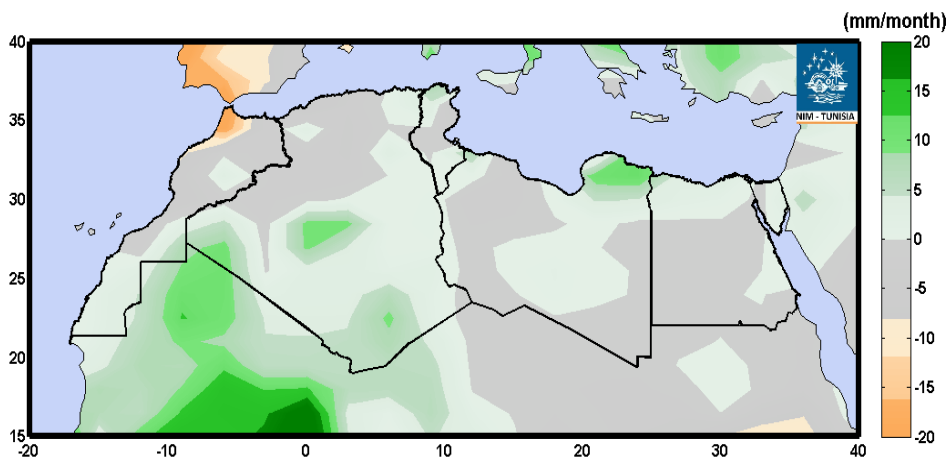


Figure 4: Total precipitation (mm) of the year 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)



*Figure 5: Anomaly of precipitation (percentage) of 2015
(Reference period 1981-2010)*

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

Drought

The drought in the region during 2015 was noticed using the Standardized Precipitation Index (SPI) for scales 12 and 24 months. Map of the Standardized Precipitation Index (SPI-24 months) shows that it was extremely, in the major parts of Egypt and Libya the Southeastern Algeria. It was near normal to moderately wet elsewhere.

The map of SPI-24 months shows that 2015 was mildly wet nearly over the all counties of North Africa region with except of Egypt.

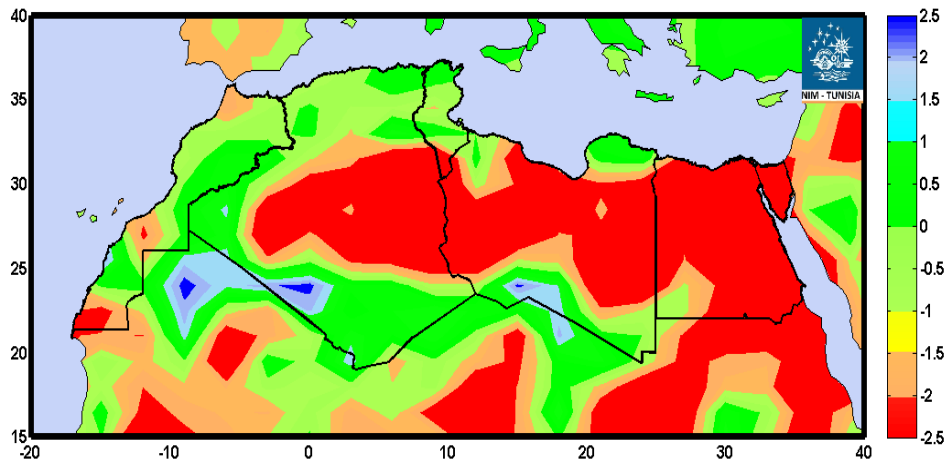


Figure 6: SPI of the year 2015 (12 months)

(Data source: <ftp://ftp.dwd.de>)

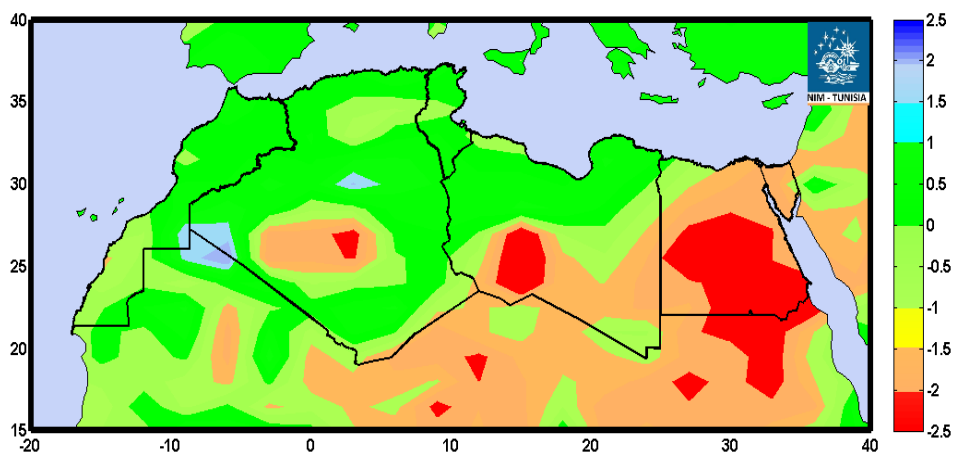


Figure 7: SPI of the year 2015 (24 months)

(Data source: <ftp://ftp.dwd.de>)

Aridity

Aridity over the region during 2015 was noticed using the De Martonne index. 2015 was hyper arid over Egypt, Libya and the southern Tunisia, Algeria and Morocco. It was arid to semi-arid in the North of Tunisia and Algeria.

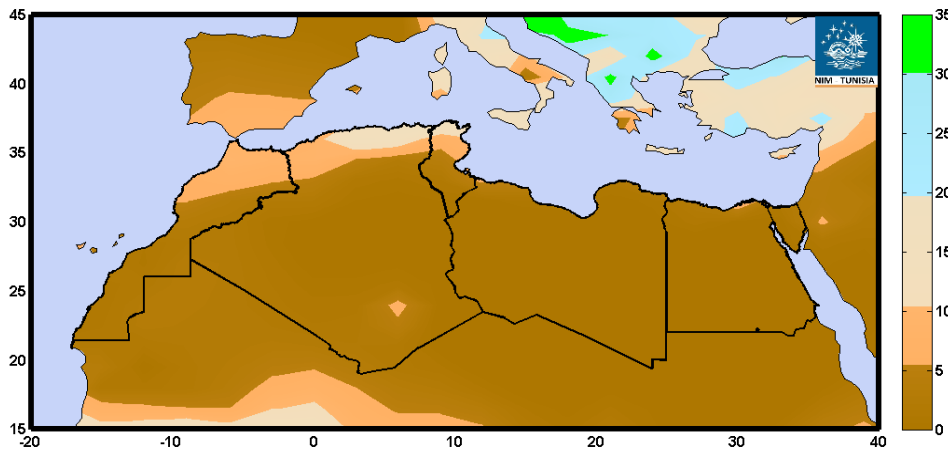


Figure 8: De Martonne aridity index of 2015

[0, 5]Hyper arid, [5, 10]Arid, [10, 20] Semi-arid, [20, 30] Semi-humid, [30, 35]humid

(Data source: <https://www.ncdc.noaa.gov>)

Sea Surface Temperature

Maps based on NCEP/NCAR data shows that the annual mean of the sea surface temperature was at its minimum in the north of the Atlantic Ocean and at its maximum in the red Sea. In 2015 the Sea Surface Temperature in nearly the whole RAI-North Africa region had positive anomalies.

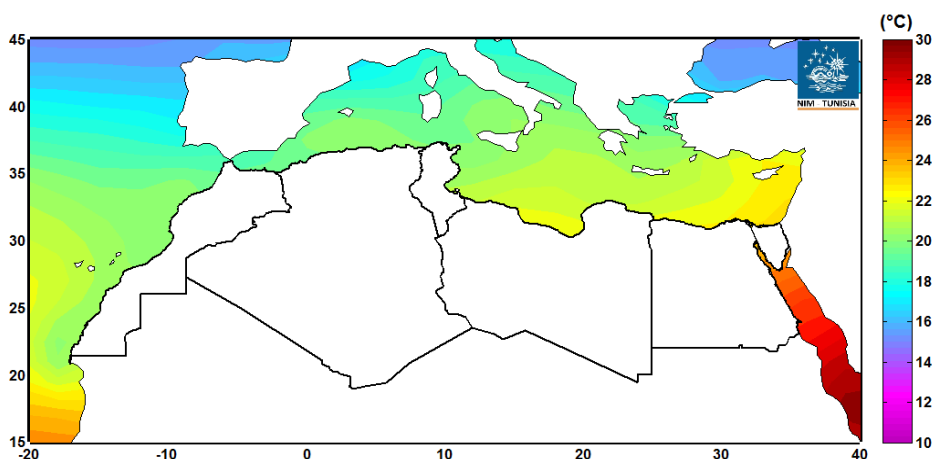


Figure 9: Mean Sea Surface Temperature (SST) of 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

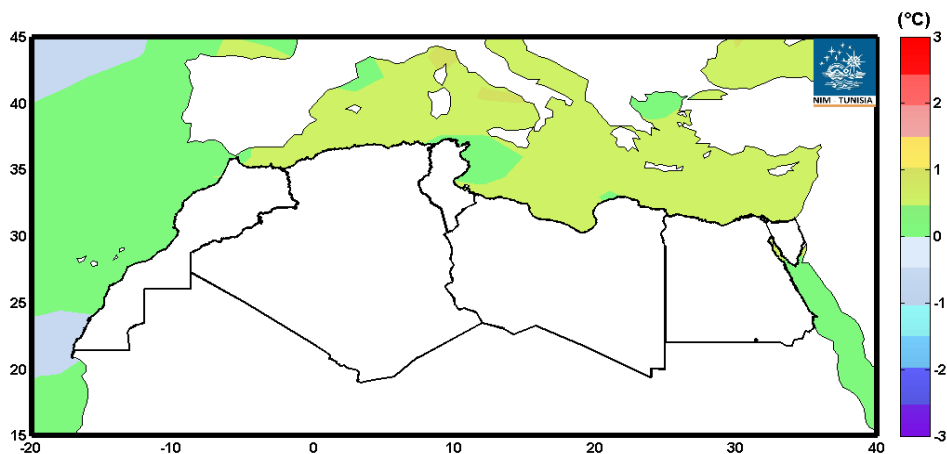


Figure 9: Anomaly (Reference period 1981-2010) of Mean Sea Surface Temperature (SST) 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

Sea level pressure

The lowest sea level pressure in the WMO RAI-North Africa region of 1012 hPa was registered over the southeastern Egypt and the maximum was registered over the north Atlantic.

The positive pressure anomalies were registered over the whole region. This pressure distribution caused more sunshine and little precipitation.

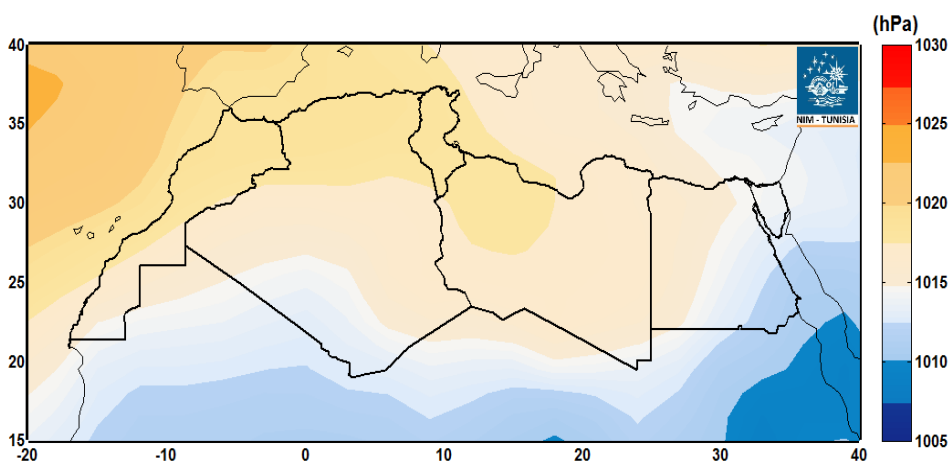


Figure 10: Mean Sea Level Pressure of the year 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

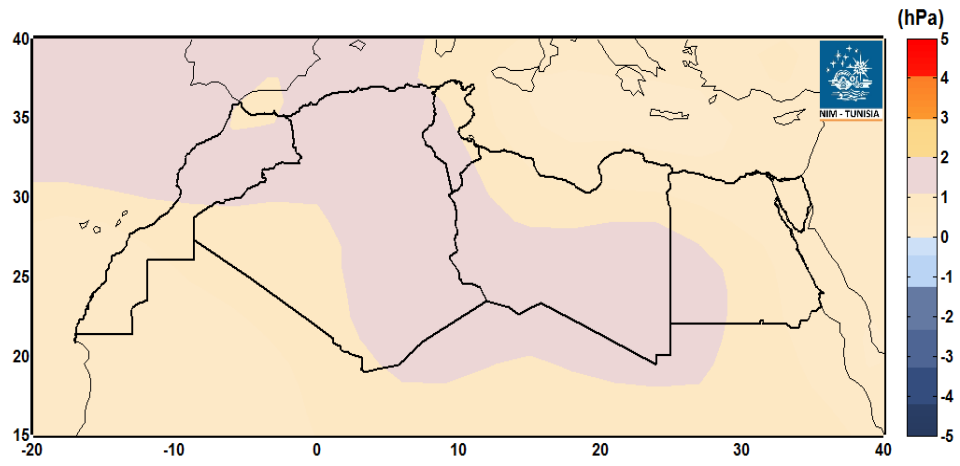


Figure 11: Anomaly (Reference period 1981-2010) of Sea Level Pressure for the year 2015

(Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

Extremes Values

The following indices are given for many stations of region in 2015:

- **TX:** highest mean maximum temperature (°C)
- **TXX:** highest absolute maximum temperature (°C)
- **TN:** lowest mean minimum temperature (°C)
- **TNN:** lowest absolute minimum temperature (°C),
- **RX1d:** highest 24 hours total (in mm)
- **RX5d:** highest 120 hours total (in mm)
- **RR10:** Number of days with total precipitation >10mm (in days)
- **RR20:** Number of days with total precipitation >20mm (in days)

WMO N°	Stations	TX(°C)	TXX(°C)	TN(°C)	TNN(°C)	RX1d	RX5d	RR10	RR20
623050	SALLUM PLATEAU	24.6	37.0	14.8	2.0	67.1	67.1	5	3
623060	MERSA MATRUH	25.2	40.0	15.8	3.0	11.9	24.9	2	0
623090	DABAA	25.2	40.6	16.8	1.0	39.1	59.2	5	2
623180	ALEXANDRIA INTL	25.8	39.6	17.2	4.8	127.0	127.0	5	5
623250	BALTIM	25.4	36.9	18.3	6.8	24.9	63.0	6	2
623330	PORT SAID	25.2	43.2	19.0	5.6	6.1	8.4	0	0
623370	EL ARISH INTL	27.2	46.6	14.9	2.7	18.0	27.9	2	0
623601	BORG EL ARAB INTL	25.1	40.0	16.1	4.0	0.0	0.0	0	0
623660	CAIRO INTL	28.1	45.0	17.6	4.6	99.1	99.3	1	1
623980	SOHAG INTL AIRPORT	31.6	47.0	18.2	3.0	7.9	7.9	0	0
624050	LUXOR INTL	33.8	47.6	18.5	3.4	5.1	5.1	0	0
624140	ASWAN INTL	34.8	47.0	20.4	3.6	3.0	5.1	0	0
624200	BAHARIA	32.4	46.8	15.0	1.6	1.0	1.0	0	0
624550	RAS SEDR	29.2	42.5	18.1	2.9	3.0	3.0	0	0
624580	ABURDEES	28.2	46.3	19.3	4.0	6.1	6.1	0	0
624590	EL TOR	28.9	43.1	19.0	5.6	70.1	70.1	1	1
624630	HURGHADA INTL	32.5	46.1	20.6	6.0	4.3	6.4	0	0
624639	SHARM EL SHEIKH INT	31.0	44.0	22.6	7.0	0.0	0.0	0	0
603510	JIJEL	23.8	39.6	14.0	3.0	49.0	125.7	35	20
603600	ANNABA	23.7	41.0	13.1	1.4	55.1	73.9	26	9
603900	HOUARI BOUMEDIENE	25.0	40.6	12.1	0.4	42.9	70.9	16	4
603950	TIZI-OUZOU	25.5	44.6	13.9	1.5	50.0	114.3	28	10
604020	SOUMMAM	23.7	43.0	13.8	2.0	50.0	97.3	15	5
604190	MOHAMED BOUDIAF INTL	23.0	42.8	9.4	-4.6	98.0	121.2	18	7
604250	ECH CHELIFF	27.2	48.0	14.2	1.5	21.1	61.2	7	1
604450	SETIF AIN ARNAT	21.7	39.5	8.0	-6.7	21.1	44.2	13	1
604570	MOSTAGANEM	24.1	42.0	12.4	-1.4	27.9	73.2	9	3
604591	HASSI R MEL	26.7	42.9	12.6	-5.0	7.9	14.0	0	0
604680	BATNA	23.4	41.6	7.8	-6.0	37.1	49.0	7	4
604900	ES SENIA	24.8	39.1	13.2	-0.4	39.9	59.2	9	2
605070	GHRISS	25.8	45.0	10.7	-2.3	107.2	122.2	14	5

605110	BOU CHEKIF	23.2	42.0	8.6	-5.0	26.9	42.9	5	1
605150	BOU SAADA	26.6	45.0	13.4	-1.0	18.0	25.1	1	0
605250	BISKRA	29.0	46.0	16.8	2.0	23.1	34.3	3	1
605310	ZENATA	25.6	41.2	12.1	0.0	37.1	72.1	5	2
605360	SAIDA	24.8	43.5	10.3	-3.4	56.9	96.8	9	5
605450	LAGHOUAT	25.8	42.0	12.6	-4.0	0.0	0.0	0	0
605490	MECHERIA	24.5	41.0	10.1	-73.3	99.1	102.6	3	2
605500	EL-BAYADH	22.0	38.2	9.6	-6.6	27.9	35.1	4	1
605590	GUEMAR	29.4	46.6	15.6	-1.4	21.1	36.6	2	1
605660	NOUMERAT	28.6	45.0	16.4	1.0	7.1	11.2	0	0
605710	BECHAR	28.5	43.4	15.4	-1.6	19.1	20.8	2	0
605800	OUARGLA	30.9	47.6	16.3	-2.0	21.1	21.3	1	1
605900	EL GOLEA	29.9	48.0	15.5	-4.0	3.0	5.1	0	0
606070	TIMIMOUN	32.3	47.1	17.5	0.0	2.0	2.0	0	0
606110	IN AMENAS	30.7	46.3	15.5	-2.3	23.9	28.2	2	1
606190	TAGUENTOUR	30.2	44.3	16.1	-2.7	4.1	4.8	0	0
606200	TOUAT CHEIKH SIDI MOHAMED BELKEBIR	34.0	48.0	17.9	-2.0	5.1	9.1	0	0
606305	IN SALAH	34.8	48.4	19.3	-1.0	4.1	4.1	0	0
606560	TINDOUF	31.4	47.3	16.3	2.0	43.9	67.1	5	2
606620	FADNOUNE	27.1	39.7	16.9	-2.3	16.0	22.6	2	0
606670	TINALKOUM	31.4	43.8	18.4	-1.4	0.3	0.3	0	0
606700	TISKA	31.0	42.5	15.2	-5.3	3.0	3.0	0	0
606720	MERTOUEK	28.1	39.0	16.7	-3.0	38.1	66.3	4	1
606770	AFARA	28.6	39.8	14.9	-6.6	14.0	30.0	1	0
606790	ASSEKREM	17.9	26.8	9.8	-9.3	40.9	118.9	12	5
606805	TAMANRASSET	29.7	39.7	15.3	-3.4	20.1	45.0	3	1
606920	IN GUEZZAM	36.1	46.2	22.9	7.6	29.0	42.9	3	2
607100	TABARKA 7 NOVEMBRE	23.6	41.2	13.6	0.7	52.3	93.0	38	16
607140	SIDI AHMED AIR BASE	24.3	42.3	13.8	1.4	31.5	70.4	14	6
607150	CARTHAGE	25.1	42.6	14.9	-3.4	44.7	81.0	15	7
607310	ENFIDHA	24.7	42.6	13.7	-0.6	39.4	65.8	8	3
607350	KAIROUAN	27.7	46.4	15.6	2.0	71.1	100.1	6	4
607450	GAFSA	27.0	43.6	13.8	-1.5	20.6	28.4	5	1
607500	THYNA	25.1	45.1	15.1	1.5	45.7	76.2	5	3
607600	NEFTA	28.4	45.3	17.3	3.0	37.1	46.5	2	1
607690	ZARZIS	25.8	44.4	17.2	5.9	45.0	56.4	5	4
600600	SIDI IFNI	22.1	38.9	17.5	11.8	9.9	17.8	0	0
601010	IBN BATOUTA	23.2	39.0	14.1	1.0	25.9	61.2	9	1
601070	CHERIF EL IDRISSE	24.0	37.4	14.7	3.3	87.9	180.1	15	9
601150	ANGADS	26.1	42.4	11.8	-1.5	100.1	120.1	5	1
601350	SALE	23.1	43.0	12.2	2.0	19.1	59.4	10	0
601500	BASSATINE	25.0	42.4	11.8	0.0	53.1	68.1	9	3
601560	MOHAMMED V	24.9	42.2	12.0	0.7	24.9	38.9	5	1
601850	SAFI	24.4	41.5	14.8	3.4	24.9	50.0	5	3
601950	MIDELT	22.4	38.1	9.0	-3.1	54.1	63.8	5	2
602100	MOULAY ALI CHERIF	27.7	42.8	14.7	-2.2	33.0	49.8	5	2
602300	MENARA	28.2	46.0	13.2	-73.3	52.1	52.6	5	3
602520	AL MASSIRA	26.4	46.0	12.9	0.0	24.9	39.9	5	1
602650	OUARZAZATE	27.7	41.2	12.6	-3.0	30.0	30.5	2	1

602800	GUELMIN	26.6	46.0	14.7	-73.3	0.0	0.0	0	0
602850	PLAGE BLANCHE	24.3	44.0	15.7	7.7	7.9	13.2	0	0
603180	SANIAT RMEL	23.7	41.2	14.9	0.0	30.0	57.2	8	3