



MEDITERRANEAN CLIMATE OUTLOOK FORUM MEDCOF-6 MEETING

ANALYSIS AND VERIFICATION OF THE MEDCOF-5 CLIMATE OUTLOOK FOR THE 2015/16 WINTER SEASON FOR THE MEDITERRANEAN REGION (MED)

Final approved version

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The following MedCOF verification report is based on

- the outcome of the consensus forecast of MedCOF 5,
- climate monitoring results of RA I NA RCC and RA VI RCC networks,
- the analysis and verification report of SEECOF-14 CLIMATE OUTLOOK for 2015/16 winter season for southeast Europe (SEE)
- national verification reports received from NMHSs or posted in RCOF forums of MedCOF, SEECOF or PRESANORD.

1. MedCOF-5 Climate outlook for the 2015/16 winter season

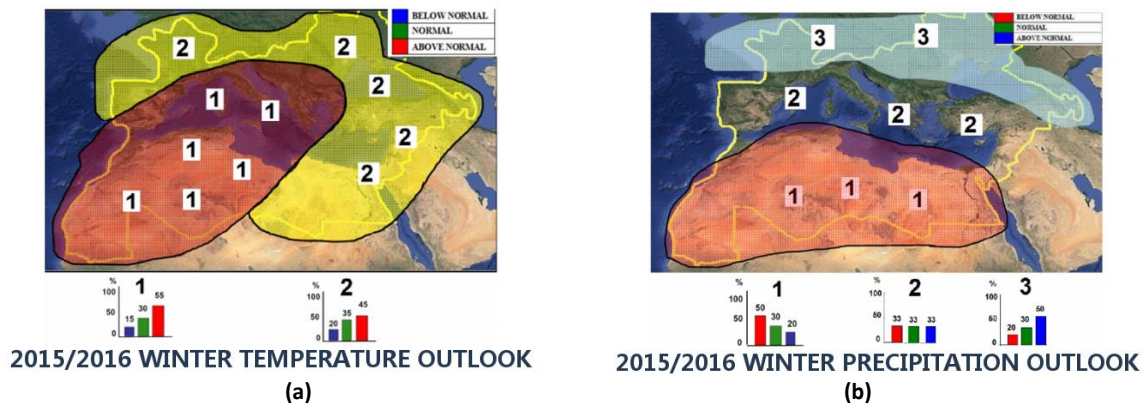


Figure 1: Graphical presentation of the climate outlook for the 2015/16 winter season for the Mediterranean region
(a) Temperature Outlook; (b) Precipitation Outlook

Temperature

The MedCOF-5 consensus statement for the seasonal climate outlook for the 2015/16 winter season in the Mediterranean region suggested an anticyclonic anomaly pole over western North Africa and a cyclonic anomaly pole over northwestern Europe as the most probable scenario, though there was much uncertainty for the temperature prediction over the MedCOF domain despite the presence of strong anomalies in the ocean and stratosphere.

There was a tendency for the upper tercile over the whole region. Two regions were defined, both with above-normal temperature as privileged scenario. Region 1, which was expected to be closer to high pressure influence and covering an area from western North Africa to the western and central Mediterranean and the Balkans, showed a higher probability for above-normal temperature (55%) than region 2 over the rest of the MedCOF area (45%, see Figure 1a).

This means for verification that an above-normal scenario is assumed for the whole MedCOF region.

Precipitation

For precipitation, uncertainties were very large and larger than for temperature. For almost the whole North African part of the MedCOF region a drier-than-average winter season was favored with 50% probability for the lowest tercile (region 1 in figure1b), for most of the Mediterranean area including Iberia, northern Morocco, southern France, Italy, most of the Balkans except the north, Turkey and the Middle East no privileged scenario was given (region 2 in Figure 1b), and over the northern part of the MedCOF area (most of France, south-eastern Central Europe, northern Balkans, Ukraine, Black Sea, South Caucasus) a wetter-than-normal winter was favored, again with 50% probability, but for the upper tercile (region 3 in Figure 1b).

2. Analysis of the 2015-16 winter season

Analysis of the winter season temperature and precipitation anomalies and general circulation are based on seasonal bulletins on the climate in the WMO region I – NA and VI for the winter 2015/16 (WMO RA I RCC Node on Climate Monitoring and watch: <http://www.meteo.tn/htmlen/donnees/climatemonitoring.php>; WMO RA VI RCC Node on Climate Monitoring: <http://www.dwd.de/rcc-cm>), contributions from Météo France (<http://elaboration.seasonal.meteo.fr/en/content/climate-monitoring>), Regional Climate Outlook Forums for Southeastern Europe (SEECOF, <http://www.seevccc.rs/?p=1502>) and North Africa (PRESANORD, <http://nwp.gov.eg/index.php/rcof/presanord>) and national verification reports from MedCOF participants.

2.1.General circulation

Anticyclonic influence dominated in most of the MedCOF region in winter 2015/16 (Fig. 2 and 3). The Azores High was more intense than normal on seasonal average and extended far into the Mediterranean region and also to North Africa. The Icelandic Low, too, was more intense than normal and cyclonic influence over the North Atlantic was shifted further south than usual. This is a typical feature of a very intense positive phase of an East Atlantic (EA) pattern (according to NOAA-NCEP-CPC teleconnection pattern classification); EA circulation indices were highly positive in all three winter months (Dec. 2015: +3.1, Jan. 2016: +1.0, Febr. 2016: +1.9). As a result, mild and moist air with cyclonic disturbances was advected in a zonal airflow to the northern parts of the MedCOF region. In contrast, relatively cold and dry continental air moved to the southernmost parts of North Africa, south of the high pressure core area. In eastern Mediterranean regions anticyclonic influence was generally weaker on seasonal average, but with large variability of airflow within the season.

A NAO+ phase was dominant particularly in December 2015 and February 2016 (Fig. 4), but was interrupted in January 2016, when NAO- was the most frequent circulation type.

Géopotentiel 500 hPa – Anomalie trimestrielle 12/2015 à 02/2016
Analyse ECMWF – réf. ERA-Intérim 1981–2010

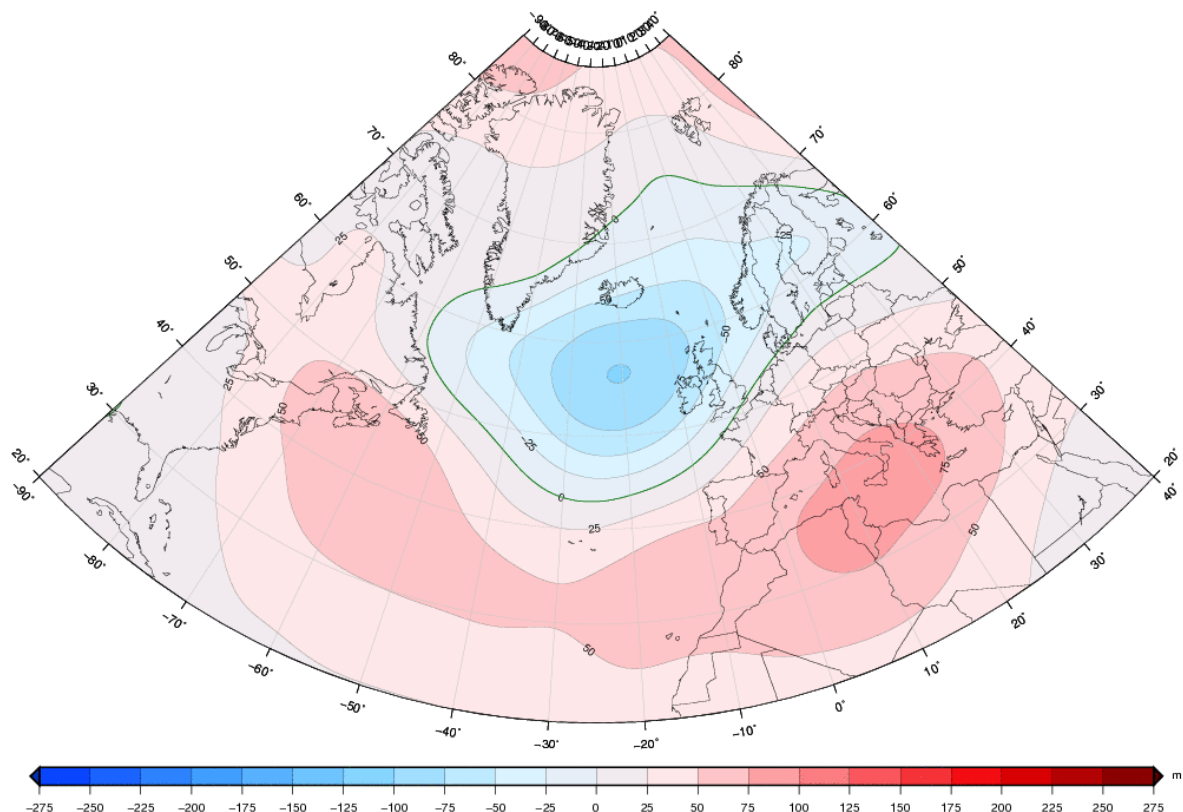


Figure 2: Mean seasonal anomalies of 500 hPa geopotential for winter 2015/16 (1981-2010 reference). Source: Météo France, data source: ECMWF ERA Interim reanalysis, <http://www.ecmwf.int/en/research/climate-reanalysis/era-interim>

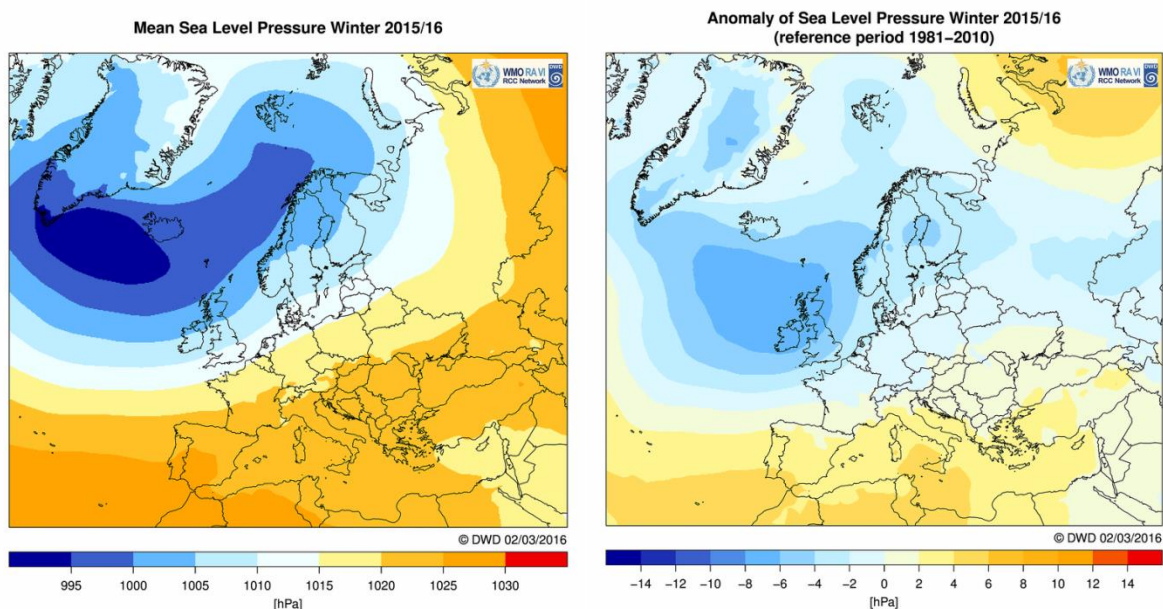


Figure 3: Seasonal mean sea level pressure (left) and its seasonal anomalies (right) for winter 2015/16 (1981-2010 reference). Source: Deutscher Wetterdienst (DWD), data source: DWD numerical ICON model analysis, http://www.dwd.de/EN/research/weatherforecasting/num_modelling/01_num_weather_prediction_modells/icon_description.html?nn=484268

Comparaison entre AnaCEP et clim des regimes d' HIVER du trimestre DJF 2015-2016

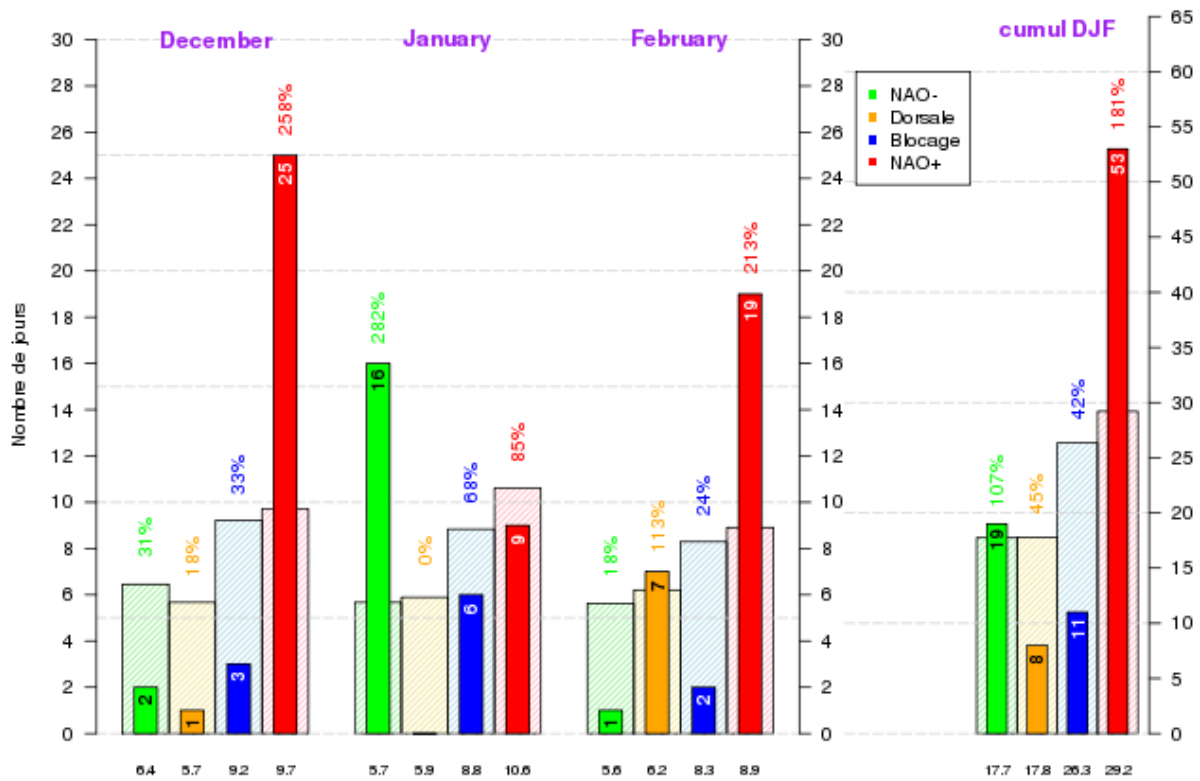


Figure 4: Number of days with circulation types of the Météo France classification for each month of the winter 2015/16 season and for the whole season (right), and in percent of the climatological frequency distribution 1981-2010. Circulation types are: negative North Atlantic Oscillation phase (NAO-), Atlantic ridge (Dorsale), Scandinavian Blocking (Blocage) and positive North Atlantic Oscillation phase (NAO+). Source: Météo France, <http://elaboration.seasonal.meteo.fr/en/content/observed-weather-patterns-0>

2.2. Temperature

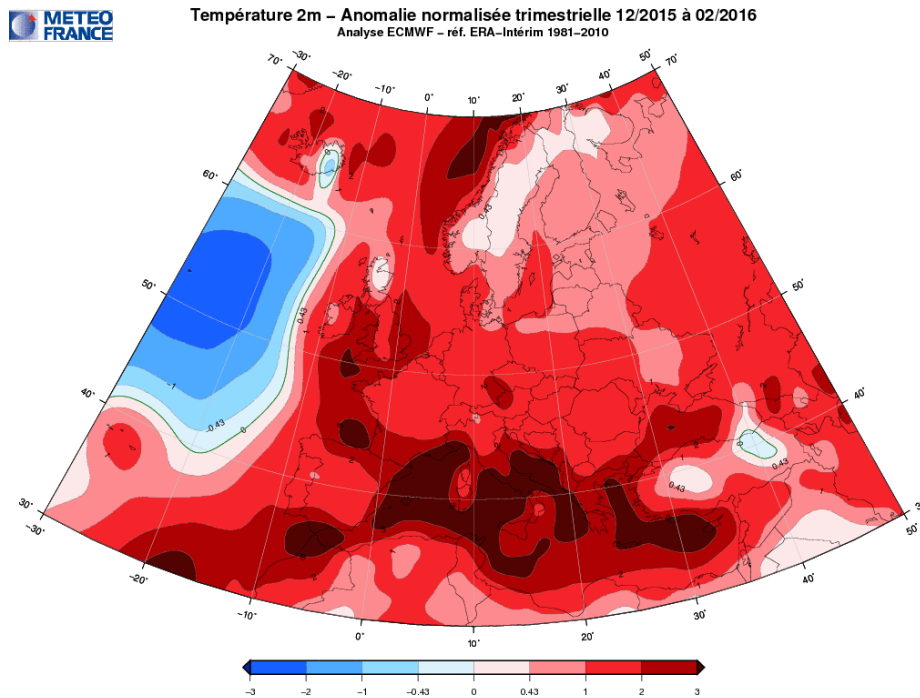


Figure 5: Seasonal normalized temperature anomalies of winter 2015-16 surface air temperature based on ERA-INTERIM grid data, 1981-2010 reference. The data range between -0.43 and +0.43 represents the middle tercile, below -0.43 the lower tercile and above +0.43 the upper tercile. Source: Météo France, data reference: <http://www.ecmwf.int/en/research/climate-reanalysis/era-interim>

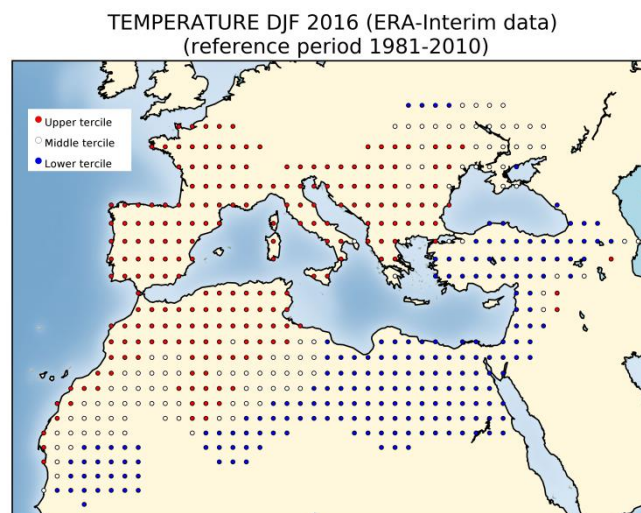


Figure 5a: Terciles of winter 2015-16 surface air temperature based on ERA-Interim Reanalysis, 1981-2010 reference. Source: AEMET, data source <http://www.ecmwf.int/en/research/climate-reanalysis/era-interim>

Europe and Middle East (RA VI)

Tercile analysis of both gridded ERA-Interim and E-OBS data and individual ECA&D station data (Fig. 5 and 6) shows that winter 2015-16 temperatures were in the upper tercile (1981-2010 reference) in almost the whole RA VI MedCOF region, even exceeding the 90th percentile (when looking at 1951-2000 reference, Fig. 7). France reported its warmest winter since 1900, particularly due to a very mild December. Exceptions can be found in parts of Turkey, Georgia and the Middle East where temperatures were closer to normal or below.

Temperature 1981-2010 and 1961-1990 anomalies were positive for winter 2015-16 within the whole MedCOF RA VI area (Fig. 8). Anomalies were highest and between +3 to +4 K (1981-2010 reference) in the north of the MedCOF region over an area from southwestern France to western Ukraine, Romania, and Bulgaria. In the eastern Mediterranean region, winter anomalies were also positive, but relatively low, due to different temperature regimes during the individual winter months. December 2015 was a colder-than-normal month especially for parts of Greece, Turkey and the Middle East. In January 2016, a cold wave occurred in the eastern Mediterranean region with extremely low minimum temperatures and frost even at eastern coasts of Cyprus. February 2016, in contrast, became a warm month in that region, when maximum temperatures in Cyprus reached up to more than 28°C.

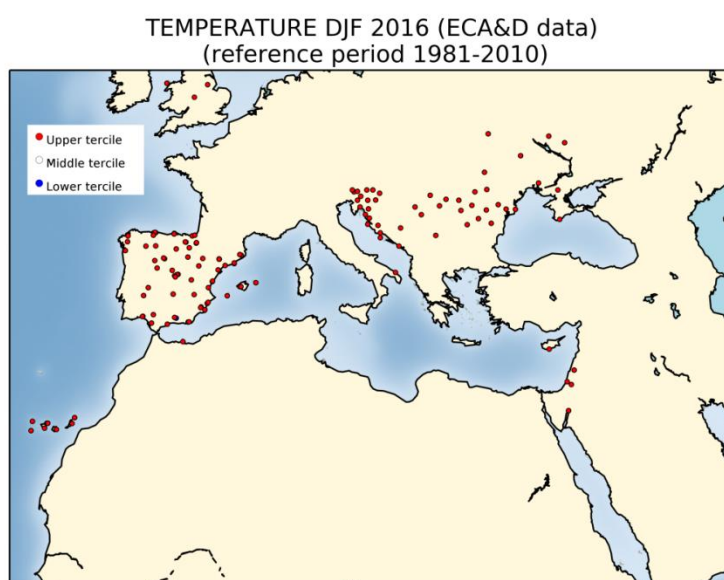
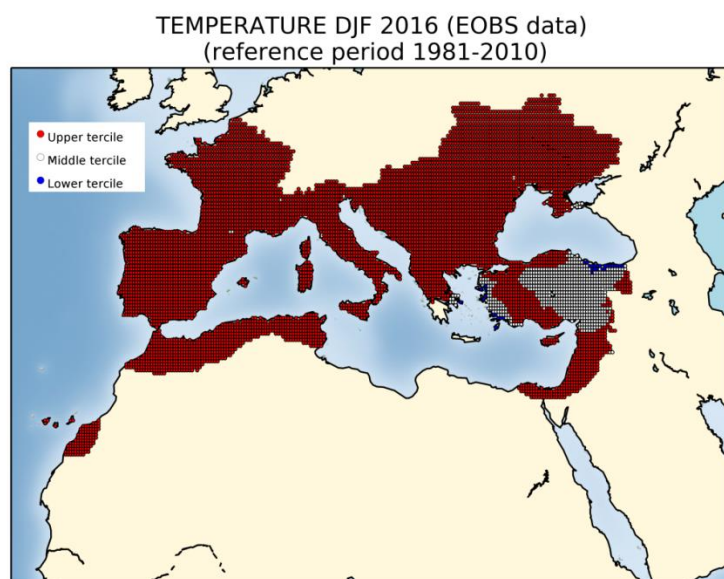


Figure 6: Terciles of winter 2015-16 surface air temperature based on interpolated E-OBS grid data (upper graph) and individual ECA&D station data (lower graph), 1981-2010 reference. Source: AEMET, data source: <http://www.ecad.eu/>

Temperature Percentile EOBS Winter 2016 (reference period 1951–2010)

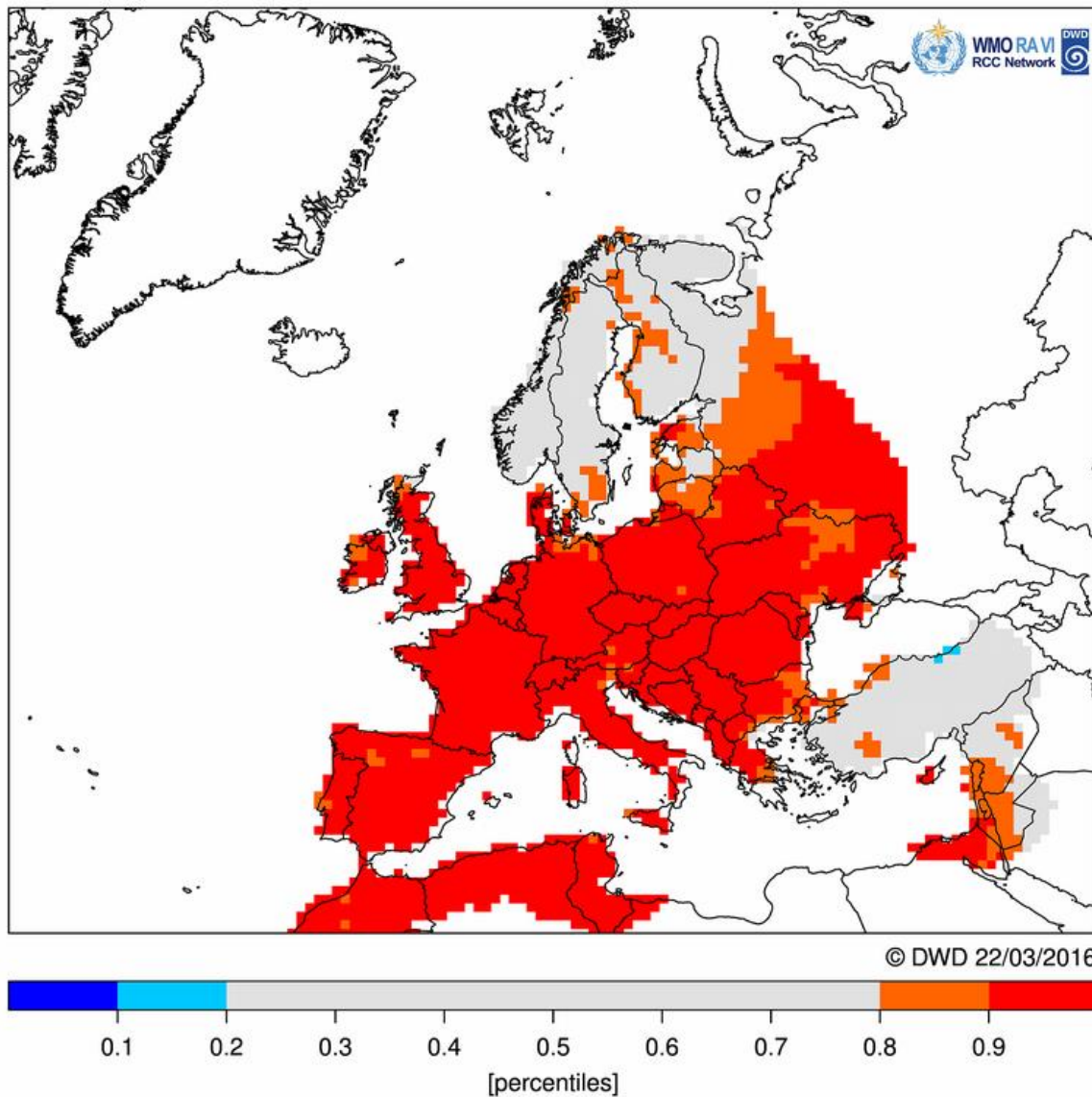


Figure 7: Percentiles of winter 2015-16 surface air temperature based on interpolated E-OBS gridded data, 1951-2010 reference. Source: DWD, data source: <http://www.ecad.eu/>

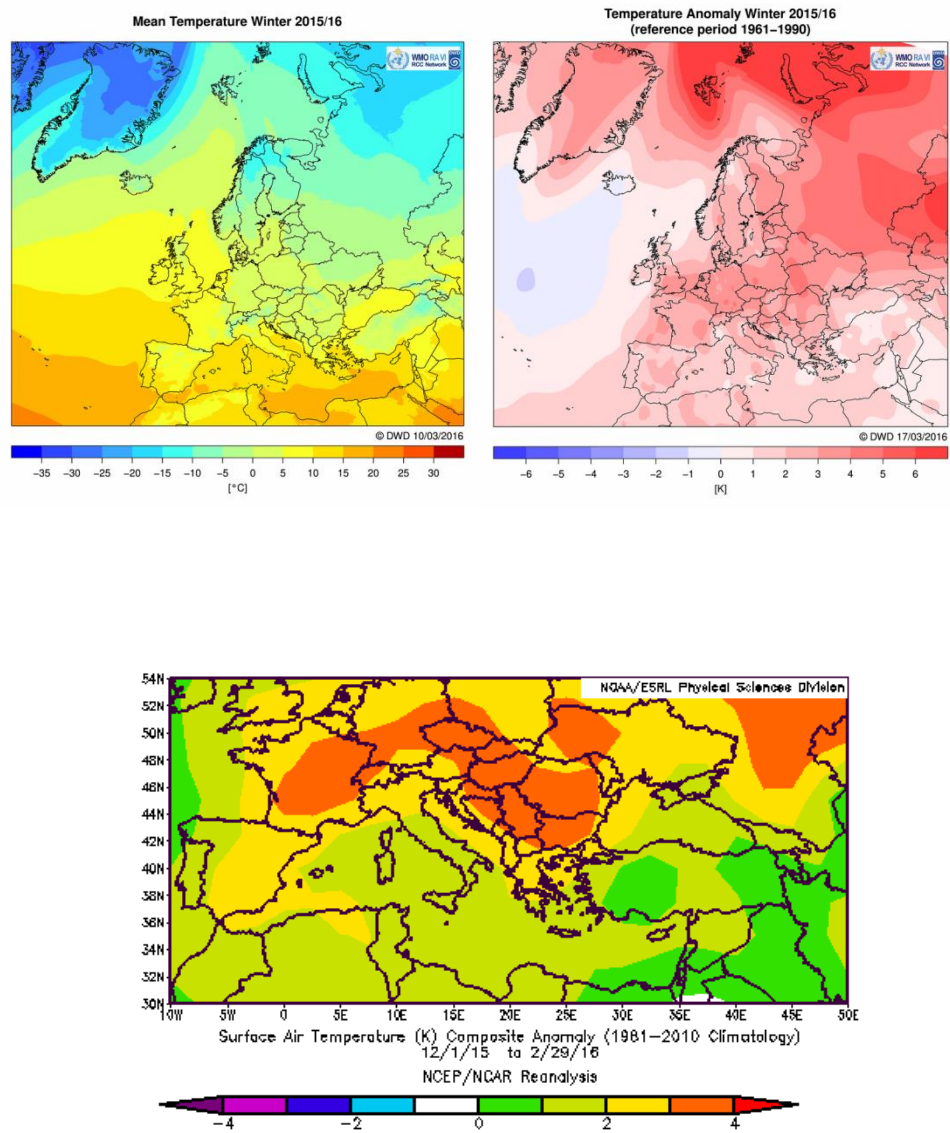


Figure 8: Surface air temperature for winter 2015-16. Upper left: Europe, seasonal mean, upper right: anomalies Europe, 1961-1990 reference, source of both maps: WMO RAVI RCC, www.dwd.de/rcc-cm, lower map: anomalies European MedCOF region, 1981-2010 reference, source: NCEP/NCAR Reanalysis, <http://www.esrl.noaa.gov/psd/data/composites/day/>

North Africa (RA I)

Winter 2015-2016 was hotter than normal in almost the whole North Africa region. Mean temperatures were ranging between 7°C and 23°C. Slightly negative anomalies were recorded over the southern region of the North African domain.

In Libya, the seasonal mean temperature was around 13.4°C, 0.4°C more than last winter season. Northern places reported averages of more than 14.0°C, especially at the east sides. Southern parts reported coldest averages this season. Anomalies of the seasonal temperature averaged over the whole country were around -0.4°C. It was warmer than the 1981-2010 normal in the north of the country and it was colder than normal in the southern part.

In Tunisia, the winter seasonal mean temperature was at its minimum over north-western regions and the center of Tunisia. The lowest value of absolute minimum temperature was -2°C measured in Thala in the western center of Tunisia. The south of Tunisia was mainly the hottest region in the 2015-16 winter season. The highest value of absolute maximum temperature was 30.1°C registered in the south of the country. Mean temperature was above normal in the north-east, and especially in the south with anomalies up to +1.5°C.

In Morocco, the mean temperature was ranging between 7°C in the northeast and 23°C in the south. Seasonal temperature anomalies were above normal at all Moroccan stations. When comparing with the normal of the season, mean temperatures were above normal for all the stations with maximum anomaly of 2.6 °C in Oujda and Khouribga.

In Algeria, mean temperature was in the above-normal tercile over almost the whole country. Comparing to the normal of the season, mean temperatures were above normal also for all the stations, with a maximum anomaly of around +2.5°C (1984-2014 reference) at the station Chlef in the northern part of Algeria and in the southern part at station In-Salah.

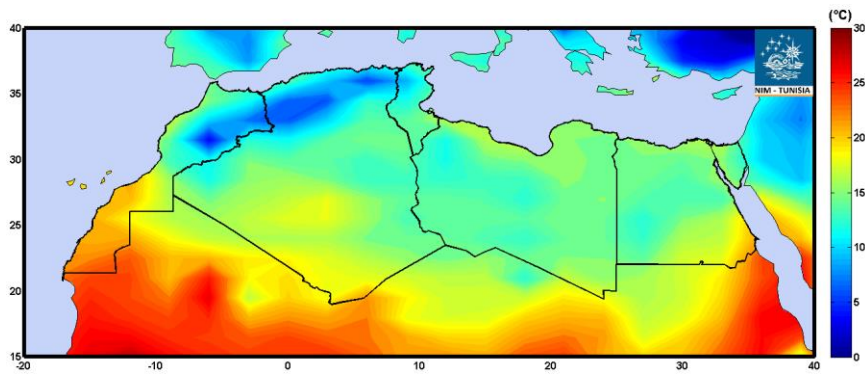


Figure 9: Mean temperature for winter season 2015-16 in the North African MedCOF region (in °C). Source: INM, (Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>)

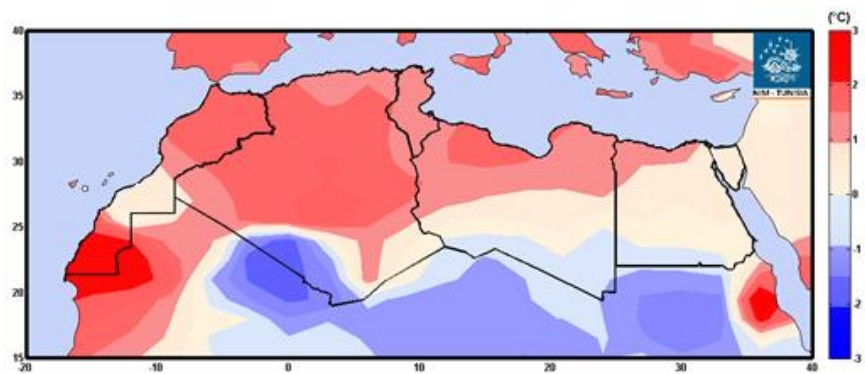


Figure 10: Temperature anomaly for winter season 2015-16 in the North African MedCOF region (in K), reference period 1981-2010. Source: INM, Data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>

2.3.Precipitation

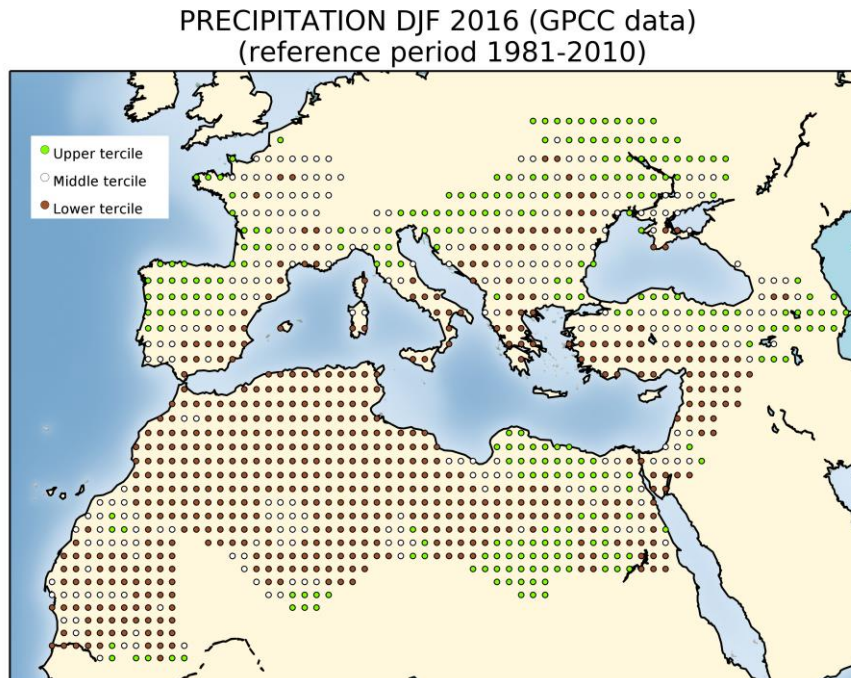
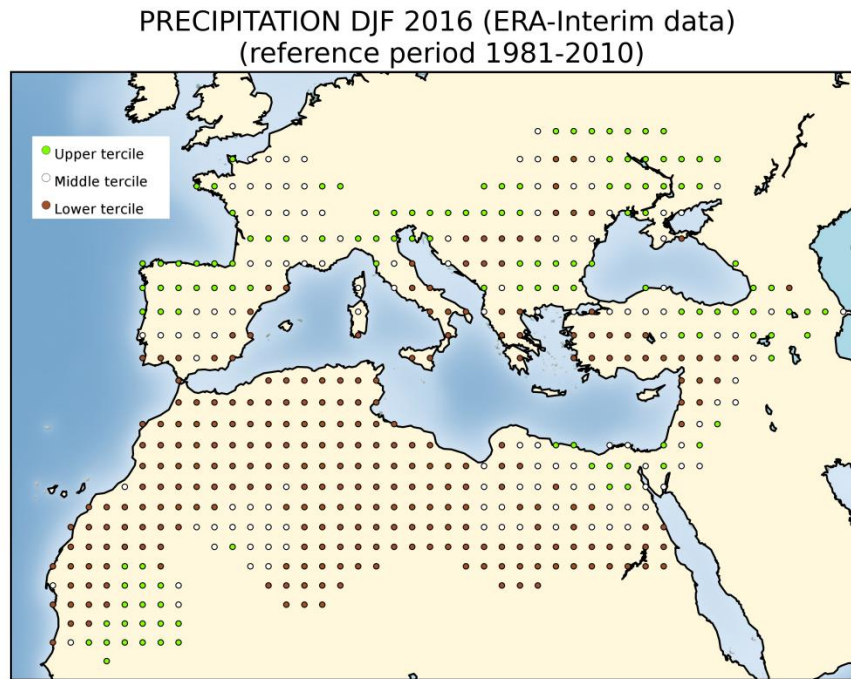


Figure 11: Terciles of winter 2015-16 precipitation based on interpolated ERA-INTERIM (upper graph) and GPCC (lower graph) grid data, 1981-2010 reference. Source: AEMET, data reference: ERA-INTERIM: <http://old.ecmwf.int/publications/library/do/references/show?id=90276> GPCC: <http://gpcc.dwd.de>

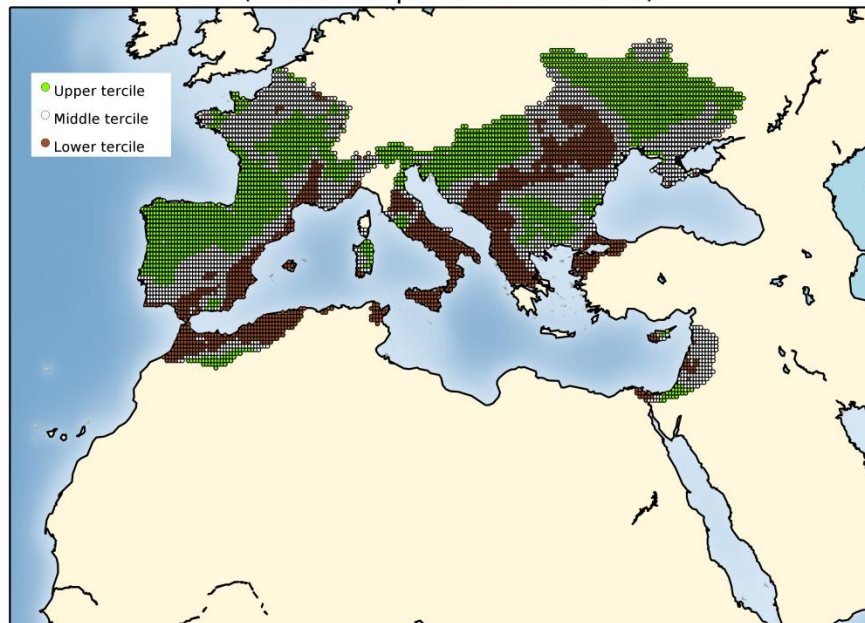
Europe and Middle East (RA VI)

Precipitation was in the upper tercile especially in some northern parts of the MedCOF region, particularly from northwestern Iberia to parts of France, northern Italy near to the Alps, Slovenia, Hungary, and much of the Ukraine, and also in some southeastern parts of the Balkan Peninsula, but only locally over the central Mediterranean (Fig. 11 and 12). In contrast, precipitation was in the lower tercile at most Mediterranean coasts and over most of Italy. Between these areas there were large regions where precipitation was in the middle tercile.

In terms of anomalies (Fig. 13), winter was particularly wetter than normal ($>125\%$) in northwestern Iberia, along the west coast of France, from northern Italy to Hungary, in parts of the Ukraine and eastern South Caucasus and locally close to the Black Sea. In many places of the Mediterranean coasts, less than 80% of the normal precipitation fell, in some areas even less than 40%.

Highest totals within the European MedCOF region were measured in northern Portugal / northwestern Spain that winter with more than 600mm. Driest parts were to be found in eastern Syria and eastern Jordan with less than 30mm in the whole winter season.

PRECIPITATION DJF 2016 (EOBS data)
(reference period 1981-2010)



PRECIPITATION DJF 2016 (ECA&D data)
(reference period 1981-2010)

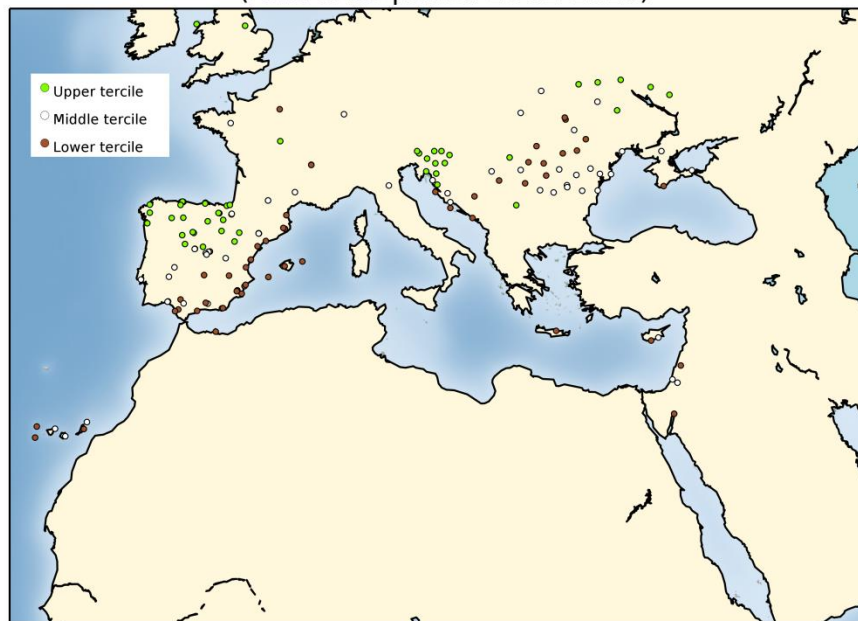


Figure 12: Terciles of winter 2015-16 precipitation based on interpolated E-OBS grid data (upper graph) and individual ECA&D station data (lower graph), 1981-2010 reference. Source: AEMET, data source: <http://www.ecad.eu/>

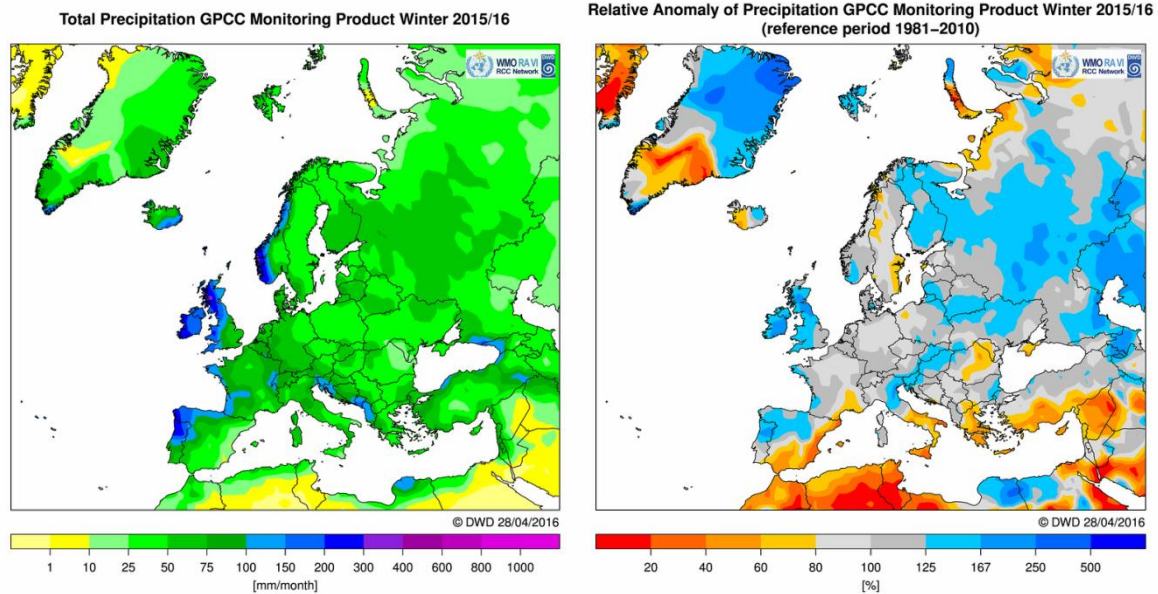


Figure 13: Precipitation for winter 2015-16 in Europe. Left: seasonal total in mm/month, right: relative anomalies, 1981-2010 reference, source: WMO RAVI RCC, www.dwd.de/rcc-cm, data source: GPCC, <http://gpcc.dwd.de>

A more detailed analysis for south-eastern Europe, including high impact events, is given in the analysis and verification report of SEECOF-14 CLIMATE OUTLOOK for 2015-16 winter season for southeast Europe (SEE), provided by SEECOF-15 (presently draft version):

<http://www.seevccc.rs/SEECOF/SEECOF-15/STEP1/Draft%20version%20of%20ass.%20of%20SEECOF-14%20Climate%20outlook%20for%202015-2016%20winter%20season.pdf>

North Africa (RA I)

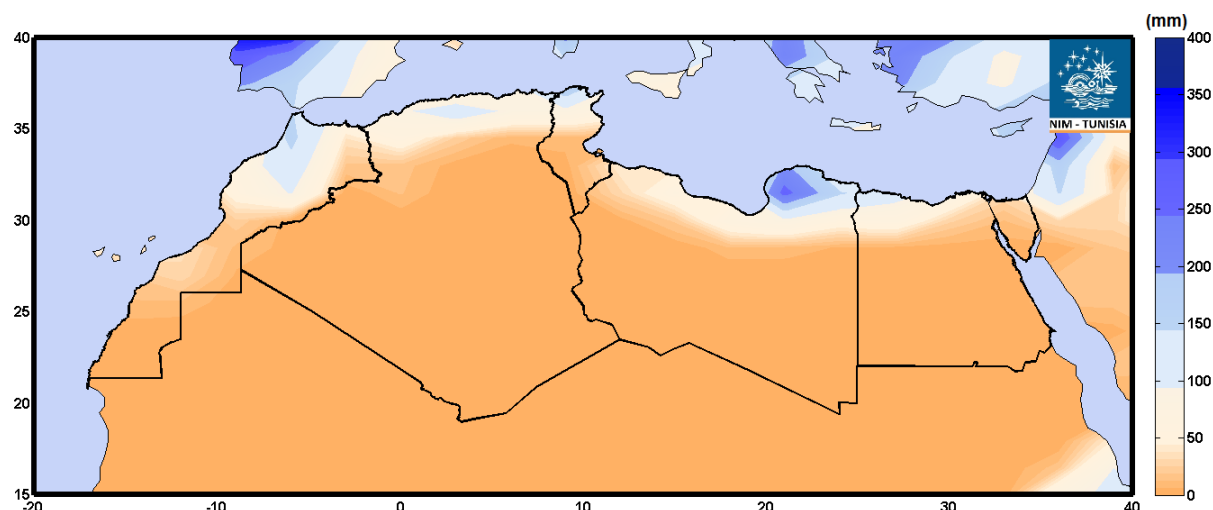


Figure 14: Total precipitation for winter season 2015-16 in the North African MedCOF region (in mm). Source: INM, data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>

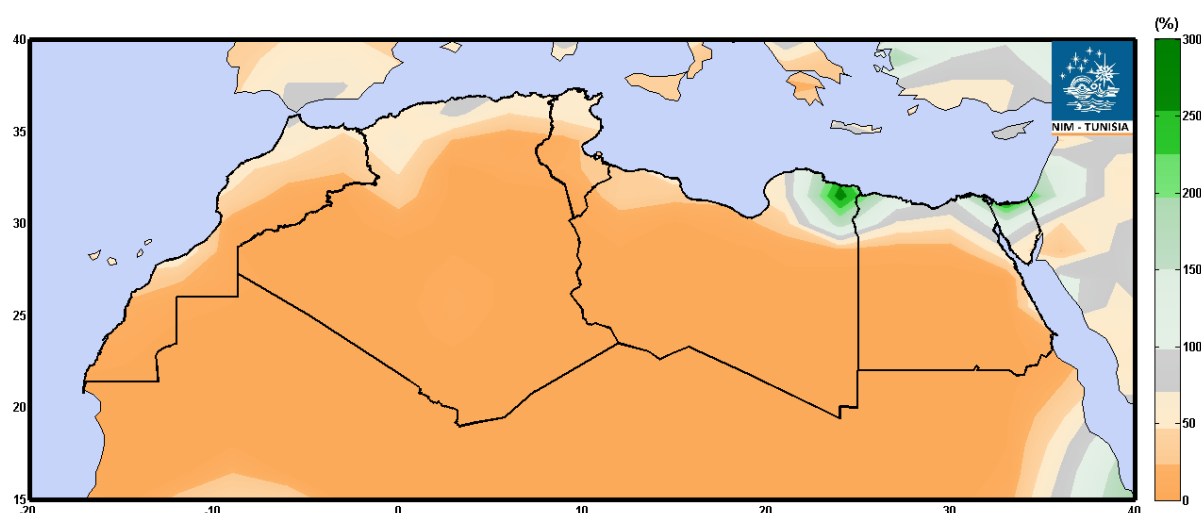


Figure 15: Precipitation anomaly for winter season 2015-16 in the North African MedCOF region (in %) (Reference period 1981-2010). Source: INM, data from NCEP/NCAR reanalysis, <http://www.esrl.noaa.gov>

Winter 2015-2016 was drier than normal over almost the entire North African domain. Only the north-east of Libya and the extreme north-west of Egypt registered above-normal precipitation. Seasonal totals of precipitation were below 30 mm over the major part of the North African region, the maximum total of precipitation was registered in the extreme northeast of Libya with a total of more than 300 mm.

In Morocco, winter 2015-2016 was drier than normal at all Moroccan stations with totals below 75% referring to the normal 1981-2010 and a maximum negative anomaly down to -90% on the eastern slopes of the country.

In Libya, winter seasonal precipitation was around 26 mm as a spatial average over the country with a deficit about 10% of the normal. However, the eastern parts of the north were wetter than the western parts, where about 37 mm of the average were received by the western

parts and about 175 mm by the eastern parts with relative anomalies of -50% and +25%, respectively. Remarkable drought events affected most parts of northern and western Libya this season.

In Tunisia, precipitation was at its maximum in the north and mainly in the north-west. Extreme values were registered at Jendouba station such as the highest 24-hour precipitation with a total of 27mm. With reference to 1981-2010 period, precipitation totals were below normal all over the country except some regions along the eastern coastline where precipitation was slightly above normal.

In Algeria, winter season was generally characterized by normal conditions in the western part and below normal in the center and eastern part of Algeria in terms of terciles.

3. Verification of the MedCOF-5 climate outlook for the 2015-16 winter season

3.1. Temperature

The MedCOF-5 climate outlook for the 2015-16 winter season favored the upper tercile over the entire domain.

Europe/RA VI

The MedCOF-5 outlook was correct for nearly the whole area. It failed only in a few parts of Turkey, Georgia and the Middle East, where seasonal mean temperature was near normal or below.

North Africa (RAI)

In fact, in almost all regions of North Africa, temperature anomalies were above normal except the south of Algeria, Libya and Egypt.

This indicates that the MedCOF-5 climate outlook for the winter seasonal temperature was not able to predict negative anomalies of the temperature registered in the south of the North African domain.

3.2. Precipitation

Europe/RA VI

MedCOF-5 climate outlook for the 2015-16 winter season favored an above-normal scenario for a northern region from France to South Caucasus (Region 3 in Fig. 1b) and a close-to-normal scenario for the Mediterranean area from Iberia to the Middle East (Region 2).

The outlook was correct for much of the northern region (Region 3), though it failed in some parts of the region, where precipitation was in the middle or lower tercile, e.g. in parts of France and northwest of the Black Sea. For the Mediterranean region (Region 2), a scenario favoring the lower tercile would have been a better choice for much of the area, but local variability was high within that region. On the other hand, the heavy above-normal precipitation over northwestern Iberia was not taken up by this outlook.

North Africa (RAI)

MedCOF-5 outlook favored a drier than average season over almost the whole North African region with a probability for the lowest tercile of 50%. Over the extreme north of Morocco there was no preference for any climate defined categories.

Winter 2015-2016 was drier than normal nearly over the entire North African region except of the extreme northeastern Libya. So the MEDCOF-5 outlook has predicted the negative anomalies of precipitation over almost all the domain except the extreme northeastern Libya and northwestern Egypt.

4. Users' perceptions of the MedCOF-5 outlook

In some countries, general public, governmental authorities and even private companies have received the national forecasts based on the MedCOF outlook, in other countries the forecasts have not been provided to end-users, just internally distributed because skill is still too low.

Users come from various economic sectors, but very little feedback is known from users.

One country stated that the 2015-16 winter forecast increased the level of trust on seasonal prediction. In another country users were asking for a more detailed product, i.e. wind, UV, cloud cover, dust events which are regular over east Mediterranean. In cases when no preferable scenario was indicated, obviously the end users were not satisfied. At least in North Africa forecasts were required or used for planning of electric energy production and in agriculture for crop monitoring and irrigation planning.

Appendix A: Contributors to the Pre-COF of MEDCOF-5

- World Meteorological Organization

Europe and Middle East (RA VI)

- National Meteorological and Hydrological Services:
 - Météo France, Republic of France
 - Deutscher Wetterdienst, Federal Republic of Germany
 - South East European Virtual Climate Change Center hosted by Republic Hydrometeorological Service of Serbia, Republic of Serbia
 - Armenian State Hydrometeorological and Monitoring Service, Republic of Armenia
 - National Institute of Meteorology and Hydrology, Republic of Bulgaria
 - Meteorological and Hydrological Service, Republic of Croatia
 - Hellenic National Meteorological Service, Greece
 - Meteorological Service, the Republic of Cyprus
 - The National Environmental Agency of Georgia, Georgia
 - Israel Meteorological Service, State of Israel
 - Republic Hydrometeorological Institute, Former Yugoslav Republic of Macedonia
 - State Hydrometeorological Service, Republic of Moldova
 - Federal Hydrometeorological Service of the Federation of Bosnia and Herzegovina, Federation of Bosnia and Herzegovina, Bosnia and Herzegovina
 - Republic Hydrometeorological Service of the Republic of Srpska, Republic of Srpska, Bosnia and Herzegovina
 - Republic Hydrometeorological Service of Serbia, Republic of Serbia
 - Environmental Agency of the Republic of Slovenia, Republic of Slovenia
 - Turkish State Meteorological Service, Republic of Turkey
 - Ukrainian Hydrometeorological Center, Ukraine
- WMO RA VI RCC Offenbach Node on Climate Monitoring, Deutscher Wetterdienst, Germany

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Portugal (5) *	Above normal	Above normal	In the north above normal, in the south around normal	No privileged Scenario	January 9th-11th: storm with high precipitation and strong wind On 13th February station Lamas de Mouro measured 184.2 mm/24h. 3rd warmest winter since 1931 February 17th: snow down to 300m elevation
Spain (5) *	Above normal	Above normal	Northeast above normal, central parts around normal, southeast below normal	No privileged Scenario	Some heavy precipitation events during winter, especially in Galicia
France (5)	Mean anomaly of +2.8° C. Tercile warm (reference period: 1981-2010).	Above normal	+10 % on a large Northern part -20 % on Mediterranean Coast	Mainly above normal, in the south no signal	December 2015: warmest and driest month since 1900 February 6th - 14th: Succession of severe storms: - Northern part of France from 6th to 9th - in Provence and Corsica from 9th to 10th - in western part of France from 13th to 14th February 26th – 28th: East-Southern part of France: Heavy rain and snow fall
Italy (5) *	Above normal	Above normal	North: normal to above normal; central parts and south: below normal	No privileged Scenario	No events reported
Slovenia (5)	Above normal	Above normal	Above normal	No predictive signal	No major high impact events occurred during the winter season. December was extremely dry and warm (especially in the mountains). January brought an intensive rain/wind period from 8th till 12th. February was very warm and wet. The winter was 5th warmest in more than 100 years.

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Hungary (5) *	Above normal	Above normal	Mainly above normal, in the south around normal	Above normal	No events reported
Ukraine (5)	Above normal	Above normal	Above normal to Normal Below normal in some places in western southern part of the country	Above normal	<p>December was abnormally dry in most of Ukraine. Precipitation were 20-77% of the month nom, in some places Odessa, Mykolaiv, Kherson, Kirovohrad and Chernivtsi regions 1-19%, in Behtery (Kherson region). Odessa , Sarata and Izmail (Odessa region) not fallen at all (it was driest month for the entire observation period)</p> <p>In January, meteorological extraordinary phenomena in the form of heavy and very heavy snow were observed: on 17-19th of January in northern, central, southern (snow and rain) and eastern parts (Chernigiv, Symu, Kharkiv, Cherkasu, Kirovgrad, Poltava, Dnipropetrovs'k, Odessa, Mykolayiv, Kherson regions) from 7 mm to 39 mm of precipitation fell in 6-12 hours (snow cover 10-34 cm). Snowfall was accompanied by strong blizzards (wind speed 15-24 m/s during 12-29 hours in Ust-Danaysk (Odessa region) wind speed was 25-27 m/s), strong ice covering with diameter of sediments 21 mm was in Kherson. Unfavorable weather conditions caused low power, telecommunications, utilities and transport.</p> <p>February was one of the warmest, in some areas of western and southern parts of country it was the warmest for the entire period of observation. There were many days when were repeated and excess absolute daily temperatures at most of stations in Ukraine.</p>
Republic of Moldova (5)	Above normal	Above normal	Near or below normal	Above normal	<p>On 17th January was recorded a meteorological phenomenon in the form of heavy snow: at MS Stefan-Voda and HP Olanesty during 12 hours have fallen 23 mm of precipitations. Heavy snow in the southern half of the country have been accompanied by strong wind of up 20 m/s (MS Stefan-Voda, Comrat, Ceadir-Lunga) and by blizzard which created unfavorable conditions for traffic.</p>

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Romania (5)*	Above normal	Above normal	In the west: above normal, other parts: below normal to normal	Above normal	No events reported
Serbia (5)	Above normal	Above normal	Below normal to normal in most part of Serbia Above normal in northernmost and some eastern parts	No predictive signal in the most of the country Above normal in northern part of the county	Winter 2015/2016 was extremely warm, the third warmest in Serbia. Record-breaking maximum daily air temperatures for February and winter were observed at twelve main meteorological stations in Serbia. The highest daily air temperature of 25.5°C during winter was measured on February 15th in Krusevac and Cuprija. Crni Vrh observed record few number of days with snow cover since the measurements began.
Croatia (1)	Above normal	Above normal	Above normal in the Northern Adriatic and its hinterland and part of Central Croatia Below normal in the Southern Adriatic Normal in the remaining part of Croatia	No predictive signal in the most of the country Above normal in the northwestern part of the country	December 2015 was extremely dry. In the most parts of Croatia there was not precipitation at all (especially along the Adriatic coast). Extreme weather conditions in January 2016 were connected mostly to wind. Gale force of bora (NE wind) was recorded along the Adriatic coast on 17th and 18th January, and caused a lot of damages and traffic interruptions. Mean wind speed at the North Adriatic was 25 m/s (Island Pag) and wind gusts were 48.9 m/s. February 2016 was very wet and extremely wet, especially in the part of Northern and Central Croatia as well as part of the Northern Adriatic and its hinterland. In some stations monthly precipitation amounts exceeded maximum monthly amounts for February (Rijeka (North Adriatic) – 407.7 mm; Ogulin (mountainous part) – 277.7 mm and Poreč (Istra, North Adriatic) – 189.6 mm). A few episodes with gale force wind (NE and SE) were recorded too. (the strongest gusts of bora wind (NE) was recorded at the island Krk, North Adriatic on 10th February – 54.5 m/s).

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Bosnia and Herzegovina, Federation of Bosnia and Herzegovina (5)	Above normal	Above normal	Near normal	No predictive signal	Winter 2015-2016 mainly was 3rd or 4th warmest during the period 1981-2016, while it was the warmest winter on Bjelasnica (mountain station).
Bosnia and Herzegovina, Republica Srpska (5)	Above normal	Above normal	Above or near normal on the North; Below normal In the southern part of the country	Above or near normal in the northern part of the country No predictive signal In the most part of the country	The month of December 2016 was extremely dry with no precipitation in many places The month of February 2016 was extremely warm On Feb 10th storm windy (Banja L. 31,8 m/s) There was a cold period in January with very low temperatures from ranged from -10°C to -16.3°C (mountain regions to -22.3°C) and snow cover in the bigger part of the entity.
Montenegro (5) *	Above normal	Above normal	Around normal	No privileged scenario	No events reported
Albania (5)*	Above normal	Above normal	Around normal	No privileged Scenario	No events reported
The Former Yugoslav Republic of Macedonia (5)	Above normal	Above normal	Below normal	No predictive signal	December 2015 No precipitations. January 2016 - Maximal monthly sum of precipitation historically measured in Mavrovo 265.9 mm. February 2016 - Unusually high air temperatures. The maximal temperatures measured in Skopje 24.3°C on 24th, in Kriva Palanka 22.0°C on 17th and Berovo 21.7°C on 23th exceeded the historical values for this month.
Bulgaria (1,5)	Above normal	Above normal	Near or above normal	Near normal or no signal	The month of December 2015 was extremely dry with almost no precipitation. The month of February 2016 was extremely warm. There was a cold period in January 2016 with very low temperatures and snow cover in the bigger part of the country.
Greece (2,5)	Above normal	Above normal	Below normal in the most of the country Above normal	No predictive signal in most of the territory	Two warm spell periods during February (15-18, and 23rd February) set some new daily maximum temperature records. Some selected examples, where the difference from the previous Tmax record is greater than 1°C: Mytilini on

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
			in northeastern part of country	Below normal in the southern part of the Greece	<p>February 23rd with record Tmax temperature was 26.2°C (ref. period 1955-2015); Kalamata on February 17th 26.0°C (1956-2015) and Tymbaki on February 23rd it was 27.0°C (1959-2015).</p> <p>The December precipitation total was much below climatology, while some locations even recorded zero precipitation. Specifically, the December monthly rainfall (averaged values of selected Weather stations) was approximately 10-times below 1971-2000 normal value (12.51%).</p>
Turkey (2)	Above normal	Above normal	Above normal mostly in the northern areas Below normal in the south of the country	No predictive signal	<p>In December 2015 transportation was affected by frost, snowfall and storms in Zonguldak, Inebolum, Sinop and Konya. Four people were injured due to the transportation difficulties.</p> <p>In January 2016, agricultural damage occurred in Mersin due to frost. In Hakkari, avalanche occurred and affected on transportation. In Aydin flood occurred due to heavy rainfall while storm affected transportation in Samsun, Ordu and Antalya.</p> <p>In February 2016, flood occurred in Bartın, Sinop, and Mersin. Heavy storms affected seas transportation in Cannakkale and Istanbul, five people were injured during storm.</p>
Georgia (1)	Near or above normal	Above normal	Near normal in Kolkheti lowlands and in mountainous region of Georgia below normal in the rest part of the country	Above normal in most of the country No predictive signal in eastern part of the country	No comments for high impact events

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Armenia (1)	Above normal	Above normal	Near or above normal in the entire country	No predictive signal	<p>December 2015 was dry during the I and II decades. Snow was observed in the III decade with heavy in some places. (Martini, Kapan 20-23 mm/h).</p> <p>Extreme weather conditions in January 2016 were connected to stormy wind and heavy snowfall. Wind speed reached 25-28 m/s, with gusts 31 m/s at January 6th and 14th. Heavy snowfall was observed at 1st, 2nd and 24th in Shirak, Gekharquinq and Sjeniq regions.</p> <p>In February mainly strong wind has been recorded in Lory region with speed 35-37 m/s Also dense fog observed during winter.</p> <p>All this events caused damages and traffic interruptions.</p>
Azerbaijan (5)*	Above normal	Above normal	Above normal	Above normal	No events reported
Syria (5)*	Above normal	Above normal	Below normal	No privileged scenario	Cold wave at the end of January
Lebanon (5)*	Above normal	Above normal	Below normal to normal	No privileged scenario	Cold wave at the end of January
Cyprus (5)	Above normal	Above normal	Below normal	Near or Below normal	<p>DEC: Warmer than the normal with the western and northern coastal zone warmer than the rest of the island. Extremes (deviating by 4°C or more from normal) were recorded. i.e., the recorded maximum of Polis of the 23rd of December 23.9°C (with a normal of 18°C). Extreme maximum temperature lower by 4°C (or more) from normal were recorded during the 31st of December. i.e., Athalassa maximum of 10.6°C (17.3°C normal) and that of Prodromos station maximum of 2.7°C with 8.3°C normal.</p> <p>Larnaka area (Southeast) recorded a total accumulated precipitation of 116mm (37 mm above its normal) while the Troodos mountainous range and the western and northern coasts recorded accumulated precipitation well below normal. A Yellow EMMA warning concerning high accumulated precipitation was issued on the 17th.</p> <p>JAN: Extreme low temperatures were recorded i.e., the absolute minimum of -9.7°C over Prodromos (normal 0.7°C), or the minimum of the eastern coasts</p>

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
					<p>-2.4°C (the normal being 6.6°C). A Yellow EMMA warning concerning extreme low temperatures for Troodos mountainous range was issued on the 25th. The Yellow EMMA was upgraded to Orange on the same day. Generally January recorded a good accumulated precipitation budget covering almost 158% (mean area average) of normal or 131mm (normal 83mm).</p> <p>FEB: The warmest February of the recent 30 years. i.e., The absolute maximum of February of 28.2°C was recorded at the station of Polis Chrysochous while the normal is only 16.3°C, The recorded maximum of 27.8°C was Athalassa's station absolute maximum for February while the normal is only 16.0°C, The recorded maximum 18.9°C, of Troodos station (1720m height) was the absolute maximum of February while the normal is only 4.1°C.</p> <p>Regarding the accumulated precipitation it is suggested that February was a notably dry month covering only 31% of normal i.e., Area average only 21.6mm (normal 69.2mm).</p>
Israel (5)	Above normal	Above normal	Below normal in the most of the country Near normal in the south	Near or Below normal	No comments for high impact events.
Jordan (5)*	Above normal	Above normal	Below normal to normal	No privileged scenario	Cold wave at the end of January

Note:

1 - Basic climatological period (1961-1990)

2 - Basic climatological period (1971-2000)

3 - Basic climatological period (1951-2000)

4 - Basic climatological period (1981-2000)

5 - Basic climatological period (1981-2010)

6 - Basic climatological period (1961-2013)

7 – No information about basic climatological period

* Data sources: E-OBS, NOAA NCDC, GPCC, ECA&D

North Africa (RA I)

Appendix A: Contributors to the Pre-COF of MEDCOF-6

National Institute of Meteorology, Tunisia

Libyan National Meteorological Center, Libya

National Meteorological Directorate, Morocco

National Office of Meteorology, Algeria

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Algeria (2)	Above normal over all the country	Above normal	Below normal (closer to normal in western and some central parts)	Below normal	In December maximum temperatures up to 26°C. Cold waves at the beginning of January in the north and northern Sahara. 15 th -17 th January fairly intense rain showers in the north, snowfall inland in central and eastern parts. In February further intense rainfall at Saharan Atlas, snowfall in interior regions, strong winds in the north especially in the last decade of February.
Egypt*	Slightly below normal in the extreme south. Above normal elsewhere	Above normal	Above normal in the extreme north-west. Below normal elsewhere	Below normal	No comment

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Libya (1)	Above normal in the north and below normal in the South	Above normal	above normal except of north-western parts which were below normal	Below normal	-Extreme monthly total of precipitation in December 2015 over the station of Tubruk, never recorded in a national climatological archive (156 mm). - Remarkable drought events affected most parts of northern and western Libya this season. February 2016 ranked as the historical driest February in Libya since 1950.
Morocco (1)	Above normal over all stations	Above normal over Morocco was likely (probabilities of 55%)	Below normal at all stations	Below normal at most stations was likely except northwestern part of Morocco where equal probabilities were likely	No comment

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-5 climate outlook for temperature	Observed	MedCOF-5 climate outlook for precipitation	
Tunisia (1)	Above normal over the whole country	Above normal	Near normal in the extreme north-east regions Below normal elsewhere	Below normal	From 16 to 21 January 2016, a cold wave hit the entire country, in particular the north-west. It caused a high drop of temperature and the occurrence of snow in the north of the country. It was heavier in the north-west region.

Note:

(1) Basic climatological period (1981-2010)

(2) Basic climatological period (1984-2014)

* No national contribution

References:

MedCOF 5 Outlook: http://medcof.aemet.es/images/doc_events/medcof5/docMedcof5/Consensus_Statement_MedCOF-5.pdf

SEECOF 15 Online Forum: <http://www.seevccc.rs/?p=1502>

PRESANORD: <http://nwp.gov.eg/index.php/rcof/presanord>

WMO RA I RCC Node on Climate Monitoring Website with monitoring results: <http://www.meteo.tn/htmlen/donnees/climatemonitoring.php>

RA VI RCC-CM Website with monitoring results: <http://www.dwd.de/rcc-cm>

Météo France climate monitoring products: <http://elaboration.seasonal.meteo.fr/en/content/climate-monitoring>

ECMWF ERA Interim reanalysis: <http://www.ecmwf.int/en/research/climate-reanalysis/era-interim>

NOAA ESRL composite maps: <http://www.esrl.noaa.gov/psd/data/composites/day/>

NOAA-NCEP-CPC northern hemisphere teleconnection patterns: <http://www.cpc.ncep.noaa.gov/data/teledoc/telecontents.shtml>

ECA&D, E-OBS: <http://www.ecad.eu>

GPCC: <http://gpcc.dwd.de>