

Seasonal Bulletin on the Climate in WMO Region VI



- Europe and Middle East -

Winter 2016/2017

Deutscher Wetterdienst



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Last Change: 26 April 2017

Highlights:

- Winter 2016/2017 warm in the northern European countries
- Winter 2016/2017 dry in many parts of Europe
- Winter 2016/2017 was wet in Norway
- Unusual high pressure over Central Europe

The following maps are first guess products based on meteorological bulletins which have been quality checked roughly. The text is based upon these maps as well as the monthly climate bulletins of the countries of RA VI as far as they are available on the web. More detailed information including updated analyses of more data which have undergone a better quality control and further aspects like clouds and water vapour may be found on the link of the Regional Climate Centre on Climate Monitoring in RAVI:

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

and at the Global Precipitation Climatology Center (GPCC):

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

The Seasonal Bulletin on the Climate in WMO Region VI will usually be delivered within 2 months after the end of a season.

Temperature

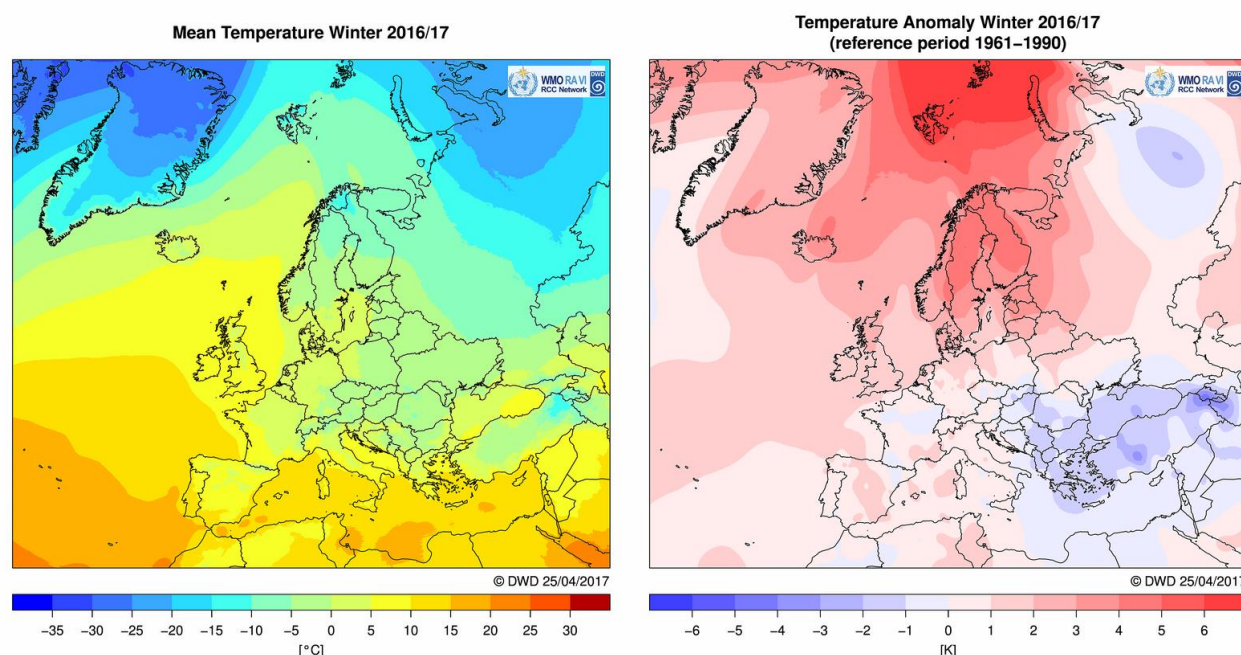


Fig. 1: Temperature: seasonal mean (left) and anomaly (right) in °C for Europe in winter 2016/17 (December 2016 to February 2017)

The temperature anomalies in **winter 2016/17** showed above normal values in northern, western and south-western Europe as well as over the North Atlantic Ocean. In contrast the south-eastern part of the RA VI region and parts of eastern Russia showed lower than normal values. The highest positive anomalies occurred in the far North. For example Svalbard Lufthavn reported a temperature anomaly for winter of +7.3°C (+9.3 in February 2017). February 2017 was the 75th month with above normal temperature anomalies in Svalbard since Nov. 2010.

The south-eastern part of Europe recorded in all three winter months cold temperature anomalies with temporally extremely low temperatures. Western, Central and southern Europe reported in January 2017 below-normal temperature anomalies, while Northern Europe (Scandinavia) registered in all three winter months above-normal temperature anomalies.

Table1: Rank statistic of winter mean temperature for some countries

Country	Rank	Anomaly in °C	Start of time series
Austria	~ 20 (14 in the mountains)	0.5 (+1.2)	
Germany	21	+1.6 (1961-1990)	1881
Norway	8	+3.7 (1961-1990)	1900

Most countries have not published a rank statistic since the temperature of this winter (2016/17) were for many countries about normal.

In most parts of central and southern Europe below-normal temperature anomalies were observed in **January 2017**. One of the cold spots was Slovakia and the Balkans. **Serbia** registered three cold waves with several new records (at stations: Crni Vrh and Leskovac). It was the fourth coldest January in Serbia relative to the 1951-2017 period. The temperature anomalies in Serbia ranged from -6.8°C in Sjenica to -4.0°C in Veliko Gradiste (base period 1981–2010). The Danube River in Belgrade was frozen and the ice led to a stop of the shipping traffic from Austria to the Black Sea.

In **Austria** it was the second coldest January for the last 30 years. The lowest temperature registered at a station elevation below 1000 meters was in Radstadt ($H_s = 835\text{ m}$) with -26.3°C on the 7th January. In **Switzerland** it was the coldest January for 30 years (see figure). But February 2012 in northern Switzerland had an anomaly of -3.8°C and was therefore 1°C colder than the January 2017 anomaly.

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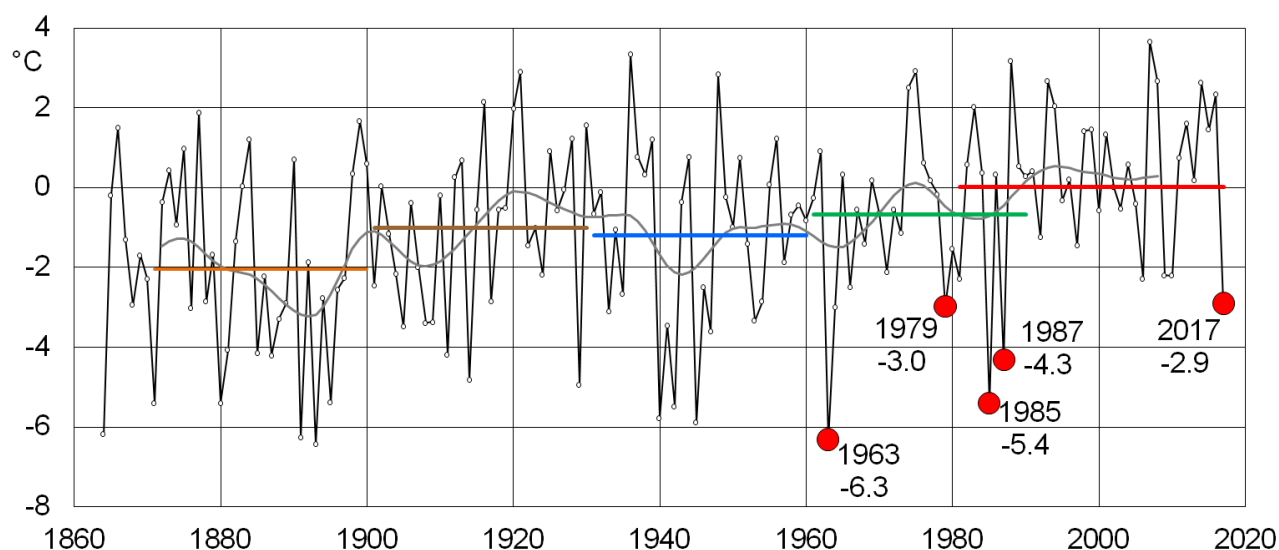
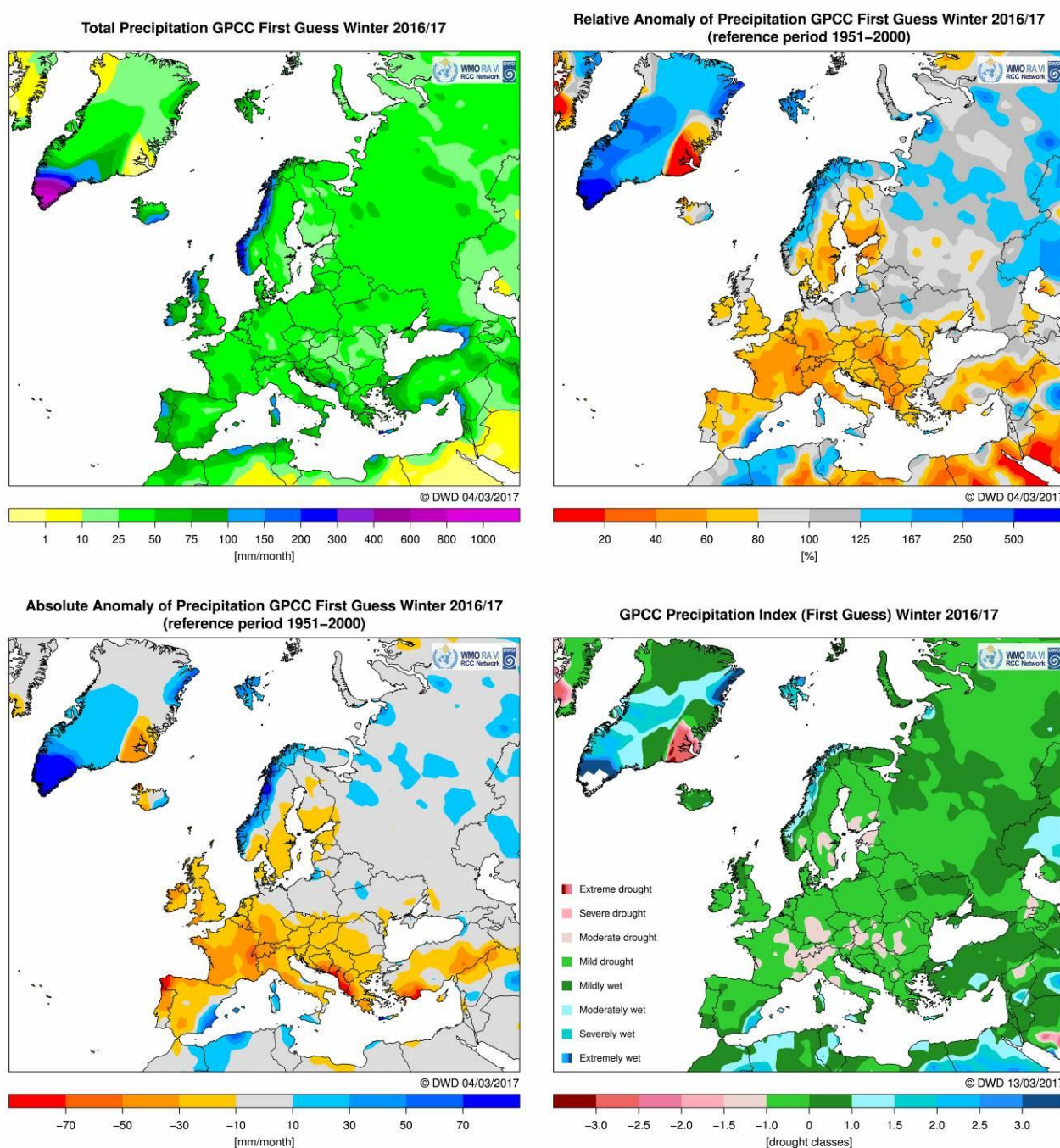


Fig. 1: January air temperature anomalies from stations of northern Switzerland below 1000 m for the period 1864-2017. The colored lines show the mean values of the 30-year normal periods, the gray curve the 20-year sliding average. (Graph provided by Meteo Swiss 2017, Zürich)

Precipitation



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Fig. 2: Seasonal precipitation for Europe in winter 2016/17 (December 2016 to February 2017): totals (mm/month, top left), relative anomalies (in % of normal; top right), absolute anomalies (mm/month, bottom left) and GPCC precipitation index (in drought classes, bottom right)

Precipitation anomalies in **Winter 2016/17** showed lower-than-normal values in many parts of Europe except in Eastern Europe, Norway and south-eastern Spain. Therefore the mean snow depth was also less than normal in many mountains although January was very cold in many parts.

Spain observed a very dry December with a country average of 48 mm (58% of the long-term mean) although some heavy rainfall events occurred in southern and south-eastern Spain. On the

4th of **December** heavy precipitation occurred at the Costa del Sol (Andalusia) with a daily precipitation total at station Estepona (Malaga) of 220 mm/d causing flooding with 2 fatalities and damaged houses. Another event happened from 16th to 22th December that affected a big area of the southeast of the peninsula from Valencia to Almeria, as well as Ibiza and Mallorca Islands. The accumulated precipitation during this event was more than 450 mm at some stations of north Mallorca and more than 350 mm in the southeast of Valencia. The maximum values of the series for December were exceeded at many stations, both the maximum monthly precipitation values and the maximum daily precipitation values. In January 2017 south-eastern Spain received again much precipitation also in form of snow up to the coastal areas, on the 19th January at station Castellón de la Plana/Almazora even 117 mm/day, at Mallorca even more than 250 mm.

The relative monthly precipitation in **December 2016** for whole of **Norway** was 150% of normal and therefore the tenth wettest December since 1900. Some regions in northern Norway showed 250-300% of the normal. The highest precipitation amount was registered at station Øvstedal with 695 mm (or 209 % of normal). The highest daily precipitation amount with 145.5 mm/d was also extreme for December.

Like in the western Mediterranean the eastern Mediterranean islands received plenty of rain in **December 2016**. The strongest rainfall of **Greece** occurred in the south-west of Crete for example at station Samaria (Σαμαριά) with a monthly total of 414.6 mm and at station Askufou (Ασκύφου) even 472.6 mm.

December 2016 was very rainy in northern and central **Israel** with monthly totals of 250-300 mm in the northern and central Coastal Plain, which is 200%-250% of normal. In Mount Carmel, northern Samaria and the northern Golan Heights rainfall amounts exceeded 300 mm and locally more than 400 mm.

Sunshine Duration and Cloud Cover

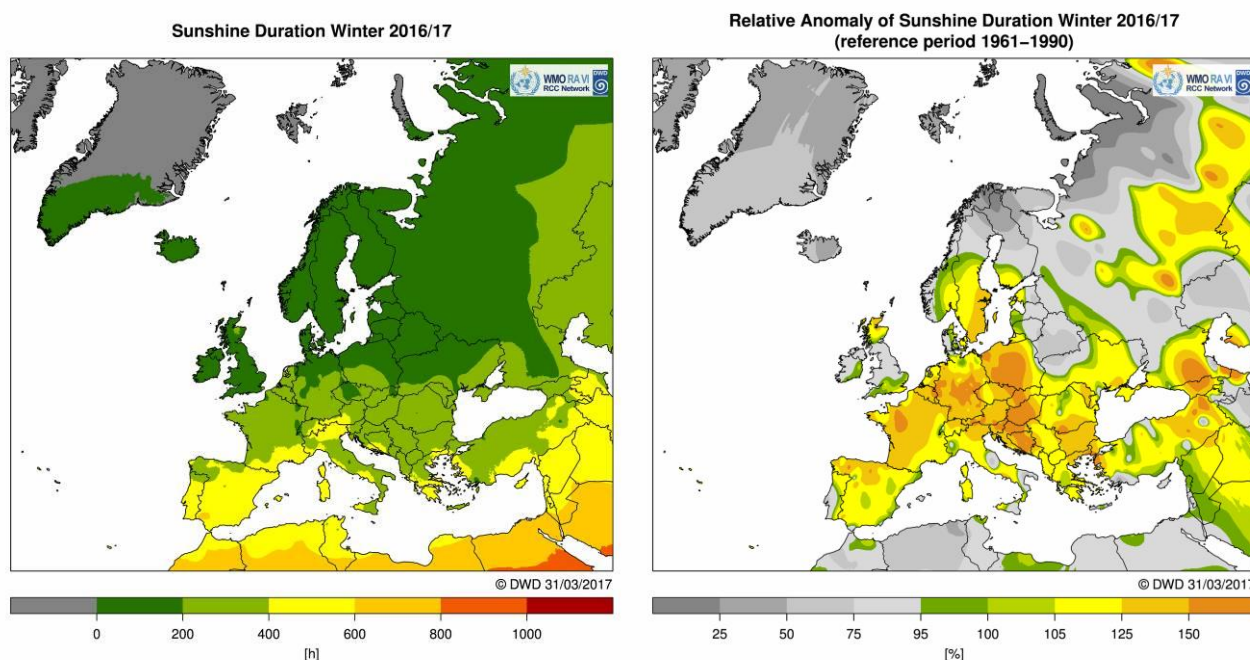


Fig. 3: Seasonal sunshine duration for Europe from synoptic network in winter (DJF) 2016/17: mean (left, in h) and relative anomaly (right, in % of normal).

Many parts of Europe received more than average sunshine in winter 2016/17. Only parts of Portugal, the United Kingdom, northern Scandinavia, the Baltic States, Belarus, Ukraine and Russia noted below-normal sunshine. This coincided well with below-normal cloud cover anomalies in most parts Europe. In contrast, the far north showed more clouds and less sunshine than normal in winter 2016/17.

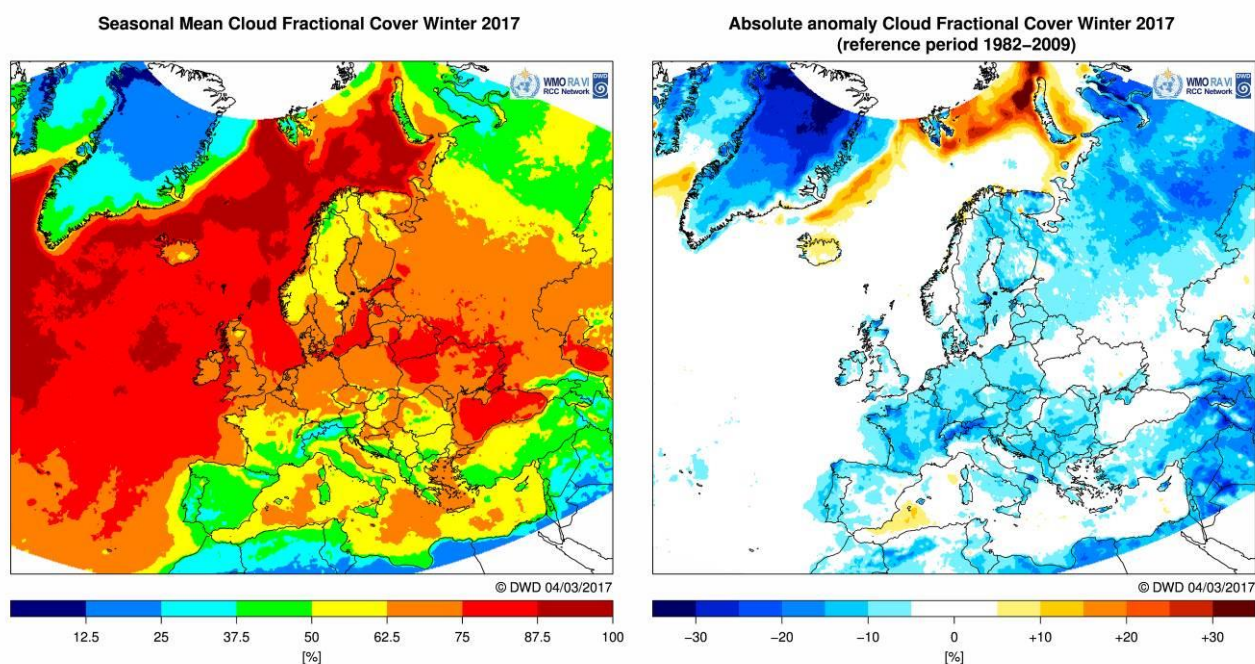
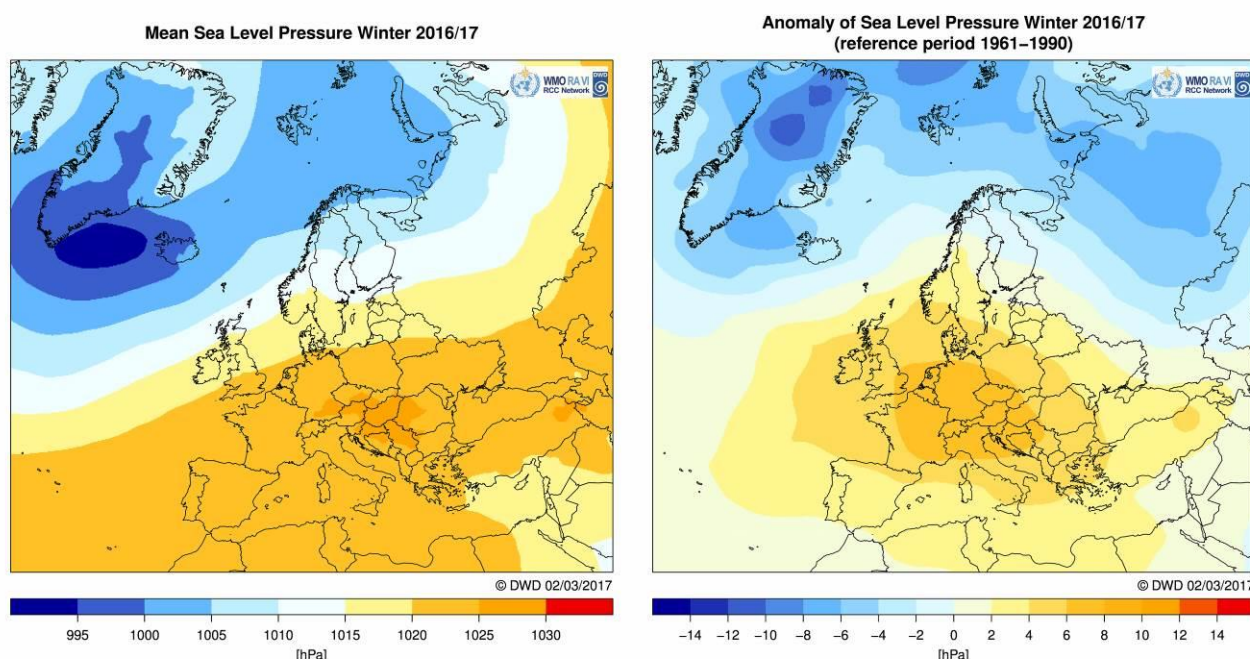


Fig. 4: Seasonal cloud cover for Europe from satellites in winter (DJF) 2016/17 in %: mean (left) and absolute anomaly (right).

Surface Air Pressure



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Fig. 5: Sea level pressure for winter (DJF) 2016/17 in hPa: mean (left) and anomalies (right)

The surface pressure distribution for winter 2016/17 was dominated by high pressure over Central Europe. In December 2016 the pressure anomalies exceeded 14 hPa from Belgium to western Germany. In January 2017 the high pressure zone extended from the Azores to Russia (similar to the winter mean) with the maximum pressure anomalies centered over the British Isles with values of more than +10 hPa. In February 2017 the maximum pressure anomalies of more than +6 hPa occurred in eastern Turkey.

The zone of below-normal pressure ranged from Greenland and Iceland to the Barents Sea, leading warm and moist air to the north. This winter the North Atlantic Oscillation (NAO) was not well developed and therefore the East Atlantic/West Russia Pattern (EA/WR) dominated the teleconnections.

Table2: Standardized Northern Hemisphere teleconnection indices for winter 2016/17 relevant for Europe (source: ftp://ftp.cpc.ncep.noaa.gov/wd52dg/data/indices/tele_index.nh)

Year	Month	NAO	EA	EA/WR	SCA	POL	AO
2016	December	0.35	0.87	1.52	-1.18	-1.10	1.79
2017	January	0.05	-1.15	0.63	0.17	0.96	0.94
2017	February	0.69	0.58	1.14	0.67	-0.38	0.34
2016/17	Winter	0.36	0.10	1.10	-0.11	-0.17	1.02

North Atlantic Oscillation (NAO)

East Atlantic Pattern (EA)

East Atlantic/West Russia Pattern (EA/WR)

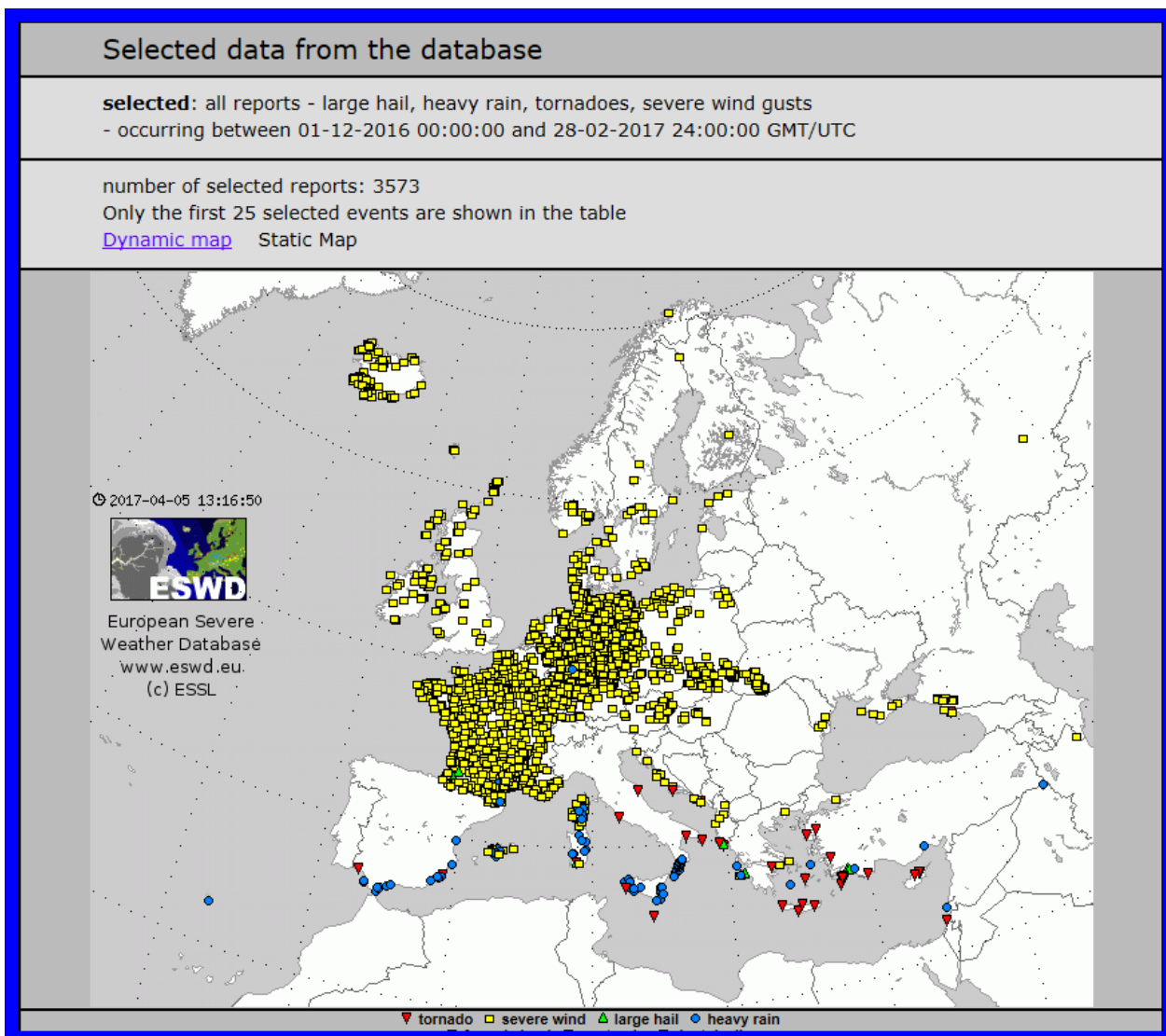
Scandinavia Pattern (SCA)

Polar/ Eurasia Pattern (POL)

Arctic Oscillation (AO, source:

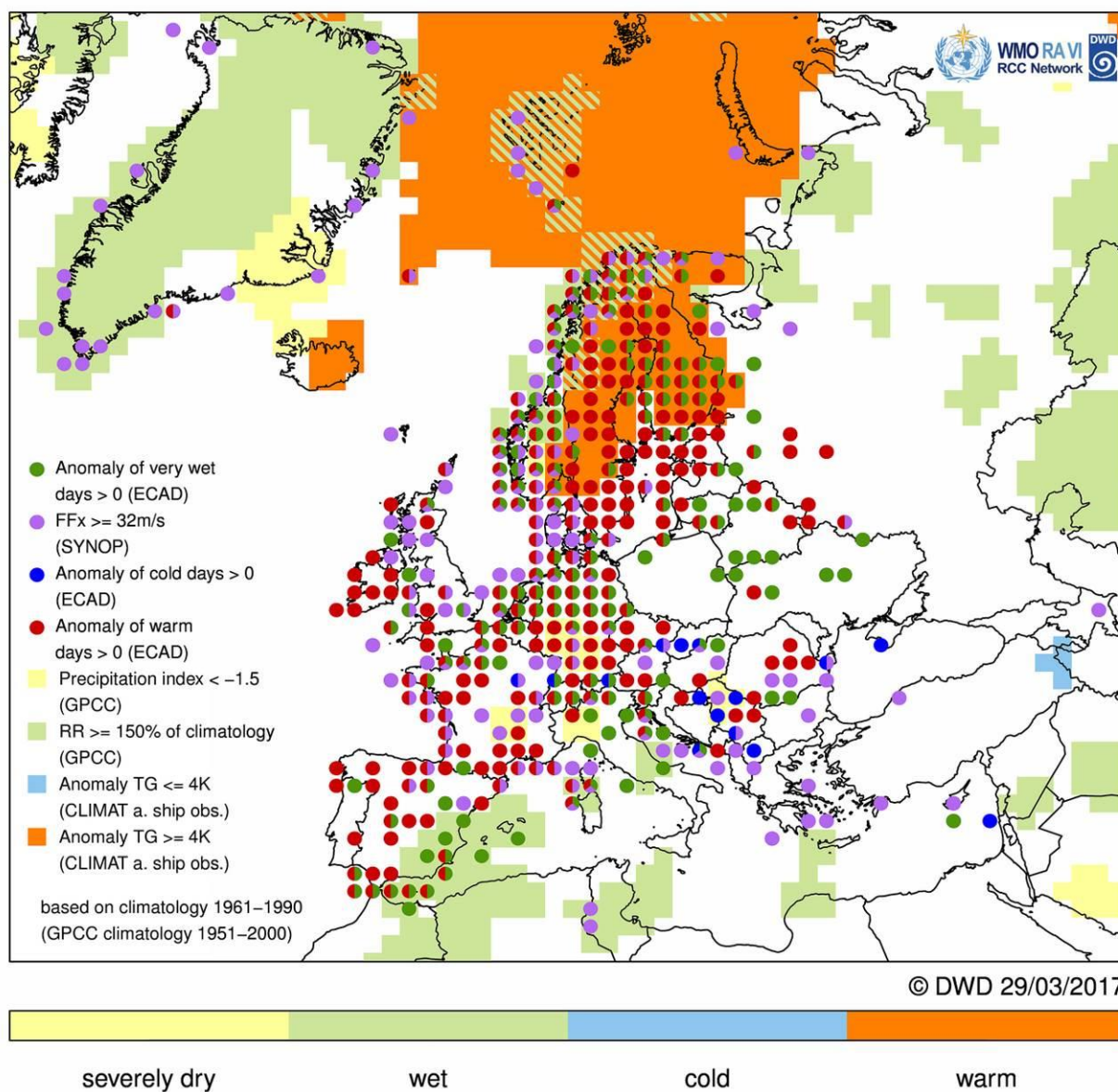
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/monthly.ao.index.b50.current.ascii.table)

Climate Extremes and Severe Weather Events



Source: European Severe Weather Database (<http://essl.org/cgi-bin/eswd/eswd.cgi>)

Event Map Winter 2016/17



References

Seasonal summaries in RA VI at national web-sites:

Austria: <http://www.zamg.ac.at/cms/de/klima/news/einer-der-drei-sonnigsten-winter-der-messgeschichte>
Austria: HISTALP Langzeitklimareihen - Österreich Winterbericht 2016/17
http://www.zamg.ac.at/histalp/download/newsletter/HISTALP_AT_Winterbericht_2016_2017.pdf
Belgium: <http://www.meteo.be/meteo/view/fr/1124472-Bilan+climatologique+saisonnier.html>
Climate Central: SE Europe Cold, January 2017 <https://www.climatecentral.org/analyses/eastern-europe-cold-snap/>
Croatia: http://klima.hr/klima_e.php?id=ocjsez_e
Denmark: Vejret i Danmark - vinteren 2016-2017 <http://www.dmi.dk/vejir/arkiver/maanedsaesonaar/>
Estonia: <http://www.ilmateenistus.ee/kliima/aastakokkuvotted/ulevaated/>
France: <http://www.meteofrance.fr/climat-passe-et-futur/bilans-climatiques/bilan-2016/hiver>
Germany: http://www.dwd.de/EN/ourservices/klimakartendeutschland/klimakartendeutschland_monatsbericht.html
Germany: Der Winter 2016/2017 in Europa, insbesondere die Kälte im Januar 2017
http://www.dwd.de/DE/leistungen/besondereereignisse/temperatur/201702_winter_europa.html
Ireland: <http://www.met.ie/climate/monthly-weather-reports.asp>
Netherlands: <http://www.knmi.nl/nederland-nu/klimatologie/maand-en-seizoensoverzichten/>
Norway: <https://www.met.no/vaer-og-klima/maanedens-vaer-vs-klima>
Portugal: <http://www.ipma.pt/pt/publicacoes/boletins.jsp?cmbDep=cli&idDep=cli&idTema=&curAno=-1>
Switzerland: <http://www.meteoswiss.admin.ch/home/climate/present-day/climate-reports.html> (accessed 21.02.2017)
Switzerland: <http://www.meteoschweiz.admin.ch/home/klima/gegenwart/klima-berichte.html>

Main URLs:

(URLs of used data and further information)

RCC-CM <http://www.dwd.de/rcc-cm>
RCC-CD (ECA&D): <http://www.ecad.eu>
GPCC: <http://gpcc.dwd.de>
ESWD: <http://essl-org/cgi-bin/eswd/eswd.cgi>