Seasonal Bulletin on the Climate in WMO Region VI

- Europe and Middle East -

Summer 2015

Deutscher Wetterdienst

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Highlights

- **Heat wave in south and Central Europe during summer 2015**
- **Summer and the month June, July, August 2015 globally the hottest on record (issued by NOAA)**
- **In June 2015 heavy rainfall and flooding in south-eastern Europe**
- **Drought in Europe from Portugal to Ukraine**
- **Extremely low North Atlantic Oscillation index (NAO)**
- **High pressure over Scandinavia.**

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):

The GPCC http://gpcc.dwd.de/

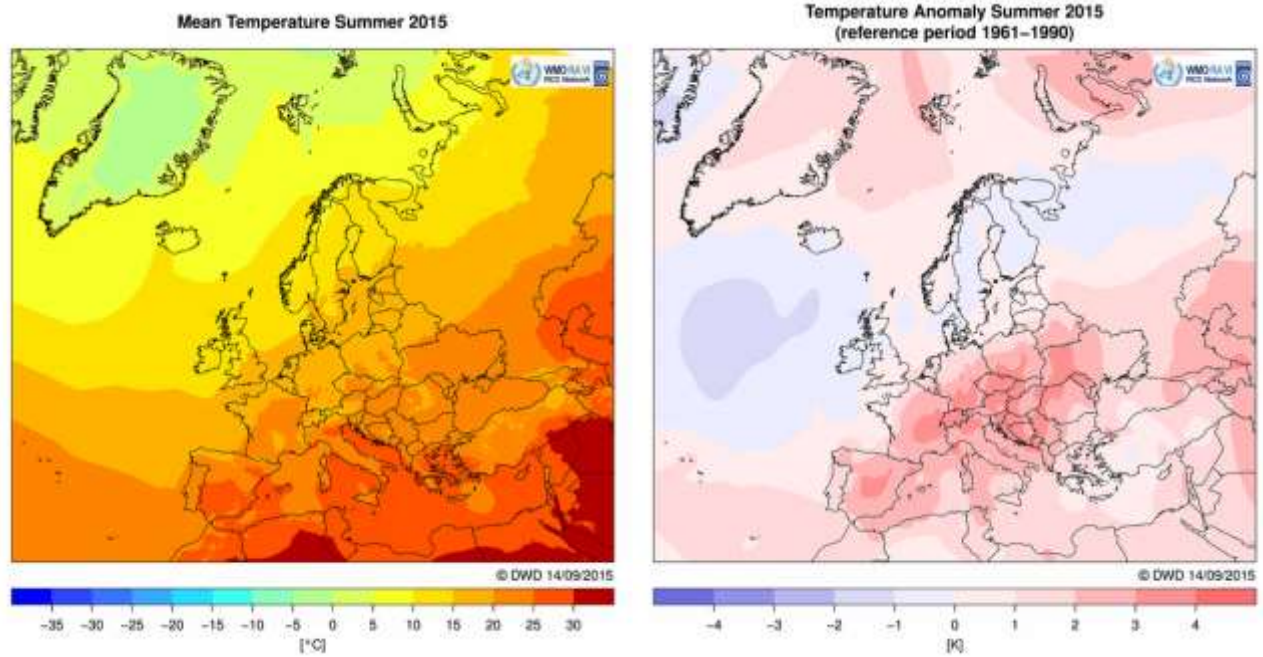
The Seasonal Bulletin on the Climate in WMO Region VI will usually be delivered within 2 months after the end of a season.

Temperature

Summer 2015 was characterized by a long lasting heat wave from end of May to end of August. The temperature for summer show a belt of anomalies of more than 3°C from Spain to Ukraine while northern Europe and the British Isles noted normal or below normal temperature.

During the summer month from June to August 2015 several heat waves crossed Europe and affected different regions at different times (fig. 1). Southern Spain (at station Cordoba) noted most of the time more than 35°C and on the 6 of July even 45.2°C. In Avignon (southern France) the maximum temperature climbed on the 25 of June above 30°C until 13 August with the exception of 3 days. In Central Europe (at station Warszawa, Poland) and the Balkan (at station Ljubljana, Slovenia) 5 heat waves (maximum temperature above 30°C) were observable, at the beginning of June, at the beginning and in mid July as well as at the beginning and the end of August. In Eastern Europe (in Bucuresti, Romania) the heat waves arrived some days later. In contrast, the heat wave reached northern Europe only on 2 July with a maximum temperature in Stockholm (Sweden, the country wide maximum was 32.8°C) of 30.3°C.

The average global land surface temperature for June, July and August 2015 as well as the summer mean were above the 20th century average and also the highest on record (NOAA National Centers for Environmental Information, State of the Climate: Regional Analysis for August 2015, published online September 2015, retrieved on September 25, 2015 from http://www.ncdc.noaa.gov/sotc/global-regions/201508). For Europe the land surface temperature (source: NOAA) for August 2015 was +2.25°C above the reference 1910-2000 and thus the warmest August since 1910 (start of the time series). The mean European temperature for summer 2015 is placed on rank 3 after the years 2003 and 2010. In many European countries this August and summer breaks several records (see table below and references at the end).



Temperature: seasonal mean (left) and anomaly (right) in °C for Europe in summer 2015 (June-August)

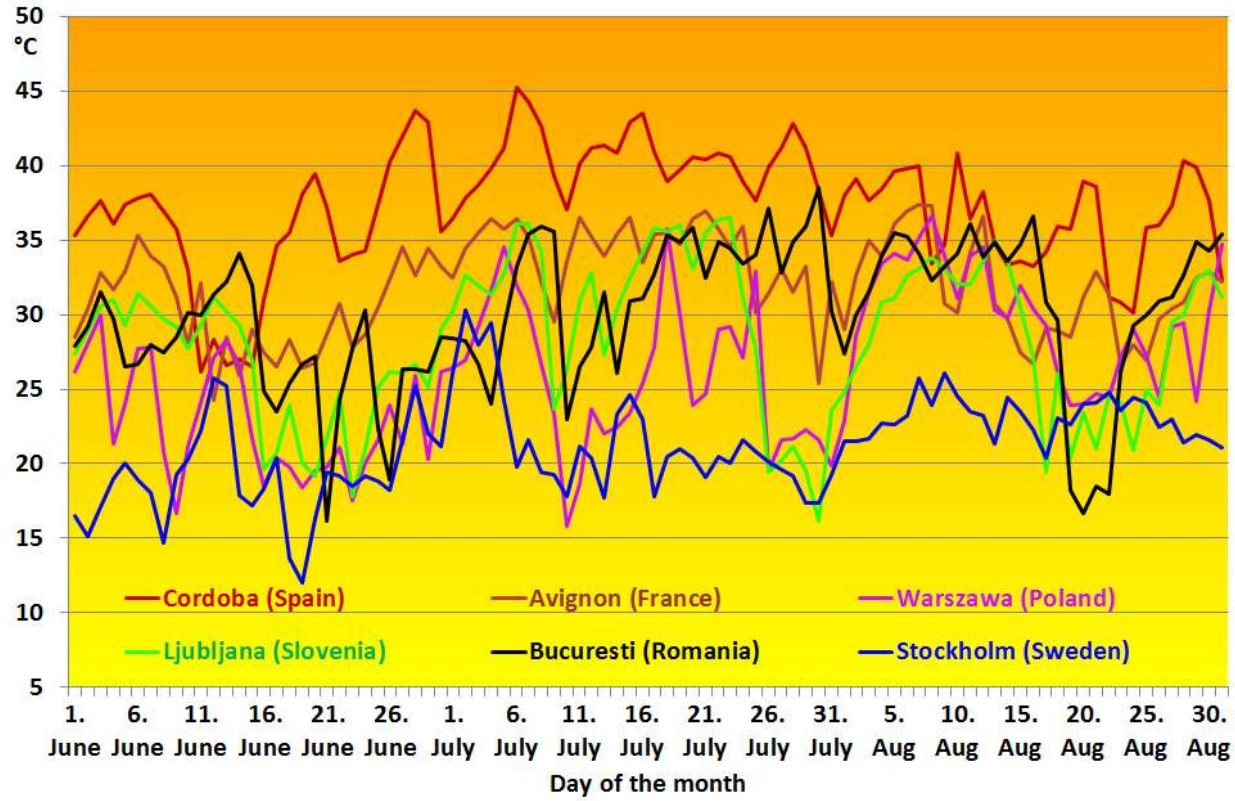
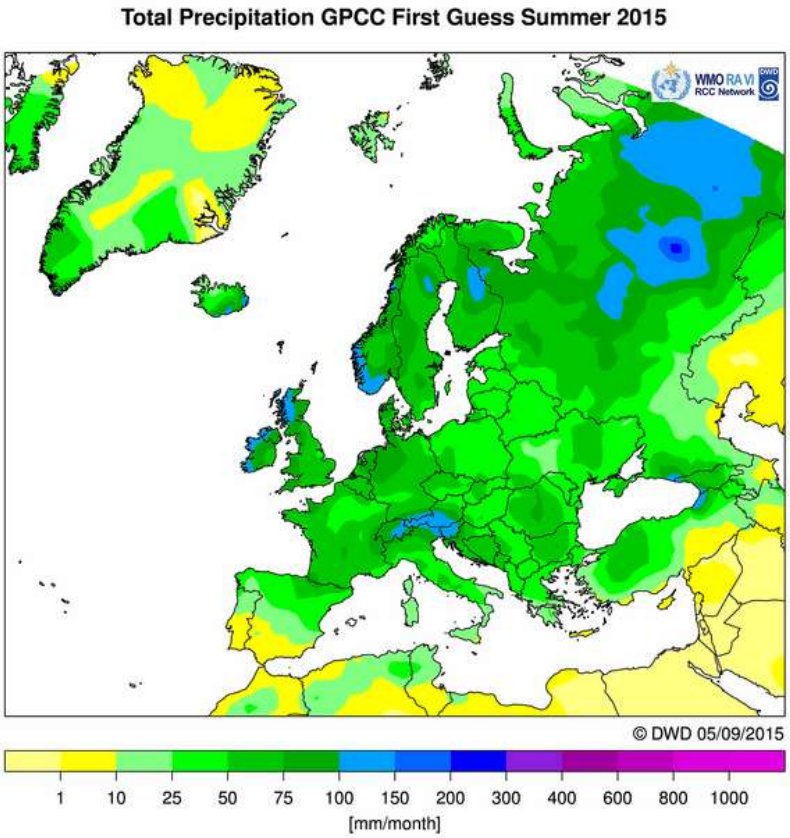


Figure 1: Daily maximum temperature (in °C) for several European SYNOP-stations from June to August 2015

Some ranks of warm winters based on web-available bulletins by NMHSs are given below:

Station	absolute maximum temperature [°C]	Month of the record at station	new record at station	no record
Armenia, Yerevan	40.9			x
Belarus, Brest	36.7	August	x	
Belgium, Kleine-Brogel	38.1	July		
Bosnia and Herzegovina -H., Mostar	41.9			x
Bulgaria, Sandanski	41.2			x
Czech Republic, Rez and Dobrichovice	39.8	(August)		
Estonia, Voru	31.6			x
France, Brive-la-Gaillarde	41.1	July	x	
Germany, Kitzingen	40.3	July/August	x	
Hungary, Budakalaszrol	39.3			x
Italy, Catania/Sigonella	42.8			x
Liechtenstein, Vaduz	35.3	(July)		
Lithuania, Kaunas	35.3	August	x	
Luxembourg, Luxembourg/Airp.	36.1	July		
Moldova, Kisinev	37.0			x
Netherlands, Maastricht/Airp.	38.2	July		
Poland, Legnica Bartoszow	38.4			x
Serbia, Veliko Gradiste	38.7			x
Slovakia, Hurbanovo	38.2			x
Slovenia, Nova Gorica Belje	38.0			x
Spain, Cordoba-Aeropuerto	45.2			x
Switzerland, Genf/Cointrin	39.7	July		
United Kingdom, London/Heathrow	36.7	July		

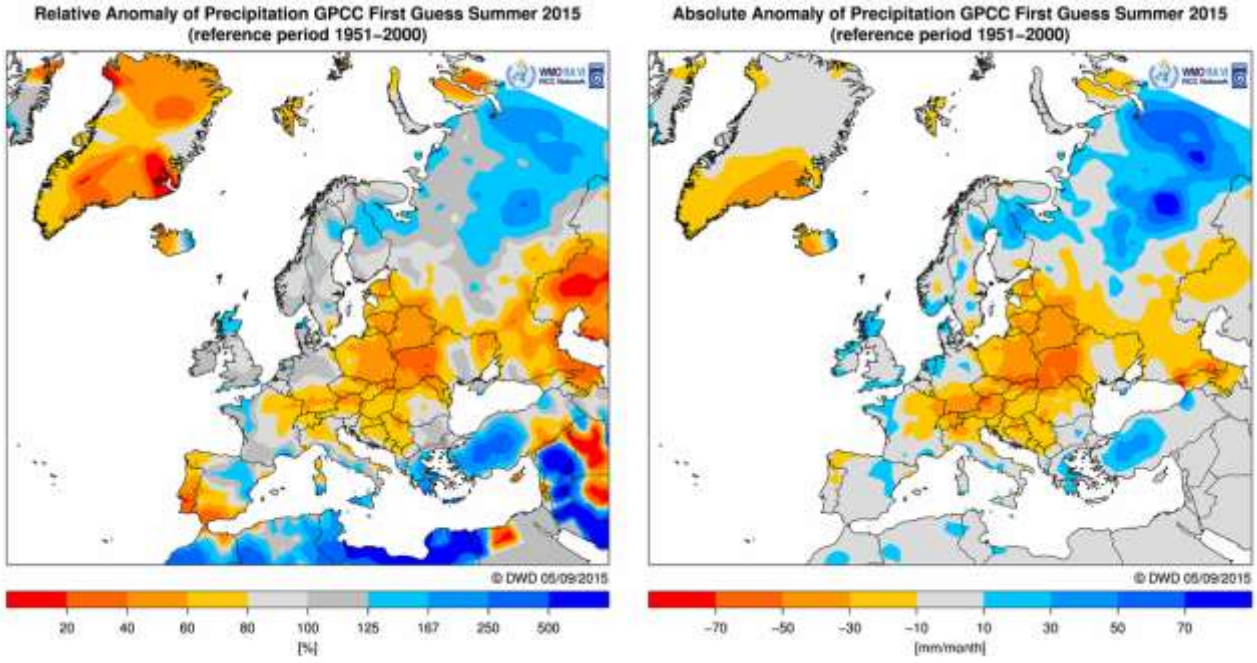
Precipitation and Drought



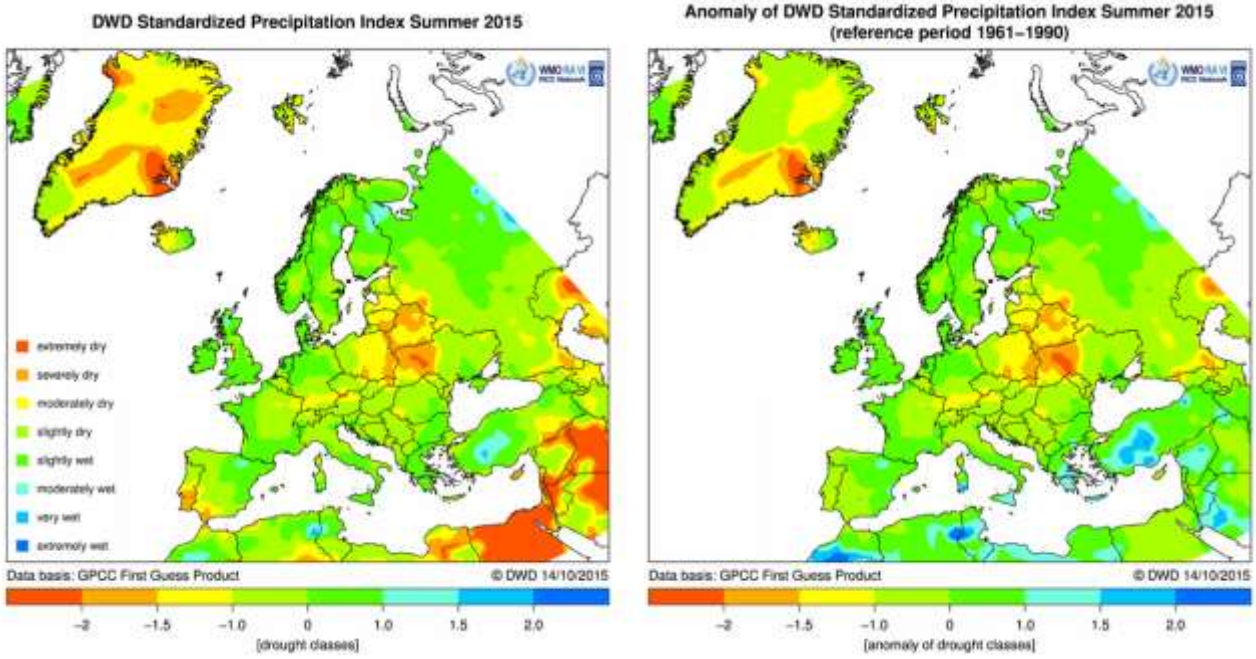
Seasonal precipitation totals (mm/month) for Europe in summer 2015 (June-August)

Precipitation anomalies for summer 2015 showed above normal precipitation in western and northern Europe in Russia of partly more than 150%. The surplus in Turkey was even more than 250%. Western and southern France as well as north-eastern Spain received due to some extreme precipitation events above normal precipitation. In France new records were set in August at station Gonneville (Brittany) with 178.4 mm (more than three times the normal amount) and Montpellier with 234.2 mm (nearly seven times the normal amount http://www.meteofrance.fr/actualites/28154719-retour-sur-les-pluies-intenses-du-23-aout-dans-l-herault)

Due to the higher than normal pressure combined with a long lasting heat wave below normal precipitation was observed especially in Central Europe. Western and southern Iberia had a precipitation deficit that last since the beginning of the year. The affected area of Portugal by drought on August 31 was for severe and extreme drought categories 74% that is the 2nd worst in 70 years (100% in 2005 and 73% in 2012). Since 1 June, Warsaw received less than half of the normal precipitation (172 mm). A total of 47 mm of rain has fallen in Belgrade during the same time, which is less than 30% of normal. In the Ukraine the precipitation deficit caused low river levels. In Germany this summer was the driest of the last 50 years.

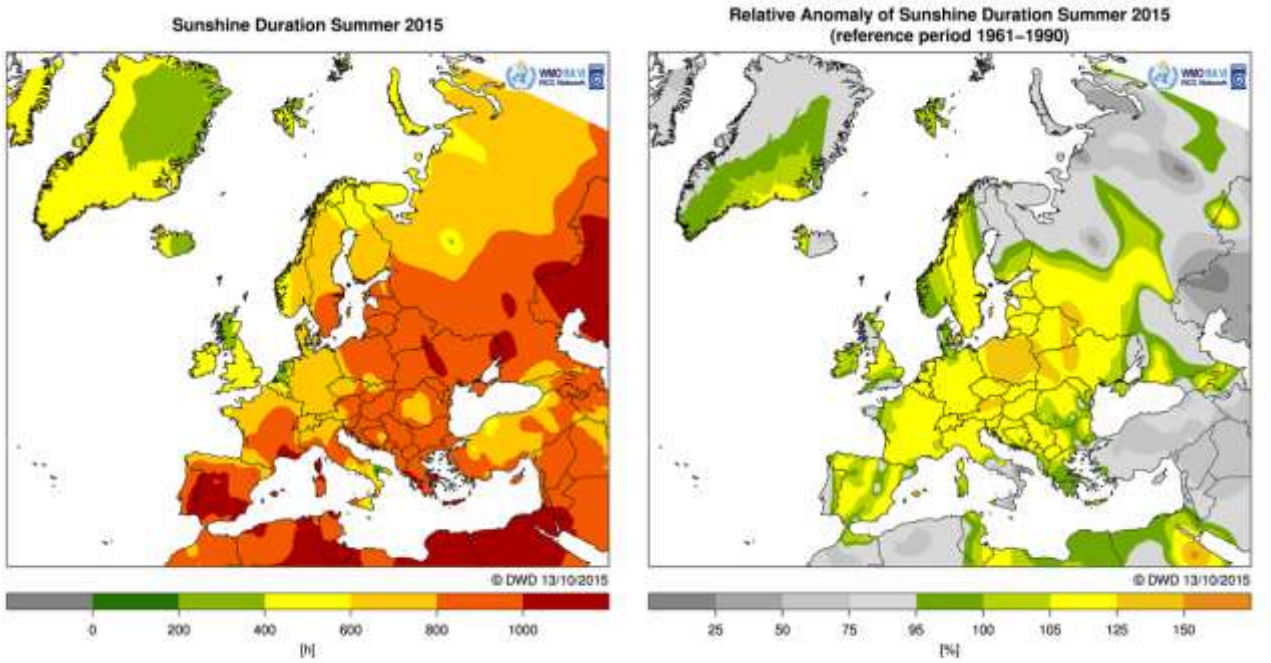


Precipitation anomalies for Europe in summer 2015 (June-August): relative (left, in %) and absolute (right, in mm/month)



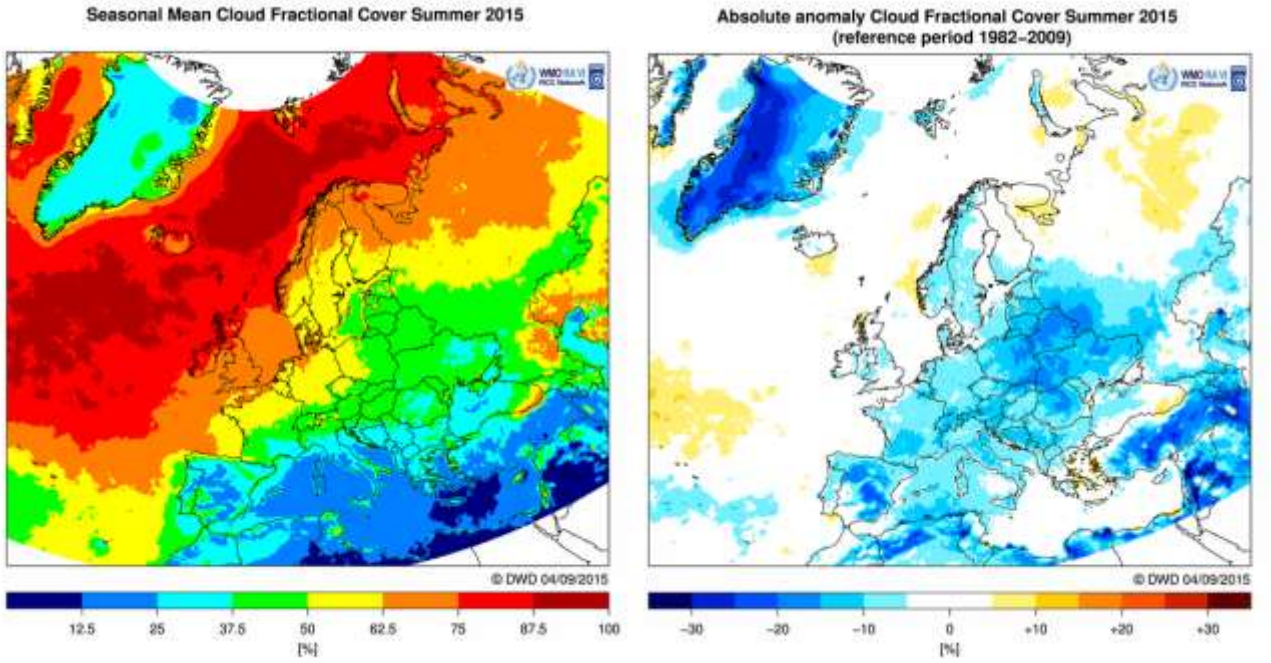
Standardized precipitation index: seasonal mean (left) and anomalies (right, seasonal drought index, SPI) for Europe in summer 2015 (June-August)

Sunshine Duration and Cloud Cover



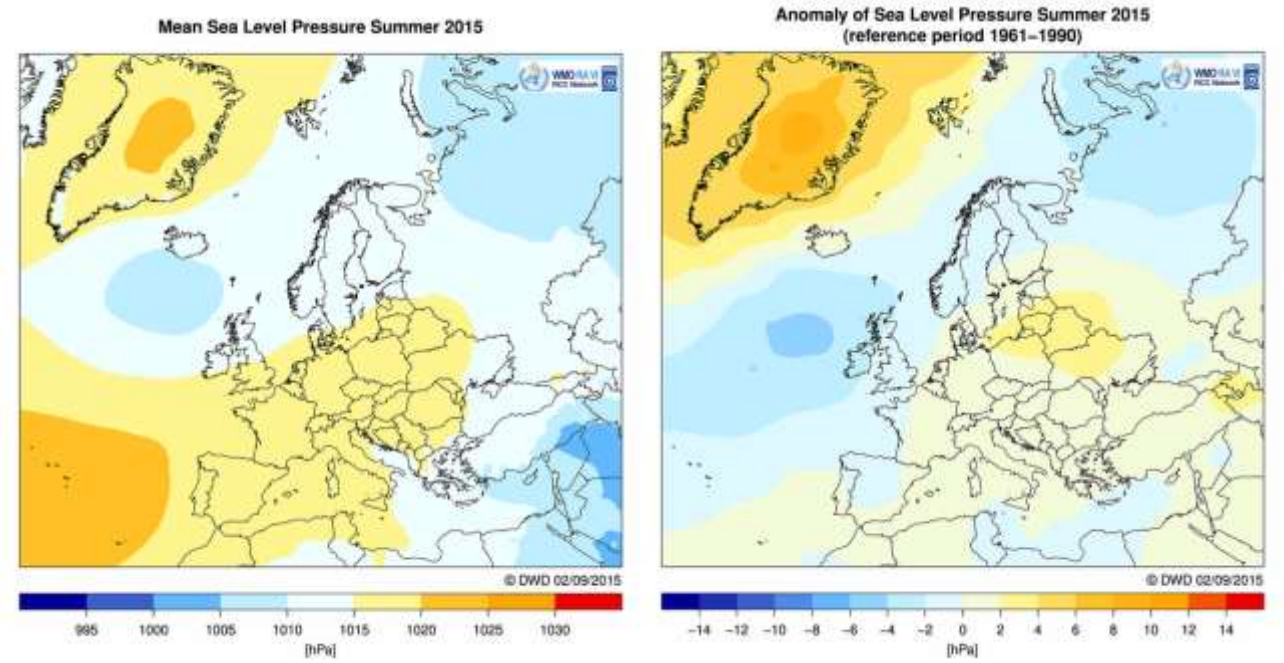
Sunshine duration seasonal mean (left, in h) and relative anomalies (right, in %) for Europe in summer 2015 (June-August; data source: CLIMATS)

Most of Europe registered above normal sunshine duration, except Russia, northern Finland and eastern Mediterranean. The cloud cover was also below normal. Only some parts of Great Britain received the normal amount of sunshine.



Cloud cover: seasonal mean (left, in %) and absolute anomalies (right, in %) for Europe in summer 2015 (June-August; data source: satellite data from CM SAF)

Air Pressure (surface)



Sea Level Pressure: Mean (left) and anomalies (right) for Europe in summer 2015 (June-August)

In summer 2015 both circulation centres, the Islandic low and Azores high were shifted southwards. Therefore high pressure over Greenland could establish with anomalies of more than 8 hPa. Most of Europe showed above normal pressure anomalies coincided with above normal sunshine duration and below normal cloud cover leading to several heat waves. Highest anomalies of more than 2 hPa dominated above the Baltic States and Belarus reflecting the situation of August. Only northern and western Europe as well as the eastern Mediterranean Sea showed below normal anomalies.

The calculated CPC-NAO index with -3.14 for July 2015 was very extreme. Only once in the 66 years an identical index value was calculated in 1993. This must be seen in combination with the East Atlantic/West Russia Pattern (EA/WR) indicated below normal pressure in northern Russia.

Month	North Atlantic Oscillation (NAO)	Scandinavia Pattern (SCA)	East Atlantic/West Russia Pattern (EA/WR)	Arctic Oscillation (AO)
June 2015	0.24	-1.52	-0.78	0.427
July 2015	-3.14	-1.11	2.01	-1.108
August 2015	-1.10	0.87	-0.37	-0.689

Data source: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

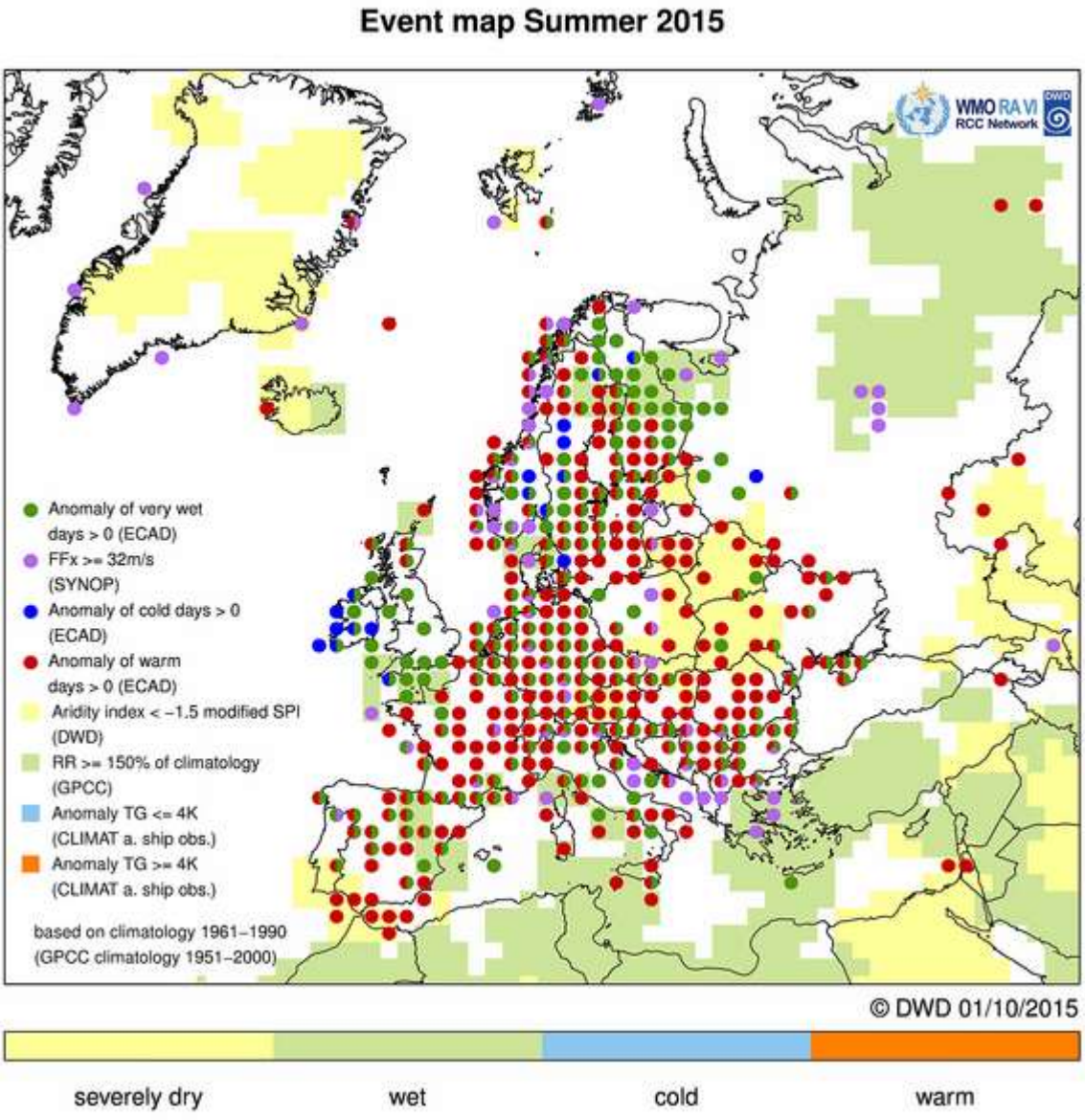
Extreme Values

Data source: The RCC-CD-node: http://www.ecad.eu
RX1d: highest 24 hours total (in mm), RX5d: highest 120 hours total (in mm),
RR10: highest number of days with heavy precipitation (>10 mm/d),
RR20: highest number of days with very heavy precipitation (>20 mm/d),
TN: lowest mean minimum temperature (° C),
TNN: lowest absolute minimum temperature (° C),
TX: highest mean maximum temperature (° C),
TXX: highest absolute maximum temperature (° C)
- : no values available
* : value corrected according to NMHSs report, may still be preliminary

Country	RX1d [mm]	RX5d [mm]	RR10 [days]	RR20 [days]	TN [°C]	TNN [°C]	TX [°C]	TXX [°C]
Algeria	-	-	-	-	-	-	40.5	46.4
Armenia	-	-	-	-	9.3	5.1	24.2	40.9
Austria	70*	91.2	23	8	2.2	-8.6*	28.9	38.3*
Belarus	44	60	8	4	-	4.6	26.5	36.7
Belgium	56	61.5	13	5	-	3.9	24.5	38.1
Bosnia and Herzegovina	43.4*	60	8	2	9.4	-0.9	28.7	41.9*
Bulgaria	71	91.6	8	3	-	6.9	33.4	41.2
Canary Island	-	-	-	-	-	-	29.1	37.1
Croatia	65	82.9	9	4	-	1.1	31	40.0
Cyprus	30*	1	1	1	-	-	-	42.5*
Czech Republic	65	101.9	9	3	-	2	-	39.8
Denmark	91.4*	-	-	-	9.0*	2.5*	21.1*	31.9*
Estonia	40*	43.5	6	2	-	2.5	22.8	31.6
Finland	49.7	83.1	11	4	6.7	-3.5	20.6	31.4*
France	169	169	8	4	-	1.7	32.1	41.4*
Germany	119.9*	246.3	19	5	2.3	-6.6	28.1	40.3*
Greece	36	26	1	0	-	-	27.9	41.6*
Greenland	-	-	-	-	0.3	-13.4	10.4	17.2
Hungary	120.5*	-	5	2	-	3.1*	29.4	39.6*
Iceland	49.0	-	-	-	6.4	-4.5*	11.9	22.9*
Ireland	41.3*	72.2	12	3	9.2	0.7	18.4	25.6*
Israel	-	3.5	0	0	-	-	39.9	46.1
Italy	302.8*	164.2	12	9	8.8	0.1	34.1	42.9
Kazakhstan	-	-	-	-	-	-0.6	36.5	46.1
Kyrgyzstan	-	-	-	-	-	-	32.1	42.1
Latvia	28.4	61.4	8	3	9.9	1.6	22.6	35.1*
Liechtenstein	-	-	-	-	16.2	8.9	26.2	35.4
Lithuania	21	40.7	6	1	-	2.9	23.9	37.4*
Luxembourg	17.0*	25.3	3	0	-	6.9	24.7	36.1

Country	RX1d [mm]	RX5d [mm]	RR10 [days]	RR20 [days]	TN [°C]	TNN [°C]	TX [°C]	TXX [°C]
Moldova	-	-	-	-	-	-	29.4	38.0*
Netherlands	46.6	92.6	13	7	-	2.5	24.2	38.2*
Norway	91.6*	119	22	10	-0.8*	-10.0*	21.7*	32.1*
Poland	62	111	8	3	-	-1.8*	27.2	38.4*
Portugal	46.6*	45.1	2	1	-	3.1*	30	43.2*
Romania	73.0	80.8	8	4	4.6	-3.3	31.9	39.1
Russian Federation	77	100.6	12	4	6.4	-2.4	27.7	36.6
Serbia	64	83.9	8	3	9.5	2.6	32.8*	38.7*
Slovakia	92	109.1	5	2	-	1.7	29.7	38.2
Slovenia	103.2	123.7	19	11	5.9	-2.8	28.4	38.0
Spain	74	105	11	5	-	1.1*	37.4	45.2
Sweden	48.0*	98.7	13	5	4.5	-3.5	21.5	32.8*
Switzerland	109*	151.9	21	9	5.7	-2.9	28.5	39.7
Tajikistan	-	-	-	-	-	-	35.8	42
Turkey	127.0*	-	-	-	-	1.3*	29.2	45.1*
Turkmenistan	-	-	-	-	-	-	39	45.1
Ukraine	69	100	8	3	-	5.7	29.8	38
United Kingdom	87.1*	85.4	12	4	8.2	-0.6*	22.7	36.7
Uzbekistan	-	-	-	-	-	8.7	38.7	45.6

Climate Extremes and Severe Weather Events



Map of reported Severe Weather Events of the Season, Source: http://essl.org/cgi-bin/eswd/eswd.cgi

References:

Seasonal summaries in RA VI at national web-sites:

Austria: HISTALP - Österreich Sommerbericht 2015 http://www.zamg.ac.at/cms/de/klima/news/histalp/histalp-oesterreich-sommerbericht-2015
Belgium: http://www.meteo.be/meteo/view/fr/1124472-Bilan+climatologique+saisonnier.html
Croatia: http://klima.hr/klima_e.php?id=ocjsez_e
Denmark: http://www.dmi.dk/vejr/arkiver/maanedsaesonaar/
Estonia: http://www.ilmateenistus.ee/kliima/aastakokkuvotted/ulevaated/
Finland: http://en.ilmatieteenlaitos.fi/press-release/98978129
France: http://www.meteofrance.fr/climat-passe-et-futur/bilans-climatiques/bilan-2015/bilan-climatique-de-l-ete
Germany: http://www.dwd.de/DE/leistungen/klimakartendeutschland/klimakartendeutschland_monatsbericht.html?nn=495662
Ireland: http://www.met.ie/climate/monthly-weather-reports.asp
Latvia: http://www.meteo.lv/lapas/noverojumi/meteorologija/laika-apstaklu-raksturojums/si-gada-laika-apstakli/?nid=955
Lithuania: http://www.meteo.lt/lt/web/guest/2015-rugsejis
Montenegro: http://195.66.163.23/klimatologija.php?tip=sezonski
Netherlands: http://www.knmi.nl/nederland-nu/klimatologie/maand-en-seizoensoverzichten/
Norway: http://met.no/Klima/Varet_i_Norge/
Poland: http://www.imgw.pl/extcont/biuletyn_monitoringu/
Russia: http://www.meteoinfo.ru/climate/climat-tabl3/-2015-
Spain: http://www.aemet.es/en/serviciosclimaticos/vigilancia_clima/resumenes?w=0&datos=1
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
University of Reading (UK, Department of Meteorology) http://www.met.reading.ac.uk/~brugge/world.html
NOAA's National Centers for Environmental Information (NCEI): http://www.ncdc.noaa.gov/cag/time-series/global/globe
Germany: Climatological assessment of the summer 2015 (only in German; Klimatologische Einschätzung des Sommer 2015) http://www.dwd.de/DE/leistungen/besondereereignisse/temperatur/20151013_bericht_sommer_2015.pdf
Germany: Global retrospect – summer 2015 (only in German; Globaler Rückblick - Sommer 2015) http://www.dwd.de/DE/leistungen/besondereereignisse/temperatur/2015_sommer_global.pdf