



WMO RA VI
RCC-Network

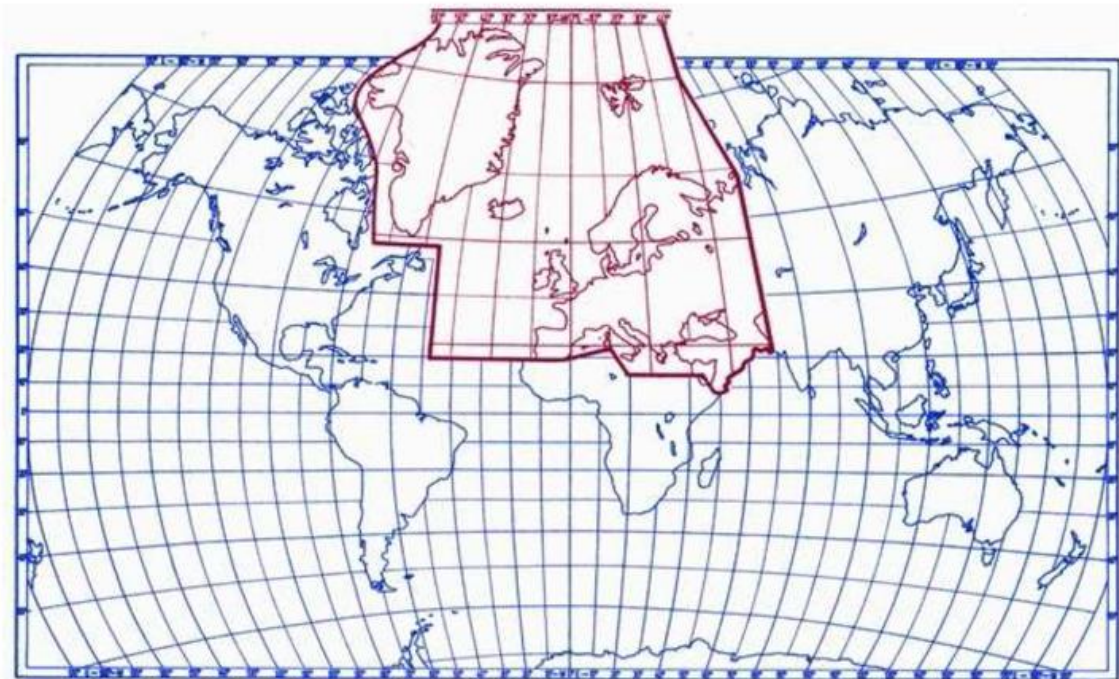


WMO RA VI **RCC-Network Node on Climate Monitoring**

Annual Bulletin on the Climate in WMO Region VI

- Europe and Middle East -

2011



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Finland

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Germany

Greece

Hungary

Ireland

Iceland

Israel

Italy

Jordan

Latvia

Lithuania

Luxembourg

Moldova

Montenegro

Netherlands

Norway

Poland

Portugal

Romania

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Slovakia

Slovenia

Spain

Sweden

Switzerland

Turkey

Ukraine

United Kingdom

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Outline

The Annual Bulletin on the Climate in WMO Region VI (Europe and Middle East) provides an overview of climate characteristics and phenomena in Europe and the Middle East for the preceding year. It is mainly based on dedicated national reports from RA VI NMHSs as well as general climate monitoring information from their official Websites. Supported by the European Climate Support Network and WMO's World Climate Data and Monitoring Programme the Bulletin provides an excellent example of international collaboration across cultural and political borders since its first publication in 1994. The Bulletin is seen as a regional contribution to WMO's climate system monitoring, complementing and detailing well-known regular global assessments, such as WMO's *Annual Statement on the Status of the Global Climate* and the Special Supplement to the Bulletin of the American Meteorological Society (BAMS) *State of the Climate*. The evolution of the RA VI Regional Climate Centre Network (RCC-Network) allowed adding a couple of RA VI-wide maps in order to provide a certain degree of consistency across the information. Otherwise, basic methodologies for, and operations of, climate monitoring activities still differ amongst the various RA VI NMHSs. Maps and information compiled in this Bulletin are the result of a selection process. Websites of NMHSs as well as the Webpages of the RA VI RCC-Network (<http://www.rccra6.org>) offer useful additional information and regularly produced maps etc. The Bulletin is intended to serve primarily NMHSs in the Region but it might also be interesting for public institutions, research institutes, universities and others.

Notes:

- (1) This version of the Bulletin is an interim version, which will be further developed in the years to come. It has a new design and will be provided in .pdf format only. The aim is to optimise the content of the Annual Bulletin to achieve a high consistency of European climate monitoring information across publications, such as the recently introduced Monthly Bulletin on the Climate in WMO Region VI (cf. www.dwd.de/rcc-cm) and others. Furthermore, we are optimising the workflow to accelerate the Annual Bulletins production, saving time and money. The life blood of the Bulletin, however, will always be the national contributions from ideally all RA VI Members. Accordingly, we will continue inviting RA VI Members for national contributions.
- (2) Maps of the RA VI RCC-Network are based on the following data sources:
 - - Temperature: CLIMAT data and ship observations provided by the Global Collection Centre (GCC), run by Deutscher Wetterdienst
 - - Precipitation: Global Precipitation Climatology Centre (GPCC), run by Deutscher Wetterdienst
 - - Sunshine: CLIMAT data.

Subregional monthly maps are provided by the Eastern Mediterranean Climate Centre (EMCC) and the Southeast European Drought Management Centre (DMCSEE)

The following subregions are used in the Bulletin:

Central and western Europe: Austria, Belgium, Czech Republic, France, Germany, Hungary, Ireland, Luxemburg, Monaco, Netherlands, Poland, Slovakia, Switzerland, United Kingdom

Nordic and Baltic Countries: Denmark, Estonia, Finland, Greenland, Iceland, Latvia, Lithuania, Norway, Sweden

Iberia: Portugal, Spain

Mediterranean, Italian and Balkan Peninsula: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Italy, Malta, Serbia, Slovenia, Republic of Macedonia, Montenegro, Turkey

Eastern Europe: Belarus, European Russia, Moldova, Romania, Ukraine

Middle East: Armenia, Azerbaijan, Cyprus, Georgia, Israel, Jordan, Lebanon, Syria, western Kazakhstan

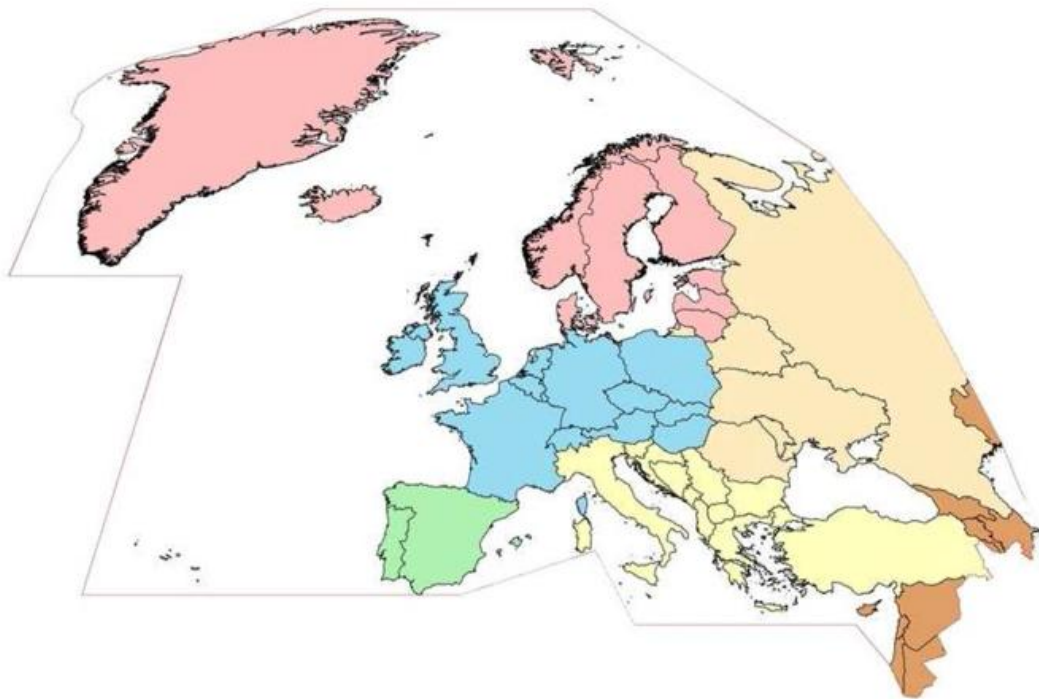


Fig. 1.1: Definition of the 6 subregions within WMO RA VI

References:

Note: *Primary information sources are the annual reports of RA VI Members, which are kindly provided by RA VI NMHSs. The names of Members, which contributed to the 2011 edition of the Bulletin are listed on page 3 above. Many contributions or also additional information may as well be found on the web, see below.*

National Reports 2011

Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Wien, Austria
Weterrückblick für 2011

<http://www.zamg.ac.at/cms/de/klima/klima-aktuell/jahresrueckblick>

Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Wien, Austria
Meldungen zu Unwetter und witterungsbedingten Schäden in der
Wirtschaft/Jahresübersicht 2011

Meteorological Service Cyprus (MOA), Cyprus
AVERAGE ANNUAL PRECIPITATION (mm)

http://www.moa.gov.cy/moa/ms/ms.nsf/DMLcyclimate_en/DMLcyclimate_en?opendocument

Royal Netherlands Meteorological Institute (KNMI), DeBilt, Netherlands
Jaaroverzicht van het weer in Nederland, 2011,

http://www.knmi.nl/klimatologie/mow/pdf/jow_2011.pdf

The Irish Meteorological Service (MET eireann), Ireland
Weather Summary of 2011,

http://www.met.ie/climate/monthly_summaries/annual_2011.pdf

The Royal Meteorological Institute of Belgium (KMI), Belgium
Klimatologisch overzicht van 2011

<http://www.meteo.be/meteo/view/nl/7609555-2011.html>

Federal Meteorological Institute (METEOBIH), Bosnia and Herzegovina
KLIMATOLOSKA ANALIZA GODINE 2011

<http://fhmzbih.gov.ba>

State Hydrometeorological Service (SHS), Moldova

Caracterizarea condițiilor meteorologice și agrometeorologice din anul 2011

<http://meteo.md/newsait/god2011.htm>

Institute of Meteorology (IM), Lisboa, Portugal

Boletim Climatológico Anual - Ano 2011, Versão Preliminar

<http://www.meteo.pt>

The Danish Meteorological Institute (DMI), Denmark
Vejret i Danmark - året 2011

http://www.dmi.dk/dmi/vejret_i_danmark_-_aret_2011

Deutscher Wetterdienst (DWD), Germany
WitterungsReport Express Jahreskurzübersicht 2011

Agencia Estatal de Meteorología (AEMET), Spain
Resumen anual climatológico 2011

http://www.aemet.es/documentos/es/serviciosclimaticos/vigilancia_clima/resumenes_climat/anuales/res_anual_clim_2011.pdf

Météo-France, Toulouse, France
Bilan de l'année 2011

http://climat.meteofrance.com/chgt_climat2/bilans_climatiques/archives/2011?page_id=15492

Federal Office of Meteorology and Climatology MeteoSwiss, Switzerland
Klimabulletin Jahr 2011

http://www.meteoschweiz.admin.ch/web/de/klima/klima_heute/jahresflash.html

Hydrological and Meteorological Service of Montenegro
Analiza temperature vazduha i količine padavina za 2011

<http://195.66.163.23/klimatologija/godisnji/2011-CG-klima.pdf>

The Meteorological Office (UK MetOffice), Exeter
UK climate: Annual 2011

<http://www.metoffice.gov.uk/climate/uk/2011/annual.html>

Meteorological and Hydrological Service (DHMZ), Zagreb, Croatia
Climate monitoring - Annual reports

http://klima.hr/klima_e.ph_id=ocjgodina_e¶m=croatien_2011.pdf

The Finnish National Weather Service, The Finnish Meteorological Institute (FMI), Finland

FMI "Vuoden 2011 sää" <http://ilmatieteenlaitos.fi/vuosi-2011>

Hydrometeorological Centre Belarus, Minsk, Belarus
Klimatische Eigenschaften des Jahres 2011

<http://pogoda.by/press-release/?page=380>

Lithuanian Hydrometeorological Service (LHMT), Lithuania
Lietuvos klimatas

http://www.meteo.lt/klim_lt_klimatas.php

Det Norske Meteorologiske institutt (DNMI), Norway

Vaeret i Norge, Nr. 13/2011, ISSN 1503-8017, KLIMA, Oslo, 18.1.2012

http://met.no/Klima/Klimastatistikk/Vaeret_i_Norge/2011/Aret_2011/filestore/20112.pdf

Other

The Eastern Mediterranean Climate Centre (EMCC)

<http://emcc.dmi.tr>

Drought Management Centre for Southeastern Europe (DMCSEE)

http://www.dmcsee.org/en/drought_bulletin/Fstran=3

Kennedy, J.J., et al., 2012: [] Drought and precipitation extremes [in "State of the Climate 2011"].

Bull. Amer. Meteor. Soc., 93 (7), Sidebar 7.3, S197-S198.

Rutgers Laboratory: "Annual Report 2011"

http://climate.rutgers.edu/snowcover/files/Robinson_snowdata2011.pdf

EUMETSAT, Top Story: Extreme depletion of arctic ozone in March 2011, O3M SAF/EUMETSAT,

[http://o3msaf.fmi.fi target="neu">](http://o3msaf.fmi.fi/target=)

ZAMG, HISTALP Langzeitklimareihen - Österreich, Frühjahrsnewsletter 2011,

<http://www.zamg.ac.at/histalp/>

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<http://www.dwd.de/ozon>

ECA&D (RCC-CD),

<http://www.ecad.eu/>

van der Schrier, G. and van den Besselaar, E. J. M. and Klein Tank, A. M. G. and Verver, G. (2013)

Monitoring European averaged temperature based on the E-OBS gridded dataset

J. Geophys. Research (Atmospheres) (submitted), doi:10.1029/2012JD019006

NOAA-NCDC, Climate Indicators

<http://www.ncdc.noaa.gov/bams-state-of-the-climate/2009-time-series/>

ISPRA, Gli indicatori del CLIMA in Italia nel 2011, Stato Dell' Ambiente, 35/2012

<http://www.scia.sinanet.apat.it/Documentazione/RAPPORTOCLIMA2011.pdf>

Outstanding Events and Anomalies

Temperature

- The warmest year on record since more than 100 years in Norway (together with 1990 and 2006), Belgium, France, Switzerland and the higher mountains of Germany, Austria, Slovenia.
- Warmest winter on record at 5 stations on Greenland
- Warmest spring since 1659 in Central England (together with 1893), 2nd mildest since 1706 in The Netherlands, since 1910 in UK, since at least 1900 in France and since 1961 in Spain.
- Warmest summer since 1866 in Estonia (together with 2010) and since the early part of the 19th century in Helsinki, Finland. But coldest summer in places since 25 to 74 years in Ireland.
- Warmest autumn since 1900 in Norway and as well in places in Ireland (Dublin since 150 years) and the 2nd warmest at least since 1900 in France.

Precipitation

- The wettest year on record in Norway (since 1900, start of registrations) and locally in northern and southern Sweden. The wettest year since 1890 for Torshavn on the Faroer Islands.
- Highest number of snowdays in Uccle, Belgium.
- Driest spring in France since at least 1959. Driest spring in at least a century in The Netherlands and partly driest spring since 1910 in UK.
- Wettest summer since at least 1906 in The Netherlands

Sunshine Duration

- Sunniest spring in Uccle, Belgium since 1887 and for at least a century in The Netherlands.

Other Anomalies

- Largest ice extent in the Baltic Sea since 1987
- 2 major drought phases: in spring in western and central Europe and in autumn mainly on the Balkan

Events

- Unusually wide-ranging dust transport from Africa to Scandinavia in April
- Extraordinarily extreme precipitation on 2 July in Denmark (in Kopenhagen more than 100 mm/day at all stations) and southern Sweden
- Extremely heavy rainfall on 25/26 October with intensities resp. totals of 153 mm within 1 hour, 328 mm within 3 hours, 472 mm within 6 hours, 511 mm within 12 hours, 539 mm within 24 hours, 542 mm within 30 hours for Brugnato in the Ligurian province La Spezia, Italy.
- Storm ROLF on 3 to 8 November in western Mediterranean Sea area had tropical character and brought daily totals up to 200 mm, 2-day totals between 300 and 500 mm and locally 9-day totals up to 800 mm in southeastern France as well as extremely intense precipitation on 4 November in Geneva (Liguria) with intensities per 3 resp. per 6 hours with return periods between 200 and 500 years.
- 2 storms in December: JOACHIM on 15-16 December with gusts of 20 m/s or more on more than a quarter of the area of France and DAGMAR on 26 December with vast damage in southern Scandinavia.

Annual Survey

Atmospheric Circulation

1.1 El Niño/La Niña

The year 2011 started with a strong La Niña which ended in late spring (Fig. 2.1). During La Niña the tendency in late winter is for a positive North Atlantic Oscillation (NAO) pressure pattern, with mild and wet conditions in northern Europe and the UK and cold and dry conditions in southern Europe. Also very typical for La Niña is a strong extended Azores high. In fact, it was already in January 2011, when high pressure conditions developed over western and southern central Europe. This went on in February and in spring, when high pressure extended far to the north and east. As a result, much of Europe, especially western and central parts, saw an outstandingly warm and dry spring.

Another similarly strong La Niña developed at the end of the year. Again, the Azores high became strong in December 2011 and extended to the north and east. As a result, Iberia and the western Mediterranean saw a very dry December in contrast to many other parts of Europe.

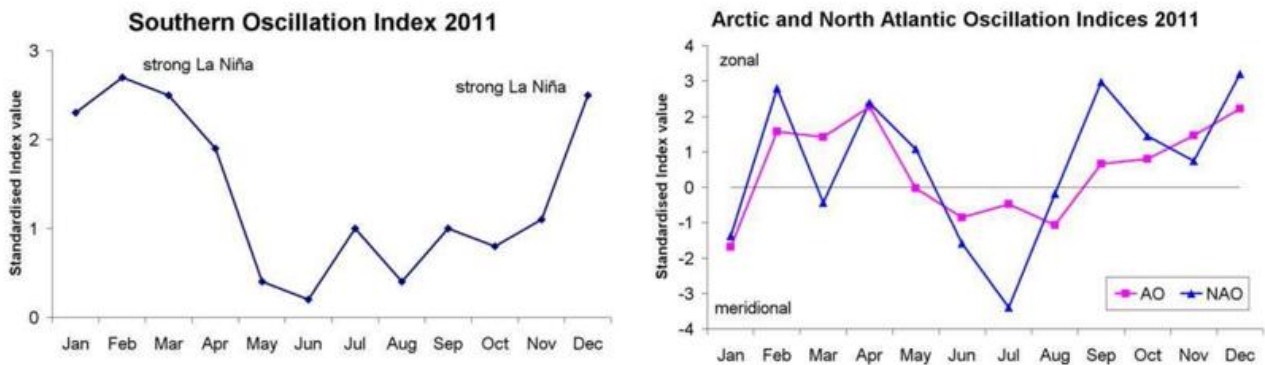
Further information: [UK MetOffice: La Nina 2011](#) [NOAA NCEP CPC: ENSO regressions](#)

1.2 Arctic Oscillation (AO) and North Atlantic Oscillation (NAO)

From January to May 2011, the NAO shows strong fluctuations between the positive and negative phase, and to a lesser extent also the AO. This was due to temporary relocations of the Icelandic low to the west or southwest, particularly in January, and to a lesser extent also in March. The positive phase was prevailing during that period, triggered by La Niña. On the other hand, high pressure conditions extended from the Azores high far into the European continent. The result was a strong warm airflow to the Arctic region, and also western and central Europe saw a mild late winter and a warm spring. NAO was strongest in February, but due to a blocking high over eastern Europe, it was mild in the west, but cold and dry in the east that month. Middle latitudes were mostly dry especially in spring, whereas most of the precipitation occurred in the north, but also in southern Europe due to some cyclonic activity in the Mediterranean.

In the summer months (June to August), both AO and NAO indices were negative. The Icelandic low was either missing or very weak or relocated eastwards, whereas high pressure over Greenland became stronger and extended, leading to further Arctic warming and dry weather there, whereas northern and temporarily also central Europe often had cyclonic conditions. Eastern Europe and the Mediterranean, in contrast, had prevailing high pressure and saw a warm and dry summer.

For the rest of the year (September to December), AO and NAO switched again to a positive mode. There was a zonal circulation over the North Atlantic, but similarly like in spring, high pressure conditions developed over the European continent and the frontal zone was over northern Europe. This development culminated to an extensive high over Europe, leading to an extremely dry November, and warm air flow in western Europe and cold air in the southeast. In December in contrast, this pattern was replaced by a zonal westerly flow with mild and wet weather over northern and middle latitudes, whereas the Mediterranean area became very dry.

**Fig. 2.1:**

Left graph:

Southern Oscillation Index for 2011, as expressed by the difference of standardised sea level pressure anomalies in Tahiti and Darwin (Australia)

Source: NOAA, <http://www.cpc.ncep.noaa.gov/data/indices/soi>
data taken on 16 March 2012

Right graph:

Standardised Arctic Oscillation (AO) Index and North Atlantic Oscillation (NAO) Index for 2011, as expressed by the difference of standardised sea level pressure anomalies between southern and northern latitudes over the whole northern hemisphere (AO) and the North Atlantic (NAO). For more details to the definitions of the indices, see sources below

Source: NOAA(AO)

http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/ao.shtml

and Climate Research Unit, University of East Anglia, United Kingdom (NAO),

<http://www.cru.uea.ac.uk/~timo/datapages/naoi.htm>

Temperature, Precipitation and Sunshine Duration

Annual Maps

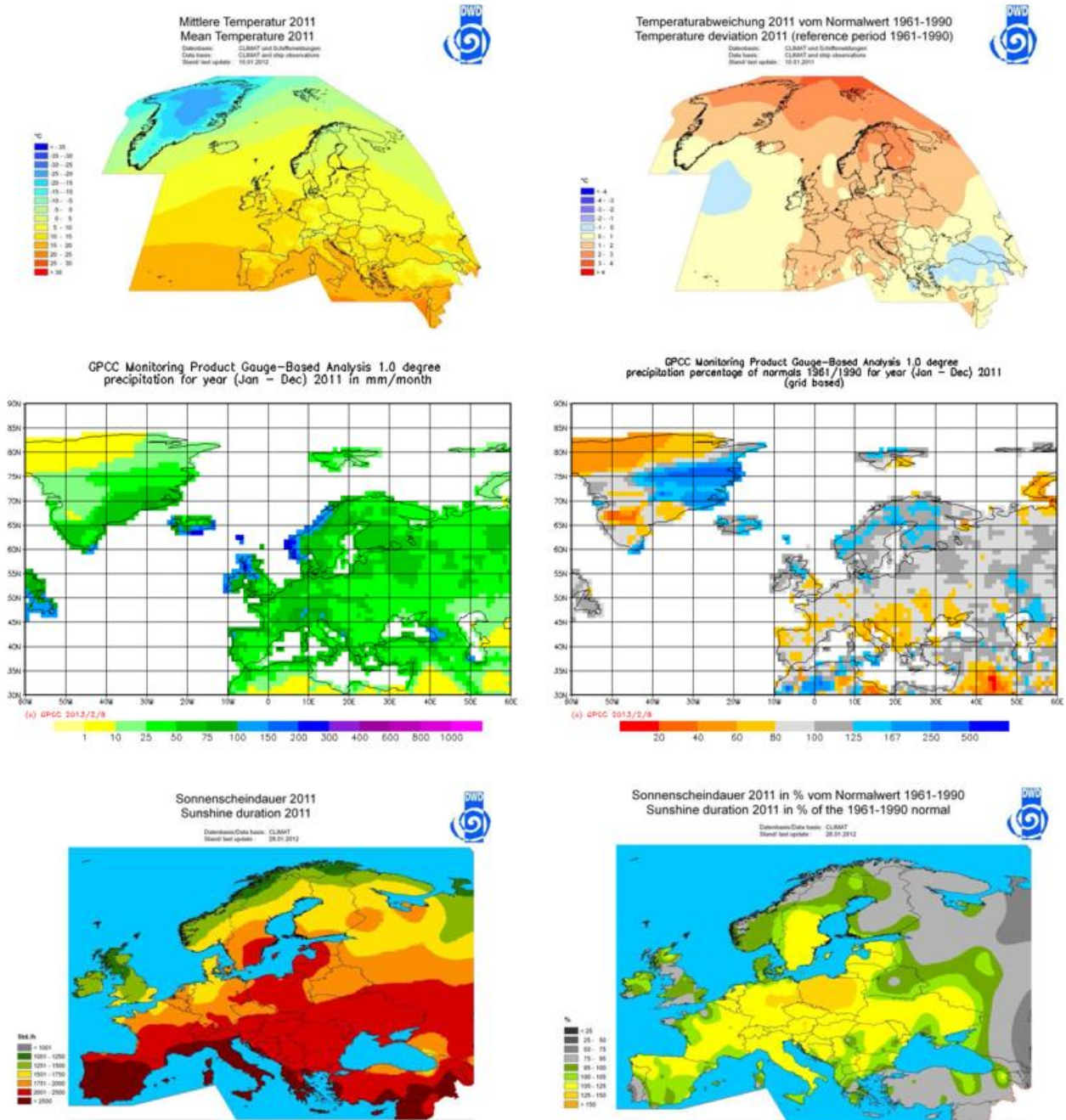


Fig. 2.2: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in 2011

Monthly and Annual Tables

Temperature and precipitation values and departures from their 1961-1990 means (CLIMAT Data)

WMO No.	Station	January 2011				February 2011			
		Temp.(°C) mean dev.	Prec. (mm) total dev.			Temp.(°C) mean dev.	Prec. (mm) total dev.		
01008	Svalbard Airport	-15.2	0.2	10	-4	-12.7	3.0	19	0
01025	Tromso	-3.5	0.5	82	1	-4.0	-0.3	51	-35
01492	Oslo	-3.5	0.8	47	-2	-4.9	-0.9	53	17
02196	Haparanda	-10.6	1.5	55	11	-15.9	-4.6	22	-10
02485	Stockholm	-1.9	0.9	33	-6	-4.2	-1.2	38	11
02836	Sodankyla	-13.4	1.7	26	-5	-19.0	-5.4	16	-9
02974	Helsinki	-5.4	1.5	55	14	-11.3	-4.5	29	-2
03091	Aberdeen	3.3	0.6	43	-38	4.8	1.9	94	43
03772	London	5.3	1.1	77	25	7.6	3.1	43	8
03967	Dublin Casement Aerodrome	3.6	-0.8	34	-32	7.0	2.6	76	25
04030	Reykjavik	1.6	2.1	62	-14	2.1	1.7	108	36
04360	Ammasslik	-6.0	1.5	89	-23	-4.1	3.6	102	11
06186	Copenhagen	0.4	-0.1	28	-23	0.2	-0.3	22	-9
06260	De Bilt	3.5	1.3	87	21	4.6	2.1	63	14
06447	Brussels	4.0	1.4	91	24	5.4	1.9	44	-9
06590	Luxembourg	1.9	1.9	67	-4	2.7	1.6	32	-30
06660	Zurich	1.2	1.7	47	-20	2.7	1.8	22	-48
06700	Geneva	2.5	1.7	45	-35	3.1	0.8	16	-65
07510	Bordeaux	5.8	0.0	27	-73	7.9	0.8	62	-24
07650	Marseilles	6.6	-0.1	19	-28	8.3	0.4	21	-33
08222	Madrid	6.4	0.3	41	-5	8.4	0.9	30	-14
08314	Mahon/Menorca	10.5	0.0	78	12	10.8	0.1	86	29
08495	Gibraltar	14.2	0.8	107	-14	14.3	0.5	46	-54
08515	Santa Maria/Azores	14.6	0.2	102	2	14.9	0.9	49	-37
08535	Lisbon	11.2	-0.2	103	-7	12.7	0.4	167	56
10384	Berlin-Tempelhof	1.9	2.1	34	-9	0.1	-0.7	25	-9
11035	Vienna	1.1	2.1	32	-6	0.7	-0.3	10	-32
11518	Prague	-0.9	1.5	23	0	-1.5	-0.7	5	-18
11903	Sliaac	-3.3	0.6	21	-23	-1.5	-0.4	11	-33
12160	Elblag	-0.9	1.5	43	-4	-4.5	-2.3	37	12
12375	Warsaw	-0.5	2.8	39	17	-3.8	-1.8	21	0
12843	Budapest	-0.1	1.5	16	-16	0.1	-1.0	4	-28
13274	Belgrade	1.5	1.1	48	-1	0.9	-1.8	56	12
14015	Ljubljana	1.5	2.6	50	-32	1.5	0.1	31	-49
14445	Split	8.1	0.7	22	-61	9.3	1.2	19	-49
14654	Sarajevo	0.1	1.0	38	-33	0.6	-0.9	36	-31
15420	Bucharest	-2.4	0.0	48	8	-2.5	-2.4	19	-17
15614	Sofia	-1.4	0.2	13	-14	0.0	-0.5	20	-13
16158	Pisa	6.7	0.6	48	-27	7.2	0.1	88	15
16597	Luqa	12.9	0.7	106	17	11.8	-0.6	90	29
16716	Athens	10.5	0.3	72	28	10.9	0.3	108	65
16754	Heraklion/Crete	13.0	1.0	72	-18	12.9	0.8	131	54
17040	Rize	7.6	1.3	275	52	6.4	-0.2	277	106
17062	Istanbul	6.8	1.2	40	-59	6.4	0.5	14	-53
17170	Van	-1.3	3.1	14	-20	-0.8	3.0	28	-5
17300	Antalya	12.1	2.2	77	-162	12.6	2.3	115	-81
17609	Larnaca	13.1	1.6	111	46	12.9	1.2	28	-29
22113	Murmansk	-11.3	0.4	39	6	-16.6	-5.4	15	-7
26038	Tallinn	-3.5	2.0	51	6	-9.6	-3.9	22	-7
26629	Kaunas	-2.9	2.1	41	4	-7.4	-3.1	38	11
26730	Vilnius	-3.3	2.8	43	2	-7.5	-2.7	36	-2
26850	Minsk	-3.8	3.1	54	14	-8.2	-2.4	30	-4
27612	Moscow	-7.5	1.8	37	-8	-11.0	-3.3	38	1
33345	Kiev	-2.4	3.2	23	-24	-6.1	-1.9	33	-13
33815	Kishinev	-1.6	1.7	31	-9	-3.2	-1.5	18	-20
34300	Kharkiv	-7.0	-0.1	32	-12	-8.9	-3.2	17	-15
34880	Astrakhan	-3.8	1.6	16	3	-6.7	-1.8	21	11
35108	Uralsk	-11.0	1.9	17	-8	-17.0	-4.5	27	9
37789	Yerevan	-0.4	3.1	27	6	0.0	1.0	41	17
40007	Aleppo	7.1	1.4	50	-14	8.3	1.0	30	-22
40080	Damascus	8.0	2.1	19	-10	8.8	0.9	58	34
40180	Tel Aviv	14.7	2.4	116	-33	15.0	2.1	49	-49
40199	Eilat	16.7	1.5	2	-3	18.5	1.6	<1	-5
40265	Mafraq	9.2	2.0	17	-17	9.8	1.1	53	22
60030	LasPalmas/Grand Canary	18.8	1.3	48	31	18.3	0.7	4	-18

WMO No.	Station	March 2011				April 2011			
		Temp.(°C)		Prec. (mm)		Temp.(°C)		Prec. (mm)	
		mean dev.	total dev.			mean dev.	total dev.		
01008	Svalbard Airport	-12.7	2.0	44	23	-5.8	5.9	17	5
01025	Tromso	-1.2	1.0	143	79	3.2	2.5	111	51
01492	Oslo	0.6	0.8	25	-21	9.4	4.8	33	-9
02196	Haparanda	-4.9	1.9	25	-10	2.7	3.2	22	-7
02485	Stockholm	1.2	1.1	11	-15	9.2	4.6	10	-20
02836	Sodankyla	-6.0	2.5	26	1	2.6	4.7	31	7
02974	Helsinki	-1.8	1.1	24	-10	6.0	3.1	24	-13
03091	Aberdeen	6.2	1.7	68	10	10.3	4.0	14	-39
03772	London	8.1	1.6	15	-32	14.1	5.2	2	-43
03967	Dublin Casement Aerodrome	6.3	0.3	15	-34	10.9	3.1	30	-17
04030	Reykjavik	0.2	-0.3	102	20	4.1	1.2	139	81
04360	Ammasslik	-9.4	-1.2	135	47	-2.6	1.5	124	51
06186	Copenhagen	3.6	1.0	17	-25	11.1	4.5	16	-26
06260	De Bilt	6.0	1.0	24	-39	13.1	5.1	8	-44
06447	Brussels	7.7	2.2	22	-32	14.1	5.3	26	-31
06590	Luxembourg	7.1	3.1	15	-55	13.3	5.8	25	-36
06660	Zurich	6.6	2.4	21	-48	12.7	4.9	24	-63
06700	Geneva	7.2	2.1	21	-58	13.2	4.4	20	-45
07510	Bordeaux	10.8	2.0	34	-42	16.2	4.9	11	-61
07650	Marseilles	11.0	0.8	58	14	15.8	2.6	5	-43
08222	Madrid	10.0	0.0	50	17	16.7	4.5	58	4
08314	Mahon/Menorca	12.1	0.5	46	-9	15.7	2.4	23	-27
08495	Gibraltar	15.1	0.1	169	94	17.9	1.7	84	24
08515	Santa Maria/Azores	14.3	-0.3	57	-22	15.4	0.2	44	-11
08535	Lisbon	13.7	0.0	89	20	18.7	3.6	136	72
10384	Berlin-Tempelhof	5.5	1.3	16	-21	13.1	4.5	37	-4
11035	Vienna	6.3	1.3	36	-5	13.0	3.1	43	-8
11518	Prague	4.7	1.7	29	1	11.3	3.6	13	-25
11903	Slac	4.7	1.7	53	11	11.9	3.4	25	-22
12160	Elblag	2.6	0.5	18	-17	9.9	3.1	40	-2
12375	Warsaw	3.3	1.3	8	-20	11.1	3.3	34	2
12843	Budapest	6.6	1.0	22	-7	13.5	2.4	7	-31
13274	Belgrade	7.8	0.6	28	-22	14.1	1.7	14	-45
14015	Ljubljana	7.1	1.7	87	-11	13.5	3.6	38	-71
14445	Split	11.2	0.8	46	-29	17.0	3.1	7	-59
14654	Sarajevo	5.2	0.1	41	-29	10.9	1.5	33	-41
15420	Bucharest	4.5	-0.3	5	-33	10.2	-1.1	36	-10
15614	Sofia	5.0	0.4	29	-9	9.8	-0.1	16	-34
16158	Pisa	9.8	0.3	87	11	14.0	1.5	24	-55
16597	Luqa	13.0	-0.4	55	14	16.4	0.9	29	6
16716	Athens	11.8	-0.8	21	-20	15.5	-0.6	48	23
16754	Heraklion/Crete	13.6	0.2	63	7	15.7	-0.6	60	30
17040	Rize	8.1	0.2	144	-2	9.7	-1.9	162	60
17062	Istanbul	8.2	0.7	46	-16	10.3	-1.7	76	27
17170	Van	2.3	1.4	31	-11	8.6	1.3	133	79
17300	Antalya	14.1	1.4	24	-79	16.6	0.5	135	89
17609	Larnaca	14.5	1.2	38	-11	17.3	-0.1	21	10
22113	Murmansk	-3.5	3.3	17	-3	2.1	4.0	33	12
26038	Tallinn	-1.0	1.2	23	-6	5.3	1.9	10	-26
26629	Kaunas	0.1	0.3	14	-18	9.0	3.0	25	-18
26730	Vilnius	-0.2	0.4	13	-26	8.7	3.0	31	-15
26850	Minsk	-0.3	1.1	7	-35	8.2	2.2	20	-22
27612	Moscow	-2.0	0.2	21	-13	6.4	0.6	44	4
33345	Kiev	1.5	0.8	7	-32	10.2	1.5	23	-26
33815	Kishinev	3.9	1.0	16	-19	10.2	0.0	58	16
34300	Kharkiv	-0.5	-0.2	6	-21	8.5	-0.4	47	11
34880	Astrakhan	1.1	-0.2	14	0	9.5	-1.6	74	56
35108	Uralsk	-6.9	-1.9	52	32	6.1	-1.6	49	30
37789	Yerevan	6.4	0.6	26	-6	11.9	-0.8	89	52
40007	Aleppo	11.8	0.8	17	-28	15.9	0.1	43	7
40080	Damascus	11.7	0.7	12	-5	15.8	0.3	29	18
40180	Tel Aviv	15.8	0.9	108	46	18.9	0.7	40	17
40199	Eilat	20.9	0.9	0	-4	24.5	0.3	5	1
40265	Mafrag	12.1	0.6	14	-15	15.9	0.1	10	0
60030	LasPalmas/Grand Canary	18.3	-0.1	10	0	19.7	1.0	17	11

WMO No.	Station	May 2011				June 2011			
		Temp.(°C)		Prec. (mm)		Temp.(°C)		Prec. (mm)	
		mean dev.	total dev.			mean dev.	total dev.		
01008	Svalbard Airport	-1.6	2.1	11	5	4.8	2.6	1	-9
01025	Tromso	6.7	1.8	41	-7	11.1	1.8	29	-24
01492	Oslo	11.3	0.5	84	32	15.9	0.7	142	77
02196	Haparanda	6.8	0.7	47	16	14.9	2.1	68	27
02485	Stockholm	11.9	1.2	34	4	17.4	1.8	55	10
02836	Sodankyla	6.5	1.5	51	16	14.5	2.9	80	24
02974	Helsinki	10.8	0.9	27	-8	17.4	2.5	41	-3
03091	Aberdeen	10.4	1.4	44	-15	12.4	0.3	105	52
03772	London	14.4	1.9	25	-26	15.9	0.2	84	33
03967	Dublin Casement Aerodrome	11.4	0.9	52	-6	12.4	-0.9	65	17
04030	Reykjavik	6.9	0.6	66	22	9.2	0.2	15	-35
04360	Ammasslik	1.2	0.6	31	-26	5.2	1.1	5	-47
06186	Copenhagen	12.7	0.7	58	15	16.8	0.7	53	-1
06260	De Bilt	14.0	1.7	31	-30	16.1	0.9	114	46
06447	Brussels	14.8	1.9	23	-48	16.8	1.1	72	-7
06590	Luxembourg	15.1	3.3	49	-32	16.5	1.6	106	24
06660	Zurich	15.3	3.2	90	-13	16.8	1.6	79	-45
06700	Geneva	16.3	3.3	36	-41	17.8	1.3	65	-24
07510	Bordeaux	18.4	3.8	8	-69	19.0	1.2	21	-35
07650	Marseilles	19.9	2.8	<1	-42	21.4	0.5	97	69
08222	Madrid	19.1	3.1	61	20	22.8	2.1	29	3
08314	Mahon/Menorca	18.9	2.1	11	-26	21.1	0.3	16	2
08495	Gibraltar	20.0	1.5	38	3	22.6	1.5	5	-6
08515	Santa Maria/Azores	16.2	-0.5	17	-13	19.2	0.5	5	-17
08535	Lisbon	20.5	3.1	85	46	21.2	1.0	8	-13
10384	Berlin-Tempelhof	15.6	1.7	18	-38	19.0	1.6	54	-21
11035	Vienna	16.0	1.4	55	-6	19.8	1.9	113	39
11518	Prague	13.8	1.1	33	-44	17.3	1.4	65	-8
11903	Sliač	14.8	1.1	30	-34	18.4	1.8	149	64
12160	Elblag	13.2	0.3	56	15	17.4	2.0	48	-46
12375	Warsaw	14.4	1.0	48	-11	19.0	2.4	49	-23
12843	Budapest	16.8	0.8	64	9	20.6	1.5	82	19
13274	Belgrade	17.5	0.3	67	-4	22.0	1.9	41	-49
14015	Ljubljana	17.0	2.4	98	-24	20.0	2.2	145	-10
14445	Split	20.2	1.8	68	12	25.1	2.9	20	-31
14654	Sarajevo	13.8	-0.3	104	22	18.7	1.8	76	-15
15420	Bucharest	15.8	-0.9	107	37	20.7	0.5	47	-30
15614	Sofia	14.8	0.5	31	-42	19.1	1.4	14	-58
16158	Pisa	18.1	1.8	8	-51	21.7	1.9	47	3
16597	Luqa	18.9	-0.2	11	4	23.4	0.4	4	1
16716	Athens	20.2	-0.4	43	27	25.4	0.3	15	8
16754	Heraklion/Crete	19.6	-0.2	56	40	24.3	0.8	<1	-3
17040	Rize	15.3	-0.5	78	-23	20.7	0.8	259	134
17062	Istanbul	16.7	0.2	25	-6	22.1	1.0	16	-5
17170	Van	12.4	-0.4	63	13	18.7	1.1	30	9
17300	Antalya	20.2	-0.1	70	42	25.4	0.4	25	17
17609	Larnaca	21.2	0.3	5	-2	25.2	0.9	<1	<1
22113	Murmansk	5.7	1.9	45	13	11.3	1.9	25	-28
26038	Tallinn	10.2	0.5	50	13	16.8	2.3	81	28
26629	Kaunas	12.7	0.0	47	-9	18.1	2.1	54	-21
26730	Vilnius	12.9	0.4	79	17	18.3	2.5	40	-37
26850	Minsk	13.6	0.7	81	19	18.8	2.7	69	-14
27612	Moscow	14.6	1.7	25	-33	19.0	2.4	38	-38
33345	Kiev	16.7	1.6	27	-26	21.1	2.9	132	59
33815	Kishinev	16.8	0.7	56	5	20.1	0.7	149	74
34300	Kharkiv	17.8	2.2	28	-19	21.1	2.2	121	63
34880	Astrakhan	18.3	0.0	78	54	24.3	1.4	36	14
35108	Uralsk	16.7	0.6	34	13	19.2	-1.0	63	26
37789	Yerevan	16.3	-1.2	75	32	22.3	0.4	24	3
40007	Aleppo	20.9	-0.3	18	-1	26.4	0.6	0	-2
40080	Damascus	20.5	0.3	8	4	24.9	0.5	0	0
40180	Tel Aviv	22.1	1.0	11	8	24.9	0.9	0	0
40199	Eilat	28.5	0.1	0	-1	31.8	0.1	0	0
40265	Mafrq	19.9	0.1	0	-3	23.0	0.3	0	0
60030	Las Palmas/Grand Canary	21.4	1.5	0	-2	23.8	2.4	0	0

WMO No.	Station	July 2011				August 2011			
		Temp.(°C) mean dev.	Prec. (mm) total dev.			Temp.(°C) mean dev.	Prec. (mm) total dev.		
01008	Svalbard Airport	6.9	0.9	14	1	6.9	2.1	8	-17
01025	Tromso	11.3	-0.4	62	-10	12.1	1.2	34	-48
01492	Oslo	18.0	1.6	106	22	16.1	0.9	198	108
02196	Haparanda	17.7	2.2	27	-23	14.0	0.7	30	-33
02485	Stockholm	19.4	2.2	13	-59	17.4	1.2	90	24
02836	Sodankyla	16.5	2.4	87	22	12.5	1.3	34	-29
02974	Helsinki	20.9	4.3	55	-18	16.9	1.9	86	6
03091	Aberdeen	13.4	-0.4	76	16	13.3	-0.3	125	50
03772	London	17.2	-0.6	50	4	17.6	0.2	69	18
03967	Dublin Casement Aerodrome	14.1	-0.8	53	-1	13.6	-1.0	52	-26
04030	Reykjavik	12.2	1.6	45	-7	11.2	0.9	23	-39
04360	Ammasslik	7.4	1.0	33	-16	6.8	0.8	67	6
06186	Copenhagen	17.8	0.6	155	86	17.2	0.2	108	45
06260	De Bilt	15.9	-0.9	179	104	16.9	0.2	96	25
06447	Brussels	16.0	-1.5	56	-19	17.3	0.0	189	126
06590	Luxembourg	15.9	-1.0	54	-14	17.8	1.4	82	10
06660	Zurich	16.5	-1.1	199	82	19.2	2.5	114	-19
06700	Geneva	17.8	-1.3	102	35	20.2	2.0	71	-8
07510	Bordeaux	19.5	-0.7	60	13	21.3	1.4	89	35
07650	Marseilles	22.9	-0.9	85	71	24.1	0.9	10	-19
08222	Madrid	25.1	0.7	0	-13	25.9	2.0	10	1
08314	Mahon/Menorca	23.6	-0.6	19	15	25.2	0.7	4	-22
08495	Gibraltar	24.3	0.6	0	-1	25.4	1.2	2	-4
08515	Santa Maria/Azores	21.3	0.5	4	-21	23.6	1.4	5	-35
08535	Lisbon	21.3	-1.1	<1	-5	22.1	-0.7	36	30
10384	Berlin-Tempelhof	18.1	-0.7	185	133	19.0	0.6	74	13
11035	Vienna	19.2	-0.5	84	21	21.1	2.2	28	-30
11518	Prague	16.8	-0.7	143	77	18.5	1.5	54	-16
11903	Slac	19.0	0.8	143	84	20.5	3.2	25	-44
12160	Elblag	18.2	1.4	149	55	18.0	1.3	102	21
12375	Warsaw	18.0	0.1	295	228	18.9	1.6	62	-1
12843	Budapest	20.8	-0.1	69	17	22.7	2.4	15	-36
13274	Belgrade	23.9	2.2	95	29	24.5	3.2	14	-38
14015	Ljubljana	21.1	1.2	157	35	22.8	3.7	43	-101
14445	Split	26.0	0.6	133	105	27.6	2.4	1	-49
14654	Sarajevo	20.4	1.5	134	55	21.4	2.9	5	-66
15420	Bucharest	23.2	1.2	65	1	22.0	0.8	53	-5
15614	Sofia	21.9	1.9	111	55	21.4	2.0	45	-7
16158	Pisa	23.1	0.3	23	0	24.4	1.9	<1	-57
16597	Luqa	26.7	0.8	<1	<1	26.8	0.5	0	-7
16716	Athens	29.6	1.8	0	-5	29.4	1.8	0	-5
16754	Heraklion/Crete	27.2	1.5	0	-1	26.6	1.0	0	-1
17040	Rize	24.7	2.5	165	31	23.8	1.6	160	-26
17062	Istanbul	26.3	3.1	8	-11	24.6	1.6	14	-12
17170	Van	22.6	0.7	11	7	21.1	-0.1	<1	-4
17300	Antalya	28.6	0.5	0	-3	29.8	2.1	0	-1
17609	Larnaca	27.9	1.0	<1	<1	28.3	1.2	2	2
22113	Murmansk	14.1	1.3	96	36	11.0	0.0	81	16
26038	Tallinn	20.1	3.8	160	81	16.6	1.3	54	-30
26629	Kaunas	19.6	2.5	146	78	17.5	1.2	152	89
26730	Vilnius	19.6	2.7	155	77	17.3	1.0	101	29
26850	Minsk	20.2	2.9	152	64	17.9	1.4	79	7
27612	Moscow	23.4	5.3	71	-21	18.7	2.3	62	-12
33345	Kiev	21.7	2.4	153	65	19.3	0.7	53	-16
33815	Kishinev	23.0	2.1	16	-53	21.8	1.3	16	-29
34300	Kharkiv	24.1	3.8	131	71	21.1	1.6	11	-39
34880	Astrakhan	28.4	3.1	7	-16	24.9	1.6	21	2
35108	Uralsk	26.5	4.0	1	-37	21.1	0.7	61	36
37789	Yerevan	27.0	1.0	26	16	24.9	-0.3	10	3
40007	Aleppo	29.9	1.6	0	0	29.5	1.4	0	-1
40080	Damascus	28.5	2.2	0	0	27.4	1.4	0	0
40180	Tel Aviv	27.5	1.8	0	0	27.8	1.7	<1	<1
40199	Eilat	34.7	1.8	0	0	33.8	1.0	0	0
40265	Mafrq	26.2	2.1	0	0	25.3	1.1	0	0
60030	Las Palmas/Grand Canary	24.1	0.8	0	0	24.4	0.3	0	0

WMO No.	Station	September 2011				October 2011			
		Temp.(°C)		Prec. (mm)		Temp.(°C)		Prec. (mm)	
		mean dev.	total dev.			mean dev.	total dev.		
01008	Svalbard Airport	4.4	3.9	25	2	-2.6	2.9	18	3
01025	Tromso	10.0	3.2	50	-44	6.0	3.1	141	16
01492	Oslo	12.7	1.9	142	52	7.6	1.2	75	-9
02196	Haparanda	10.7	2.8	121	58	4.7	2.2	77	13
02485	Stockholm	14.0	2.8	60	5	8.5	1.0	44	-6
02836	Sodankyla	8.7	2.8	42	-13	2.9	3.2	90	39
02974	Helsinki	12.9	2.9	81	8	7.6	2.2	86	13
03091	Aberdeen	13.5	1.8	90	22	10.8	0.9	68	-9
03772	London	16.9	1.9	35	-16	14.2	2.5	18	-40
03967	Dublin Casement Aerodrome	14.0	1.0	76	7	11.7	1.4	166	98
04030	Reykjavik	9.4	2.0	73	6	5.0	0.6	104	18
04360	Ammasslik	5.4	2.3	55	-13	-0.2	0.6	34	-48
06186	Copenhagen	14.9	1.3	56	-6	10.2	0.3	36	-23
06260	De Bilt	15.6	1.6	89	22	11.4	0.9	68	-4
06447	Brussels	16.5	2.0	83	24	12.1	1.2	49	-21
06590	Luxembourg	16.1	2.7	46	-24	10.2	1.1	30	-45
06660	Zurich	16.4	2.6	74	-18	9.5	0.2	75	6
06700	Geneva	17.2	2.3	45	-36	11.0	0.9	36	-41
07510	Bordeaux	19.6	1.7	25	-49	14.8	0.8	40	-48
07650	Marseilles	22.1	1.8	17	-30	17.2	1.1	55	-23
08222	Madrid	22.7	2.2	<1	-30	17.2	2.4	30	-15
08314	Mahon/Minorca	23.4	1.2	77	23	19.9	1.4	17	-67
08495	Gibraltar	22.9	0.1	11	-4	20.7	1.2	65	1
08515	Santa Maria/Azores	22.4	1.0	82	25	20.7	1.4	100	16
08535	Lisbon	21.9	0.2	21	-5	20.7	2.2	38	-42
10384	Berlin-Tempelhof	16.5	1.9	56	10	10.6	0.6	35	-1
11035	Vienna	17.7	2.6	21	-24	10.0	0.1	73	32
11518	Prague	15.6	2.3	32	-8	8.6	0.3	25	-5
11903	Sliač	16.6	3.2	5	-51	8.0	-0.3	18	-32
12160	Elblag	14.6	1.9	49	-21	9.3	0.4	45	-8
12375	Warsaw	15.1	1.9	7	-36	8.5	0.2	9	-29
12843	Budapest	19.9	3.5	4	-36	10.8	-0.1	29	-5
13274	Belgrade	22.5	4.8	48	-3	12.0	-0.4	36	-4
14015	Ljubljana	19.4	3.9	64	-66	10.0	-0.4	181	66
14445	Split	25.4	4.0	18	-43	17.2	0.3	94	15
14654	Sarajevo	18.9	3.8	39	-31	9.1	-1.3	69	-19
15420	Bucharest	19.6	2.7	7	-35	9.2	-1.6	34	2
15614	Sofia	19.3	3.5	24	-15	9.2	-1.2	62	25
16158	Pisa	21.9	2.4	35	-54	16.0	0.7	19	-101
16597	Luqa	25.2	1.1	7	-33	20.1	-0.6	85	-5
16716	Athens	27.0	2.8	2	-8	17.8	-1.5	52	0
16754	Heraklion/Crete	25.0	1.9	6	-12	18.9	-0.8	92	16
17040	Rize	21.0	1.6	338	115	15.8	0.4	493	220
17062	Istanbul	22.9	3.2	10	-31	15.0	-0.3	70	-1
17170	Van	18.0	1.2	53	43	9.9	-0.2	82	34
17300	Antalya	27.4	2.9	59	48	20.1	0.5	73	3
17609	Larnaca	26.3	1.2	1	1	21.9	0.6	5	-14
22113	Murmansk	9.4	2.7	30	-22	4.1	3.1	64	22
26038	Tallinn	13.1	2.3	87	5	8.2	1.9	67	-3
26629	Kaunas	13.6	1.5	74	15	7.4	0.5	22	-29
26730	Vilnius	13.3	1.7	62	-3	6.6	0.0	13	-40
26850	Minsk	13.7	2.0	28	-32	6.2	-0.1	36	-13
27612	Moscow	12.1	1.2	75	11	6.6	1.6	63	5
33345	Kiev	15.8	1.9	18	-29	7.7	-0.4	77	42
33815	Kishinev	19.1	2.9	8	-40	9.4	-0.7	36	9
34300	Kharkiv	15.7	1.6	13	-28	7.8	0.5	27	-8
34880	Astrakhan	18.1	0.8	23	-3	10.7	1.6	9	-8
35108	Uralsk	14.2	0.1	56	29	6.8	1.7	31	1
37789	Yerevan	20.3	-0.4	4	-6	12.8	-0.4	22	-5
40007	Aleppo	26.9	1.7	1	-1	19.2	-0.4	11	-11
40080	Damascus	24.9	1.7	0	-1	18.6	0.5	7	-5
40180	Tel Aviv	26.6	1.8	2	2	23.6	1.6	2	-24
40199	Eilat	31.7	1.3	0	0	27.1	0.4	0	-4
40265	Mafrag	23.7	1.0	0	-1	18.8	-0.3	0	-7
60030	Las Palmas/Grand Canary	24.5	0.7	0	-8	23.8	1.3	0	-10

WMO No.	Station	November 2011				December 2011			
		Temp.(°C)		Prec. (mm)		Temp.(°C)		Prec. (mm)	
		mean dev.	total dev.			mean dev.	total dev.		
01008	Svalbard Airport	-6.0	4.5	27	14	-6.6	6.7	5	-7
01025	Tromso	4.0	4.8	156	52	-0.5	2.5	71	-33
01492	Oslo	4.6	3.9	19	-56	0.8	3.6	74	18
02196	Haparanda	1.6	5.7	34	-24	-0.7	8.8	120	78
02485	Stockholm	6.1	3.5	15	-38	2.5	3.5	75	29
02836	Sodankyla	-2.1	5.3	43	4	-3.7	9.4	70	39
02974	Helsinki	4.2	4.1	27	-45	2.1	6.2	167	109
03091	Aberdeen	8.8	3.8	34	-41	4.1	0.6	51	-22
03772	London	10.7	3.5	29	-26	6.9	1.8	63	6
03967	Dublin Casement Aerodrome	9.9	3.2	55	-15	5.8	0.5	53	-24
04030	Reykjavik	4.3	3.2	90	17	-1.9	-1.7	78	-1
04360	Ammasslik	-1.7	3.0	109	13	-9.4	-2.2	54	-49
06186	Copenhagen	7.3	1.8	4	-58	4.7	2.5	50	-8
06260	De Bilt	7.2	1.3	11	-70	6.5	3.3	139	59
06447	Brussels	8.6	2.5	9	-67	6.1	2.6	152	76
06590	Luxembourg	6.1	2.3	10	-73	4.0	3.0	188	108
06660	Zurich	5.1	1.2	0	-82	3.6	3.0	169	96
06700	Geneva	6.5	1.5	19	-73	4.2	2.4	145	58
07510	Bordeaux	12.4	3.3	36	-58	9.4	3.0	175	76
07650	Marseilles	13.8	3.1	135	77	9.1	1.8	8	-48
08222	Madrid	11.2	1.8	65	1	6.9	0.5	5	-46
08314	Mahon/Menorca	16.9	2.5	200	123	13.0	1.2	15	-59
08495	Gibraltar	16.4	0.3	168	27	14.6	0.5	6	-140
08515	Santa Maria/Azores	16.7	-0.7	97	-5	16.2	0.8	75	-20
08535	Lisbon	14.7	0.2	155	41	12.2	0.4	27	-81
10384	Berlin-Tempelhof	5.0	0.1	1	-48	5.0	3.6	78	25
11035	Vienna	3.4	-1.2	0	-50	3.8	2.9	18	-25
11518	Prague	2.8	0.0	1	-31	2.9	3.5	30	4
11903	Slac	0.8	-2.2	1	-68	0.0	1.7	63	6
12160	Elblag	4.2	0.9	15	-41	2.9	2.6	35	-17
12375	Warsaw	3.0	-0.2	0	-42	2.6	3.5	32	0
12843	Budapest	3.2	-1.6	0	-52	2.6	2.2	61	21
13274	Belgrade	4.3	-2.7	5	-49	5.4	3.1	48	-10
14015	Ljubljana	3.8	-0.8	3	-132	3.3	3.3	101	0
14445	Split	13.3	1.1	107	-1	10.6	1.9	49	-51
14654	Sarajevo	3.4	-1.4	24	-67	2.1	2.3	94	30
15420	Bucharest	2.7	-2.5	2	-47	2.6	2.4	46	3
15614	Sofia	2.6	-2.4	2	-45	1.3	0.8	38	-1
16158	Pisa	11.7	1.3	27	-97	9.0	2.2	94	9
16597	Luqa	17.4	0.4	132	52	14.1	0.3	73	-39
16716	Athens	12.1	-3.4	<1	-50	11.8	-0.4	63	-8
16754	Heraklion/Crete	14.5	-2.1	20	-39	13.2	-0.6	30	-44
17040	Rize	8.4	-3.2	237	-13	8.4	0.1	126	-112
17062	Istanbul	9.2	-2.4	16	-73	9.1	1.0	97	-25
17170	Van	0.8	-3.2	19	-25	-0.6	0.5	12	-22
17300	Antalya	14.9	0.1	20	-114	12.5	1.1	126	-101
17609	Larnaca	15.4	-1.0	126	82	13.3	0.1	98	22
22113	Murmansk	-1.0	4.1	58	18	-2.1	7.2	22	-16
26038	Tallinn	5.0	3.8	46	-22	2.0	4.9	125	70
26629	Kaunas	3.5	1.4	22	-31	1.9	4.3	37	-7
26730	Vilnius	2.9	1.7	16	-41	1.2	4.1	46	-9
26850	Minsk	2.3	1.5	17	-35	1.1	4.9	42	-11
27612	Moscow	0.2	1.3	45	-13	-0.1	6.0	76	24
33345	Kiev	2.4	0.3	5	-46	2.2	4.5	29	-23
33815	Kishinev	2.9	-1.5	<1	-39	2.9	3.2	23	-15
34300	Kharkiv	0.5	-0.8	8	-36	1.3	4.7	53	8
34880	Astrakhan	-1.1	-4.4	14	-5	-1.2	0.7	9	-6
35108	Uralsk	-5.3	-3.2	31	-4	-8.9	-0.5	9	-20
37789	Yerevan	2.4	-4.1	14	-8	-2.1	-2.3	9	-14
40007	Aleppo	9.1	-3.1	56	21	6.2	-1.0	55	-4
40080	Damascus	9.0	-2.8	13	-9	6.2	-1.0	3	-23
40180	Tel Aviv	16.5	-1.5	128	60	14.4	0.6	31	-107
40199	Eilat	19.2	-2.3	0	-3	16.4	-0.2	0	-6
40265	Mafraq	10.6	-2.9	43	26	8.3	-0.5	9	-19
60030	Las Palmas/Grand Canary	20.7	0.3	1	-20	19.4	1.1	2	-19

WMO No.	Station	Year 2011			
		Temp.(°C) mean dev.	Prec. (mm) total dev.		
01008	Svalbard Airport	-3.3	3.1	199	16
01025	Tromso	4.6	1.8	971	-2
01492	Oslo	7.4	1.7	998	229
02196	Haparanda	3.4	2.2	648	96
02485	Stockholm	8.5	1.9	478	-61
02836	Sodankyla	1.7	2.7	596	96
02974	Helsinki	6.7	2.2	702	51
03091	Aberdeen	9.3	1.4	812	29
03772	London	12.4	1.9	510	-89
03967	Dublin Casement Aerodrome	10.1	0.8	727	-8
04030	Reykjavik	5.4	1.0	905	107
04360	Ammasslik	-0.6	1.1	838	-94
06186	Copenhagen	9.7	1.1	603	-33
06260	De Bilt	10.9	1.5	909	104
06447	Brussels	11.6	1.7	816	16
06590	Luxembourg	10.6	2.3	704	-171
06660	Zurich	10.5	2.0	914	-172
06700	Geneva	11.4	1.8	621	-333
07510	Bordeaux	14.6	1.9	588	-335
07650	Marseilles	16.0	1.2	511	-34
08222	Madrid	16.0	1.7	380	-76
08314	Mahon/Menorca	17.6	1.0	592	-6
08495	Gibraltar	19.0	0.8	701	-74
08515	Santa Maria/Azores	18.0	0.5	637	-138
08535	Lisbon	17.6	0.8	866	113
10384	Berlin-Tempelhof	10.8	1.4	613	29
11035	Vienna	11.0	1.3	513	-94
11518	Prague	9.2	1.3	453	-73
11903	Sliač	9.2	1.3	544	-142
12160	Elblag	8.7	1.1	637	-53
12375	Warsaw	9.1	1.3	604	85
12843	Budapest	11.5	1.1	373	-145
13274	Belgrade	13.0	1.1	500	-184
14015	Ljubljana	11.7	1.9	998	-395
14445	Split	17.6	1.7	584	-241
14654	Sarajevo	10.4	0.9	693	-225
15420	Bucharest	10.5	-0.1	469	-126
15614	Sofia	10.2	0.5	405	-158
16158	Pisa	15.3	1.2	501	-403
16597	Luqa	18.9	0.3	593	40
16716	Athens	18.5	0.0	425	56
16754	Heraklion/Crete	18.7	0.2	531	30
17040	Rize	14.2	0.3	2714	542
17062	Istanbul	14.8	0.7	432	-265
17170	Van	9.3	0.7	477	99
17300	Antalya	19.5	1.1	724	-342
17609	Larnaca	19.8	0.7	436	107
22113	Murmansk	1.9	2.0	525	47
26038	Tallinn	6.9	1.8	776	109
26629	Kaunas	7.8	1.4	672	64
26730	Vilnius	7.5	1.5	635	-48
26850	Minsk	7.5	1.7	615	-62
27612	Moscow	6.7	1.8	595	-93
33345	Kiev	9.2	1.5	580	-69
33815	Kishinev	10.4	0.8	428	-119
34300	Kharkiv	8.5	1.0	494	-25
34880	Astrakhan	10.2	0.2	322	102
35108	Uralsk	5.1	-0.3	431	107
37789	Yerevan	11.8	-0.3	367	90
40007	Aleppo	17.6	0.3	281	-56
40080	Damascus	17.0	0.5	149	3
40180	Tel Aviv	20.6	1.1	488	-79
40199	Eilat	25.3	0.5	8	-24
40265	Mafraq	16.9	0.4	146	-13
60030	Las Palmas/Grand Canary	21.4	0.9	82	-35

Seasonal and Annual Areal Means of Temperature Anomalies for each country (Reference: 1961-1990)

from gridded data (result of spatial analysis of CLIMAT and SHIP data)

Country	Winter 2010/2011	Spring 2011	Summer 2011	Autumn 2011	Year 2011
Albania	0.8	1.0	1.9	0.7	1.1
Andorra	-0.5	2.5	0.4	2.0	1.4
Armenia	2.0	-0.1	1.2	-1.4	-0.0
Austria	0.2	2.4	1.3	1.2	1.6
Azerbaijan	1.5	-0.2	1.8	-1.0	0.2
Belarus	-0.9	1.1	2.3	1.0	1.6
Belgium	-0.2	3.2	0.1	1.8	1.8
Bosnia and Herzegovina	0.6	1.2	2.3	0.8	1.4
Bulgaria	-0.1	-0.3	1.4	-0.3	0.3
Croatia	0.5	1.7	2.3	0.9	1.6
Cyprus	2.0	0.5	1.1	0.5	0.8
Czech Republic	-0.9	2.2	1.0	0.9	1.4
Denmark	-1.8	2.2	0.9	1.5	1.4
Estonia	-1.8	1.3	2.6	2.5	1.9
Faroer Islands	0.4	1.4	0.1	2.0	1.0
Finland	-2.7	2.1	2.0	3.3	2.2
France	-0.3	2.9	0.2	1.7	1.5
Georgia	1.5	-0.7	1.2	-1.3	-0.2
Germany	-0.8	2.6	0.6	1.0	1.5
Greece	0.7	-0.1	1.3	-0.5	0.3
Greenland	5.7	0.7	1.4	1.6	1.7
Hungary	-0.3	1.4	1.6	0.2	1.0
Iceland	1.7	1.2	0.2	2.0	1.0
Ireland	-1.4	1.4	-0.9	1.4	0.6
Israel	1.7	0.7	1.2	0.1	0.8
Italy	0.2	1.7	1.3	1.4	1.3
Jordan	1.1	0.1	1.2	-0.7	0.2
Kazakhstan	1.0	-0.5	2.0	-0.6	0.1
Latvia	-1.8	1.2	2.0	1.4	1.5
Lebanon	1.6	0.6	1.7	-0.1	0.8
Liechtenstein	-0.0	3.5	1.4	2.7	2.2
Lithuania	-1.8	1.2	2.3	1.9	1.7
Luxembourg	-0.1	3.7	0.6	2.0	2.1
Macedonia	0.6	0.4	1.7	0.2	0.7
Malta	0.3	0.2	1.1	0.3	0.4
Moldova	-0.5	0.5	1.6	0.1	0.9
Montenegro	0.6	1.0	2.1	1.1	1.2
Netherlands	-0.6	2.5	0.1	1.1	1.4
Norway	-0.5	2.4	1.3	3.1	2.1
Poland	-1.4	1.6	1.4	0.6	1.2
Portugal	0.3	2.3	0.4	1.1	1.0
Romania	-0.4	0.3	1.6	-0.4	0.5
Russia	-1.5	1.0	2.0	1.4	1.3
Serbia	0.1	0.7	2.0	0.3	0.9
Slovakia	-0.6	1.7	1.5	0.2	1.1
Slovenia	0.5	2.1	2.1	1.0	1.7
Spain	0.4	2.5	1.0	1.8	1.5
Svalbard	2.0	3.9	1.0	3.8	3.1
Sweden	-2.2	2.1	1.5	2.9	1.9
Switzerland	0.3	3.4	1.1	1.9	2.0
Syria	1.4	0.4	1.2	-0.7	0.3
Turkey	1.9	-0.4	0.8	-1.1	-0.0
Ukraine	-0.2	0.7	2.0	0.1	1.0
United Kingdom	-0.6	2.1	-0.2	2.2	1.3

Seasonal and Annual Areal Means of Temperature Anomalies for each subregion (Reference: 1961-1990)

from gridded data (result of spatial analysis of CLIMAT and SHIP data)

Region	Winter 2010/2011	Spring 2011	Summer 2011	Autumn 2011	Year 2011
<i>Central and western Europe</i>	0.6	2.3	0.6	1.3	1.4
<i>Nordic and Baltic countries</i>	2.0	1.2	1.5	2.1	1.8
<i>Iberia</i>	-0.4	2.5	0.9	1.7	1.4
<i>Mediterranean, Italian and Balkan Peninsula</i>	-0.7	1.0	1.8	0.6	1.1
<i>Eastern Europe</i>	1.2	0.9	2.0	1.1	1.2
<i>Middle East</i>	-0.8	-0.1	1.5	-0.8	0.2

Temperature:

According to BAMS Annual State of the Climate 2011 was together with the year 2007 on rank 1 of the warmest years in Europe. With respect to uncertainties it was at least one of the 6 warmest years since 1850. This result is based upon the CRUTEM3 dataset (Brohan et.al. 2006), see also BAMS July 2012, p. 186. 'Europe' is here defined as the land area within 35°N - 75°N and 10°W - 30°E. For 'Europe' defined as the land area within 35°N - 75°N and 25°W - 45°E and the E-OBS dataset 2011 came out on rank 4 since 1950 (van der Schrier, G., 2013; see also: Climate Indicator Bulletin: European Temperature) with an Europe-average mean temperature 10.9°C (=normal + 1.1°C, compared to CRUTEM3 with +1.23 +/- 0.14°C). This difference is essentially due to the area taken for 'Europe'. E-OBS includes more of the North Atlantic (Iceland) as well as more of Eastern Europe, the Black Sea area and Middle East where the temperature anomalies were smaller or partially even negative (Fig.2.2). Both definitions for Europe do not cover the complete RA VI region. But a dataset covering the complete RA VI area is not yet available.

Locally in northern parts of Sweden 2011 was the warmest year on record. 2011 was as a whole the warmest year on record (for more than 100 years) for Norway (equal to 2006 and 1990), the 2nd warmest year since 1900 in Finland, the warmest since 1900 in France and Switzerland. The Belgian station Uccle recorded the highest annual mean temperature since 1833. Also in southern Europe the year 2011 was a very warm year. At coastal, central and eastern parts of Montenegro 2011 was the warmest year since the beginning of the 20th century. Spain recorded the warmest year since 1961 and Portugal reported the highest mean of the daily maximum temperatures since 1931. In Austria, Germany and Slovenia it was the warmest year on record on the higher mountains.

Most remarkable is that the polar region of the whole northern hemisphere was much warmer than normal. For the Region VI it was warmer than normal through all seasons of the year. The Middle East on the other hand had the smallest positive anomaly of the annual mean temperature. See the table on page 22.

Note: *Small differences between the areal temperature anomalies in the tables on pages 21 and 22 and according values given by individual countries may occur due to the calculation method. The anomalies result from the temperature analysis (see [RCC-CM: Products - Monitoring Europe - Temperature](#)).*

Precipitation:

The annual precipitation totals in 2011 (reference 1961-1990) were above normal in Scandinavia, Iceland, eastern Greenland and northern UK and locally in southwestern Mediterranean as well as partially in southeastern Russia. They were below normal partially in southern and western Europe and in Middle East. Remarkable is a large area of drier than normal precipitation spreading from southwestern France and the northern Iberian Peninsula to southwestern Ukraine, including southern England, eastern France and western Germany, Switzerland, Austria, northern Italy, the western Balkan Peninsula and western Romania. The deficit is mostly between 10 and 30 mm, but 30 to 50 mm at the western Adriatic coast. In terms of percentages the largest almost coherent area covers the western Balkan, eastern Austria and northern Italy, where between 60 and 80 percent of the normal annual precipitation fell. Locally it was even less. In the wetter than normal regions especially in the north and east on the other hand the 90 percentile was exceeded (reference 1951-2000).

Sunshine:

It was sunnier than normal in most parts of Central Europe as well as parts of western and southwestern, southern and southeastern Europe and around the southern Baltic Sea. The surplus ranged mostly between 5 and 25 percent and was highest in Poland and southern parts of eastern Germany exceeding the normal by 25 to 50 percent. The other areas were mostly close to normal or slightly below normal. Only northeastern Russia and the region around the Caspian Sea received less than 50 percent of the normal. Spring and autumn largely contributed to the surplus while summer was rather dull.

Drought

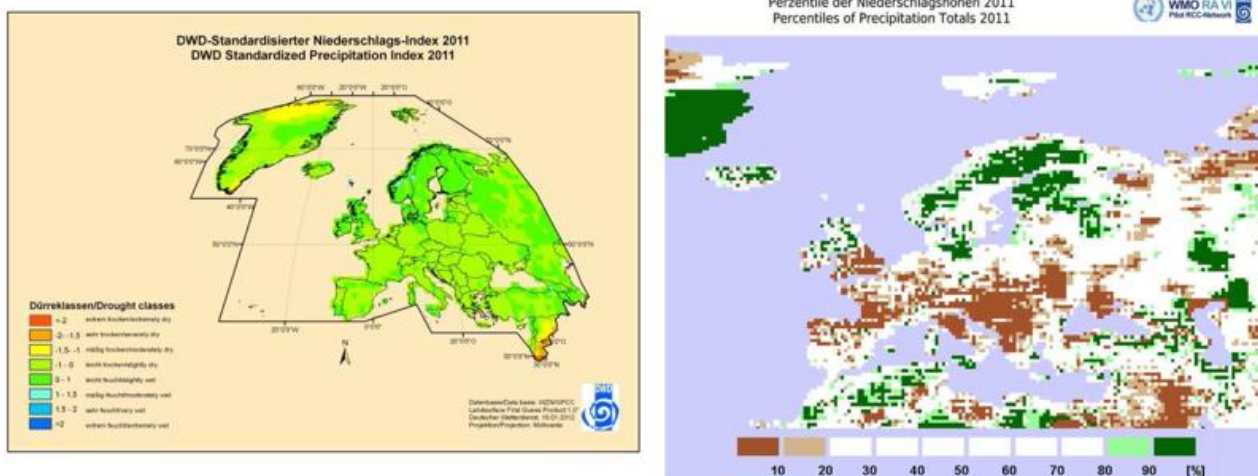


Fig. 2.3: Annual means of the modified Standardized Precipitation Index (DWD-SPI) and precipitation totals in terms of percentiles 2011 based on GPCC data 1951 to 2000

Drought Situation:

As the map of the modified Standardized Precipitation Index (SPI)(annual mean of 1-month DWD-SPI) shows, most of Europe was slightly dry over the year. The annual anomalies of the 3-months SPI and even a little more the 6-months SPI (see [European Climate Assessment & Dataset - Indices of extremes](#)) even show extremely dry conditions for many stations in western, southern and eastern Europe, including the southern British Isles. The map of the precipitation totals 2011 in terms of percentiles (on the basis 1951-2000) clearly show very dry as well as the very wet regions. The seasons spring and autumn 2011 mostly contributed to this result. Europe suffered from drought conditions during those seasons which were centered during spring in central and western Europe and on the Balkans during autumn. The spatial extent was large (see the maps) and affected regions which usually do not belong to the dry regions. Especially during November 2011 the drought situation spread over most of central, eastern and southeastern Europe and affected even northern Europe. Thus parts of Europe were affected by both drought events as for instance the United Kingdom. There is a Press Release of 8 June 2011 on the first drought episode under [Drought conditions in Europe 2011](#) and a Special Report in [Drought and precipitation extremes, in "State of the Climate 2011"](#). Some additional information will be given in part 3 'Monthly Survey in the section for November.

Snow Cover

Fig.2.4 to 2.6 show the maps of first occurrence of snow, last occurrence of snow and duration in the snow period for Europe September 2010 to August 2011 on the basis of SYNOP reports.

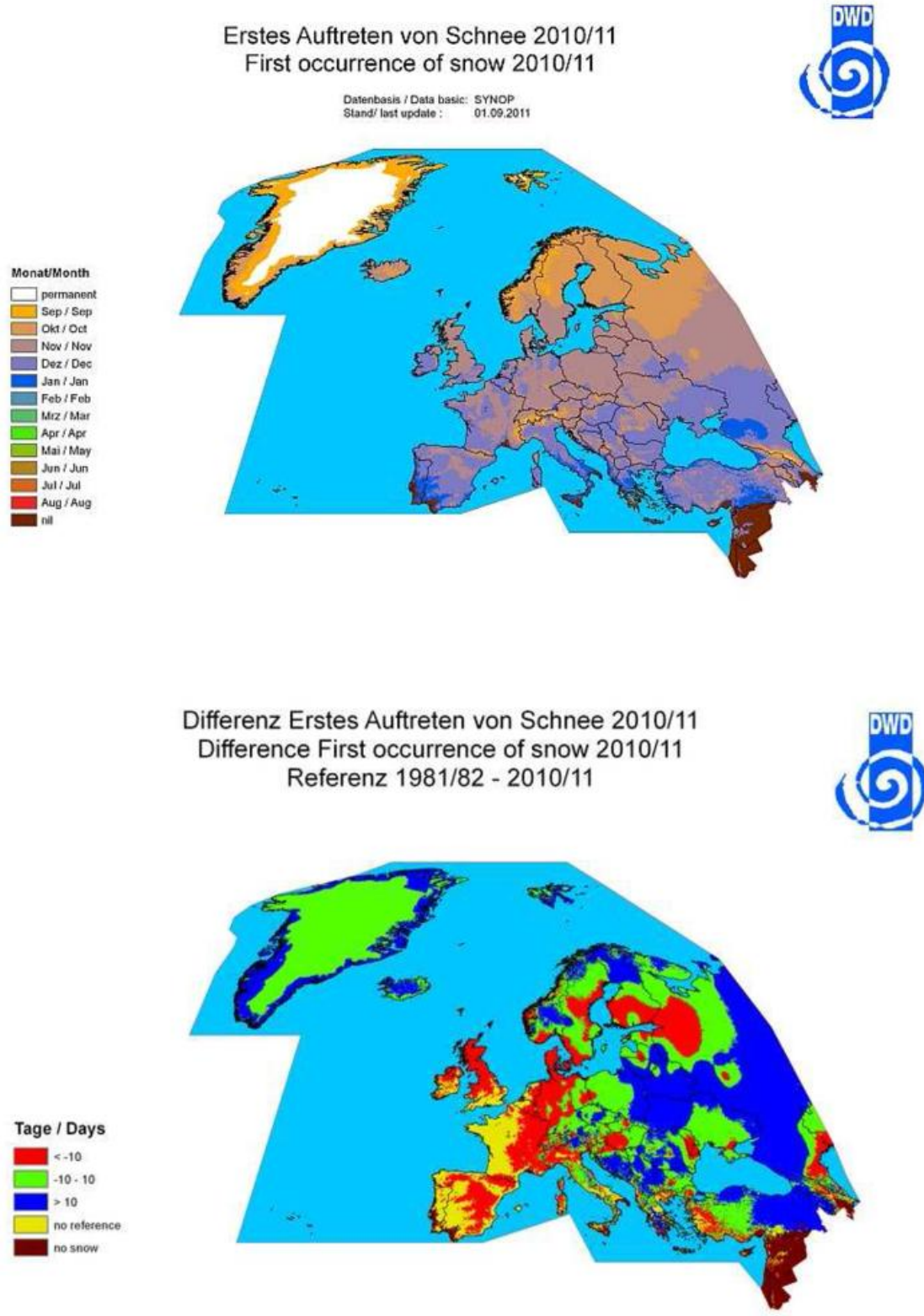
Earlier (October/November 2010) than usual (December/January) snow occurred in the northwest and southwest (northern England and Scotland and higher elevated parts of the Iberian Peninsula) of the European continent. Snow even occurred in western France and much of the Iberian Peninsula as well as southern Italy, the Ionean and the Aegean parts of Greece and western Turkey where no snow is expected according to the reference 1981/82 - 2010/11. In northern Russia and southern Finland snow fell already in October where it is usually to be expected in November. Snow fell later than usual in southern Russia, the Caucasus region and eastern Turkey.

On the other hand snow in the northwest melted earlier, already in January/February, where it usually may be expected until February/March. Most of the early snow in the west (France, southern England) melted already in the same month. Snow remained longer than usual in Poland, partly in Ukraine and in western Turkey.

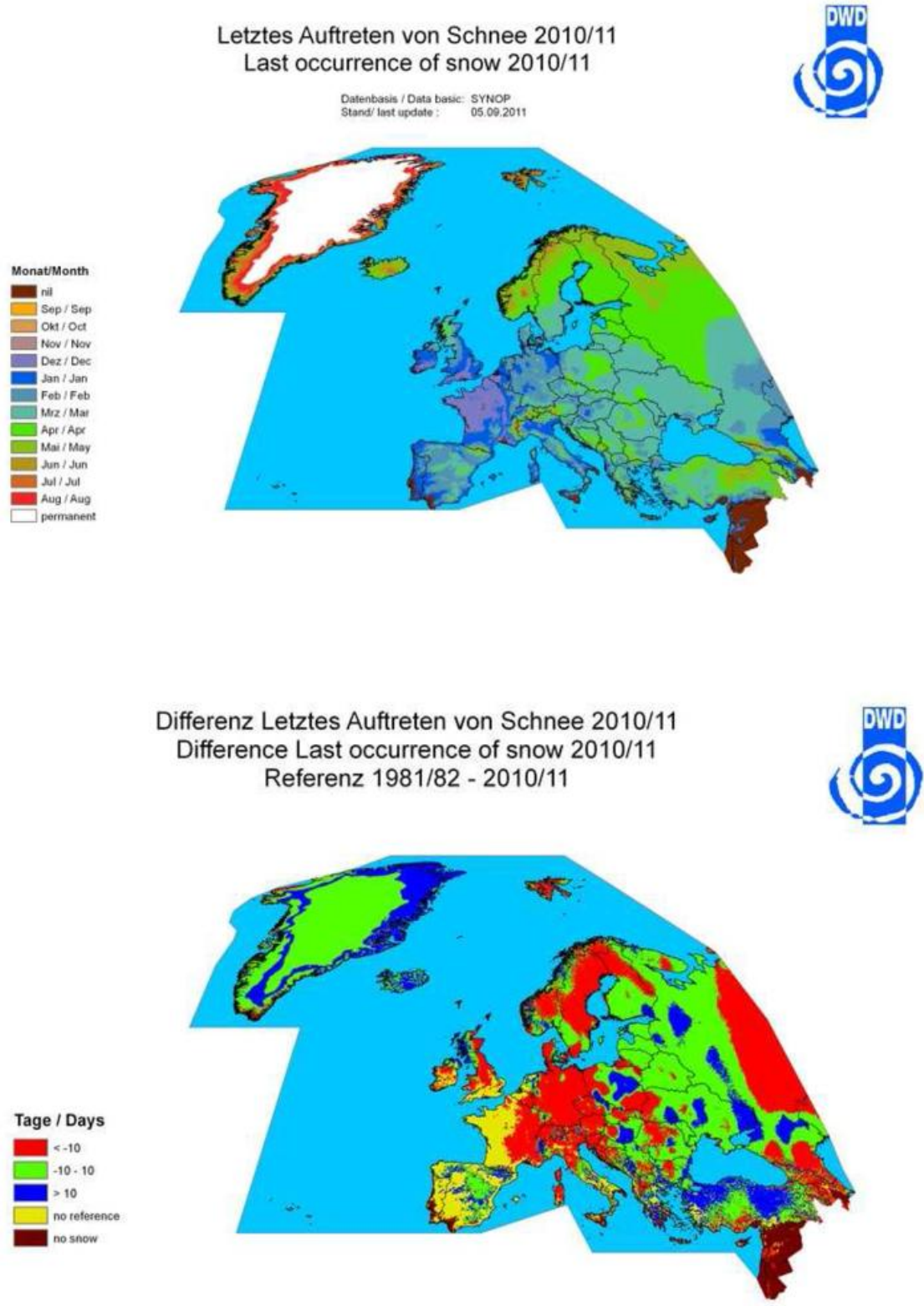
Overall the snow-season 2010/2011 was shorter than in average in eastern and northern Europe and in the Caucasus region while a short snow period occurred in the west where on average no snow occurs at all.

More information about snow conditions may be found on the RCC-CM-Webside ([RCC-CM](#)).

The snow cover extent for the entire Northern Hemisphere is operationally evaluated from satellite images by Rutgers's Laboratory (see: [2011 Annual Report](#)). The time series for annual snow extent covers 42 years, on a monthly basis up to 46 years. For the Northern Hemisphere the snow extent in 2011 was on rank 26 of 42, for Eurasia it was on rank 27. November 2011 was on rank 4 (of 46 years) of the most extensive snow cover in November on the Northern Hemisphere, in Eurasia it was on rank 5. January was on rank 6 (in Eurasia rank 11) of 45 years.



*Fig. 2.4: Upper Figure: Map of first occurrence of snow during the snow-season 2010/2011
Lower Figure: Map of anomaly of first occurrence of snow (reference 1981/1982 - 2010/2011)*



*Fig. 2.5: Upper Figure: Map of last occurrence of snow during the snow-season 2010/2011
 Lower Figure: Map of anomaly of last occurrence of snow (reference 1981/1982 - 2010/2011)*

Länge der Schneeperiode 2010/11
Duration of snow period 2010/11

Datenbasis / Data basic: SYNOP
Stand/ last update: 05.09.2011



Differenz Länge der Schneeperiode 2010/11
Difference Duration of snow period 2010/11
Referenz 1981/82 - 2010/11

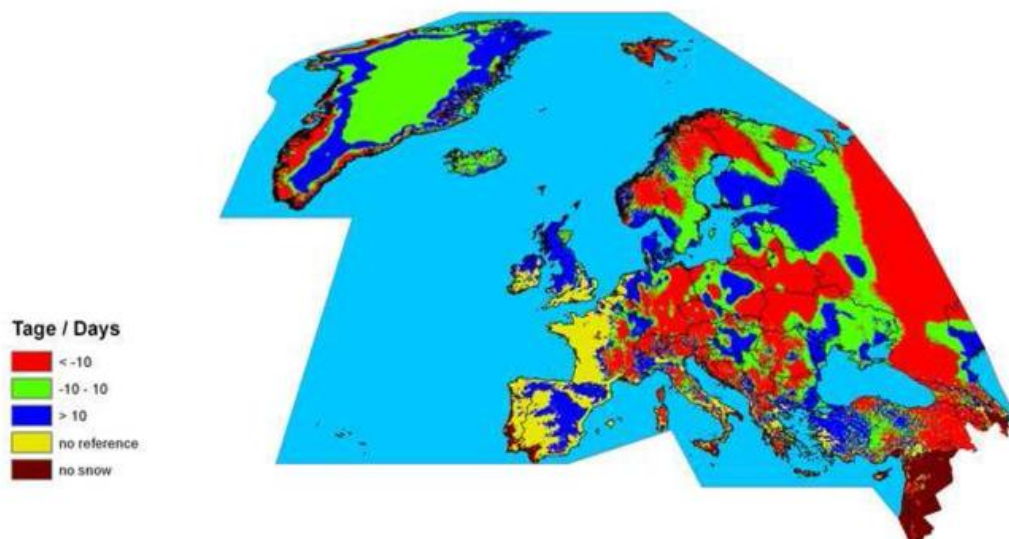


Fig. 2.6: Upper Figure: Map of duration of snow cover in the snow-season 2010/2011
Lower Figure: Map of anomaly duration of snow season (reference 1981/1982 - 2010/2011)

The Ozone Layer over Central Europe

(by Wolfgang Steinbrecht, Hans Claude, and Ulf Köhler - Deutscher Wetterdienst, Meteorological Observatory Hohenpeißenberg)

2011 was quite an unusual year for the ozone layer over the northern hemisphere, as was the very large decrease from 2010 to 2011. The major feature of 2011 was the extremely large chemical ozone depletion above the Arctic in spring of 2011. This record depletion, up to approximately 130 DU, exceeded what had previously been observed in the Arctic, e.g., in 1996, 2000, 2005. It was due to the still large levels of anthropogenic chlorine in the stratosphere in combination with an unusually stable and cold polar winter vortex. For the first time, the depletion in the Arctic was comparable in most aspects to the ozone hole occurring regularly above Antarctica. Figure 2.7 clearly shows the unusually low total ozone columns above the Arctic in early 2011 (top left panel). After the breakup of the Arctic vortex in April, ozone-depleted air-masses spread over the Northern hemisphere and contributed to the low total ozone columns observed throughout most of the year (other panels of Fig. 2.7). Additional factors favouring the generally low ozone columns at northern mid-latitudes in 2011 were:

- The phase of the quasi-biennial oscillation of the equatorial stratosphere (QBO) in early 2011. It resulted in high ozone in the tropics and low ozone at mid-latitudes, in the first half of 2011 (top panels of Fig. 2.7).
- The usually positive phase of the Arctic- or North-Atlantic Oscillation (AO or NAO) throughout most of 2011. It contributed to low ozone over the Atlantic sector from about 30°N to 50°N, and high ozone near Greenland / Iceland (right panels of Fig. 2.7). Note that this phase of the AO or NAO contrasted the largely opposite AO phase and high total ozone columns observed throughout 2010. The positive AO/NAO also contributed to the generally warm and sunny weather over much of Central Europe in 2011.

Figure 2.8 shows the time series of observed total ozone annual means (black dots, top) at Hohenpeißenberg in southern Germany (47.8°N, 11.0°E). Hohenpeißenberg results are representative for Central Europe, and are similar to much of the northern mid-latitudes. The red line in the top panel of Fig. 2.8, and the lower panels, show ozone variations attributed to several influence factors. This attribution is done by multiple linear regression analysis and can explain about 80% of the variance. The regression result is shown by the grey line in the top panel. On decadal time-scales, total ozone shows a substantial decline from the 1960s until the late 1990s, and a beginning recovery since. This is due to the large increase of anthropogenic chlorine until the mid-1990s and the slow chlorine decline following the end of CFC production initiated by the 1987 Montreal Protocol. In Fig. 2.8 the chlorine related total ozone variation is represented by the red curve for EESC (=Equivalent Effective Stratospheric Chlorine). Another important factor is the 11-year solar cycle (orange line, bottom panel). On the inter-annual time-scale the QBO and the Arctic Oscillation (or North-Atlantic-Oscillation) play major roles (magenta and blue lines in Fig. 2.8). They act on ozone, but are also connected with the intensity of the polar winter vortex. In particular, QBO and AO played a major role in the large swing from high total ozone in 2010 to low values in 2011. Figure 2.8 also give an indication of the ozone columns to be expected over the next decade or so. The beginning slow recovery of the ozone layer should continue. However, large variations are to be expected. Because chlorine levels are still high, winters with a stable and cold polar vortex will result in substantial ozone loss, and even "ozone hole" conditions. Climate change and stratospheric cooling may actually favour such conditions in the future. Substantial ozone loss can result in very high levels of UV-B radiation, particularly on sunny days in spring, and in Central Europe. A major volcanic eruption with substantial aerosol loading in the stratosphere would also result in low ozone levels, comparable to the all-time lows observed in 1992 and 1993, and the low values seen in 2011.

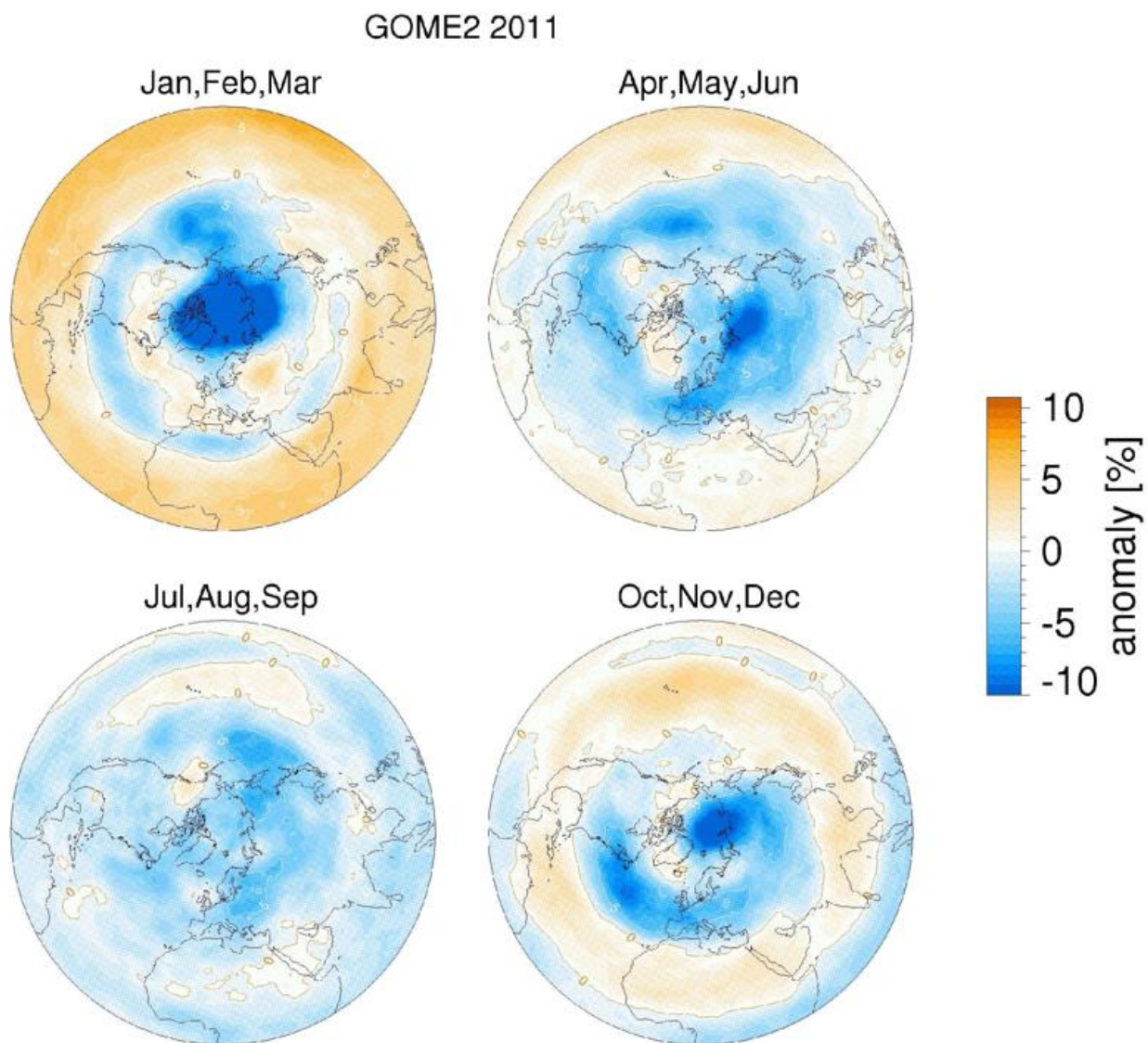


Fig. 2.7: Relative deviation of the total ozone columns observed by the GOME2 satellite instrument in 2011 from the 1979 to 2010 climatological mean. Data source: www.temis.nl.

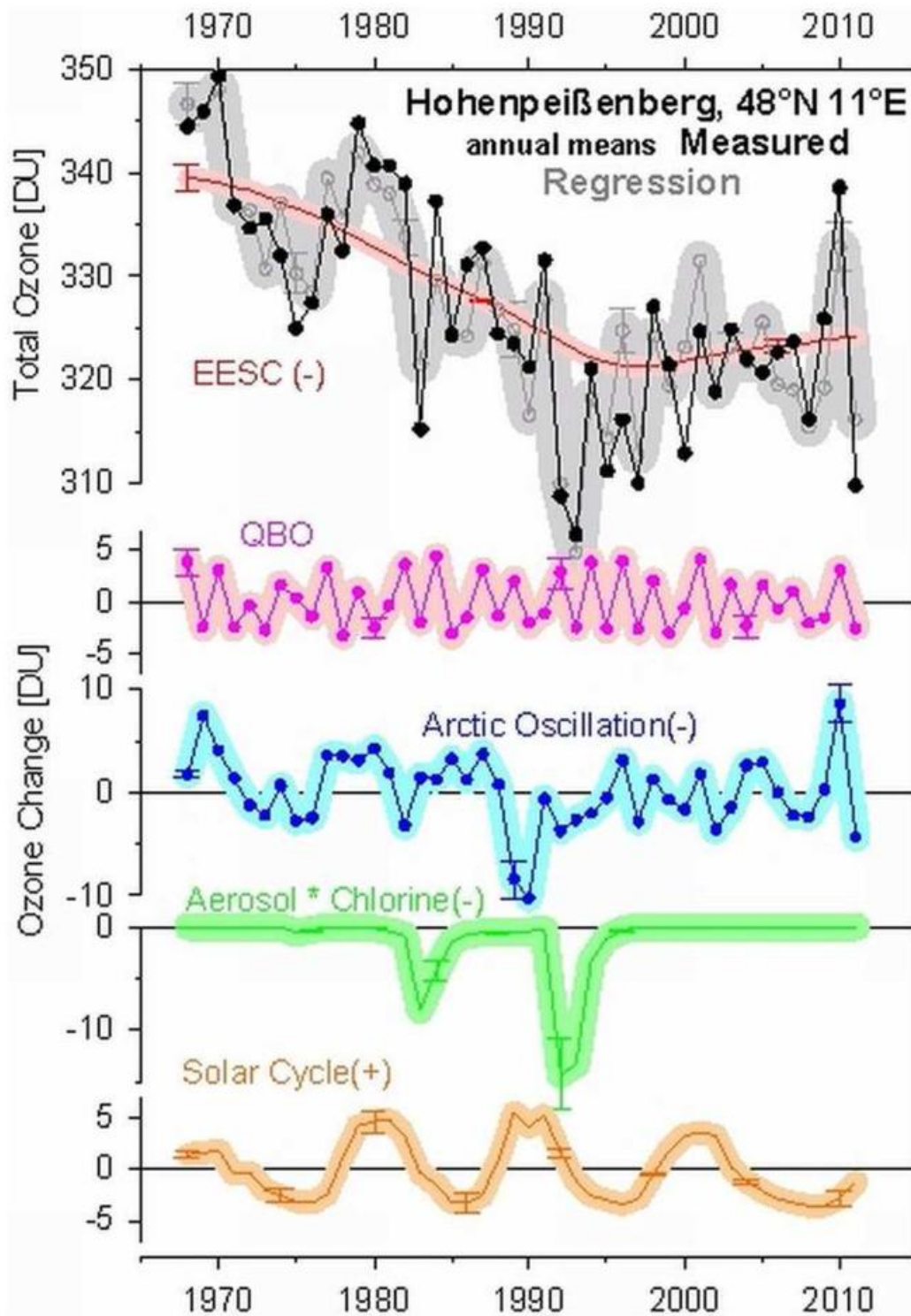


Fig. 2.8: Annual mean total ozone observed at Hohenpeißenberg (47.8°N, 11.0°E) and variation attributed to influencing factors by multiple linear regression. Top panel, black: Observed annual means. Grey: Multiple linear regression result. Red: Ozone variation attributed to Effective Equivalent Stratospheric Chlorine. Lower panels: Variation attributed to the QBO (magenta), the Arctic-Oscillation (blue), enhanced stratospheric aerosol multiplied by EESC (green), and to the 11-year solar cycle (orange). Error bars ($\pm 1\sigma$) and thickness of the underlying lines give the approximate statistical uncertainty of the linear regression.

Temporal Evolution of Climate Elements

On the following pages graphs of long time series of temperature, precipitation and sunshine duration as provided by the NMHSs are presented to give an overview of the temporal development of the basic climate elements. The graphs are grouped with respect to the 6 subregions defined above (Fig. 1.1). The table below informs about the lengths of the time series shown as well as whether they refer to spatial means of the country or single stations. Most time series are temperature time series. Each subregion is at least represented by one country. Time series of precipitation totals are fewer and there is no diagram for the subregion 'Eastern Europe'. Diagrams of long-term annual sums of sunshine duration are only provided by 3 countries and they belong to the subregions 'Central and western Europe' and 'Nordic and Baltic countries'.

Following this section, trend maps representative for the elements temperature and precipitation are shown. As reference period for these trend maps 1951-2011 was chosen. After this, we present examples of the temporal development of other temperature related phenomena, such as the sea surface temperature in the North Sea and the mass balance of the Austrian Goldberg glacier.

Start of long-term time series of Temperature, Precipitation and Sunshine Duration						
Country	Temperature		Precipitation		Sunshine Duration	
	Spatial Mean	Single Station	Spatial Mean	Single Station	Spatial Mean	Single Station
Armenia	1929					
Austria	1851 ¹					
Belgium		1833				
Belarus	1881					
Bulgaria	1901					
Croatia		1862				
Denmark	1873		1873		1920	
Estonia		1866		1866		1953-1958, 1967
Finland	1900					
France	1900					
Faroe		1873				
Germany	1900		1900		1951	
Greenland		1873				
United Kingdom	1910		1910		1929	
Hungary	1901		1901 ²			
Italy	1961		1951			
Israel	1991		1940			
Latvia	1924		1924			
Lithuania	1961					
Norway	1900		1900			
Portugal	1931		1931			
Russia	1939					
Slovakia				1876		
Spain	1961		1947			
Sweden			1860			
Switzerland	1864					
Turkey	1941		1941			

1: Mountain Summits; 2: Mean of 58 homogenized stations

Temperature

Note: Long time series of the mean annual temperature are available for each of the 6 subregions. The number of countries which provided information differs as well as the length of the series and the kind of presentation. The longest time series for areal means were provided by Austria (1851, for mountain summits), Switzerland (1864), Denmark (1873) and Belarus (1881). Most graphs are diagrams of the mean annual temperature over the years. Usually the mean annual temperature is given as a mean for the whole country. In a few cases the diagram refers to one station only. Some countries present the time series in form of anomalies from a reference (mostly the standard WMO reference period 1961-1990, except Belgium (1981-2010), and France, Hungary, Poland, Portugal, Spain, Turkey (all 1971-2000)). In this context this must be reflected when for instance the number of years with annual means above the reference is compared. Taking into account that the temperature is growing with time, the year from which onward the annual mean lies above the reference will be later when the reference is 1971-2000 than compared with the standard normal period 1961-1990. Some countries provide further statistics in their diagrams like a running mean or a trend line. Generally all time series document the rising temperatures with time and the increase of the rise during the last 15 years. Some special aspects will be discussed in the following.

In Central and western Europe Fig 2.9 shows the time series of United Kingdom, Belgium (station Uccle), France and Germany. Fig 2.10 shows time series for the Alpine states Switzerland and Austria and of Hungary. In Austria the diagram refers only to the summits of high mountains. But both graphs, the one of Switzerland and the one of the Austrian summits resemble each other closely though the graph of Switzerland is given as anomalies from the standard WMO reference period 1961-1990. All years since 1986 were warmer than the normal and 2011 was the warmest. Concerning this aspect the graph of France may be considered as equal in result though the anomalies refer to 1971-2000. The temporal evolution at the station Uccle in Belgium, 1833 - 2011, shows 2 points of change of the temperature regime, in 1913 and in 1983. The reason for this effect is not clear as it is not observed similarly in other time series.

In the Nordic and Baltic Countries Fig 2.11 shows the time series of the mean annual temperatures of stations in Greenland and the Faroe Islands compared to Copenhagen in Denmark. The longest time series start in 1873. The stations on Greenland show a higher temporal variability than Copenhagen and Torshavn with low values around 1890 and 1985 and high values around 1930 and nowadays in the smoothed curves. The high values nowadays exceed the high values of the 1930er years. In Fig 2.12 we see similar but weaker variations for Norway, Finland and Denmark as country areal means. In any case the temperatures of at least the last decade are higher than formerly. This can as well be seen in Fig 2.13 for the Baltic states Estonia, Latvia and Lithuania where the series is given as anomalies from the standard normal period.

For Iberia Fig 2.14 shows the temporal development of the mean annual temperature of Portugal and Spain. In Portugal nearly all years from 1995 on had higher mean, maximum or minimum temperatures than the reference 1971-2000.

Similar results may be seen for **Mediterranean, Italian and Balkan Peninsulas**, see Fig 2.15, 2.16 and for **Eastern Europe and Middle East** as well, see Fig 2.17 and 2.18.

Overall 2011 was the warmest year within the shown time series for France, Belgium, Switzerland, Norway and Spain as well as for several stations of western Greenland and for the Austrian summit stations.

Central and Western Europe:

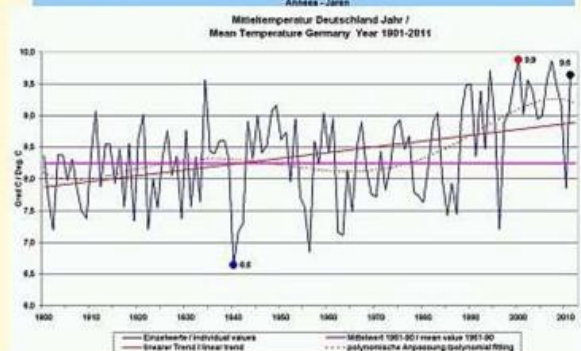
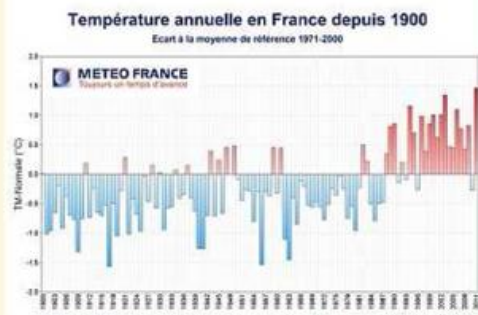
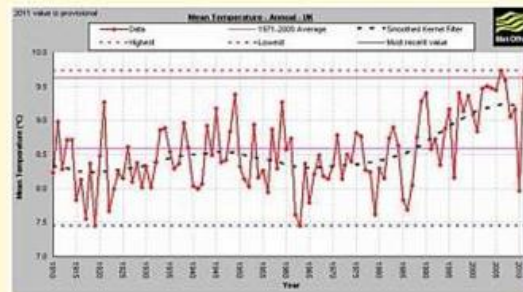


Fig. 2.9 : Mean annual temperatures in western and central Europe, United Kingdom, France, Belgium and Germany (Diagrams as provided by the NHMSs)

Central and Western Europe:

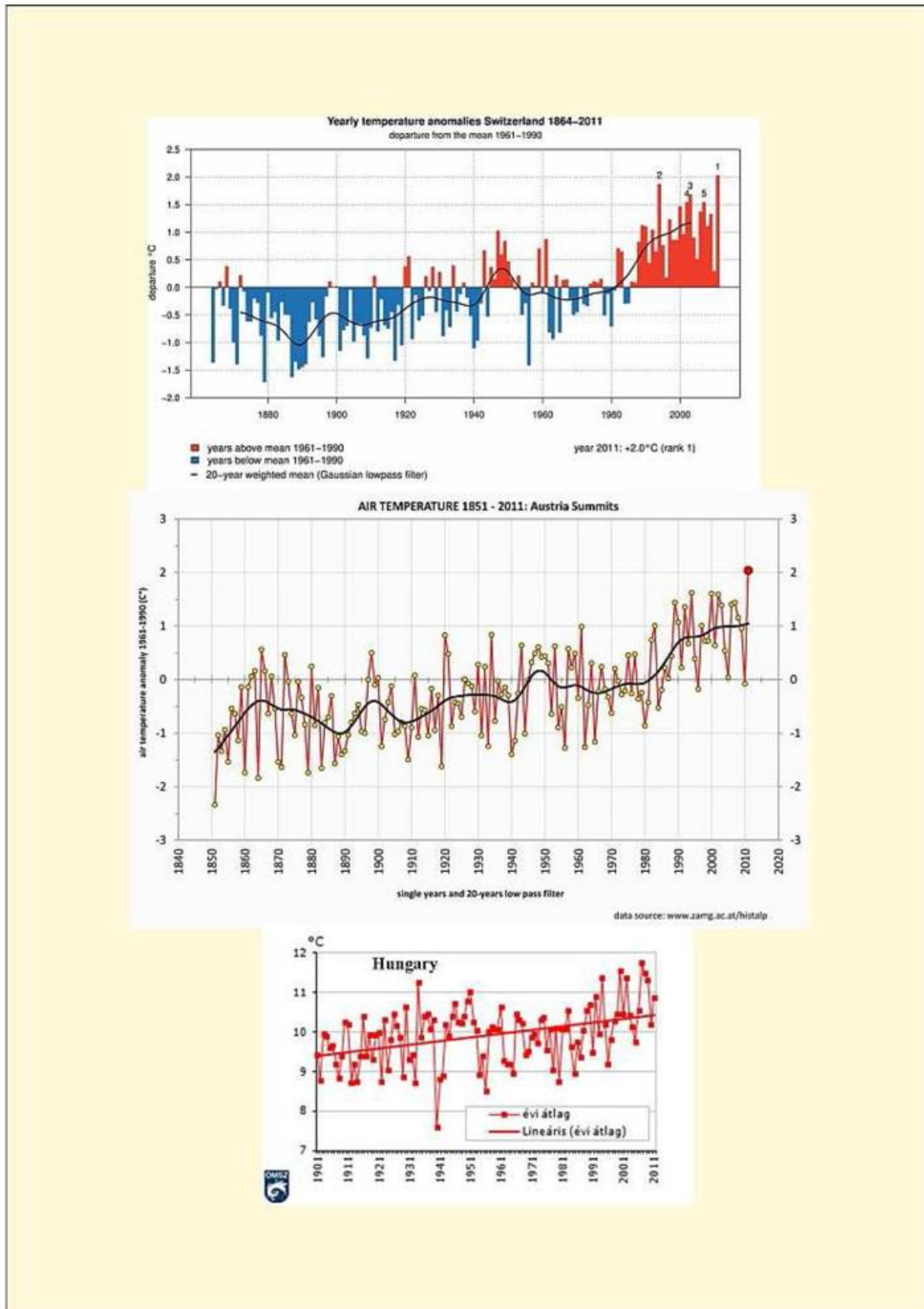


Fig. 2.10 : Mean annual temperatures in western and central Europe, Switzerland, Austria (summits) and Hungary (Diagrams as provided by the NHMSs)

Nordic and Baltic Countries:

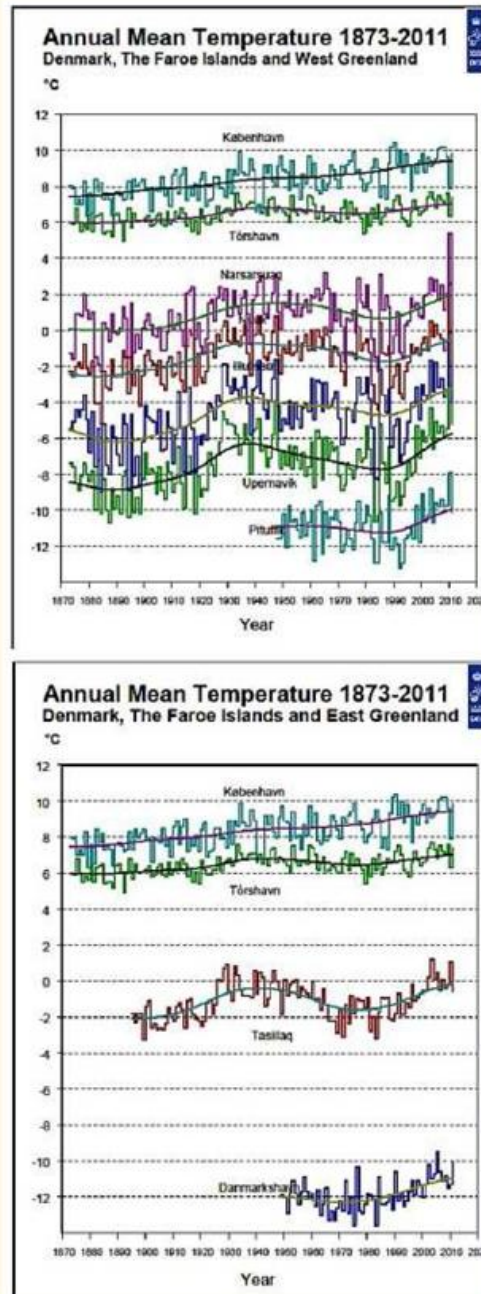


Fig. 2.11 : Mean annual temperatures for Nordic and Baltic countries - Greenland and Faroer compared to Copenhagen (Diagrams as provided by the NHMSs)

Nordic and Baltic Countries:

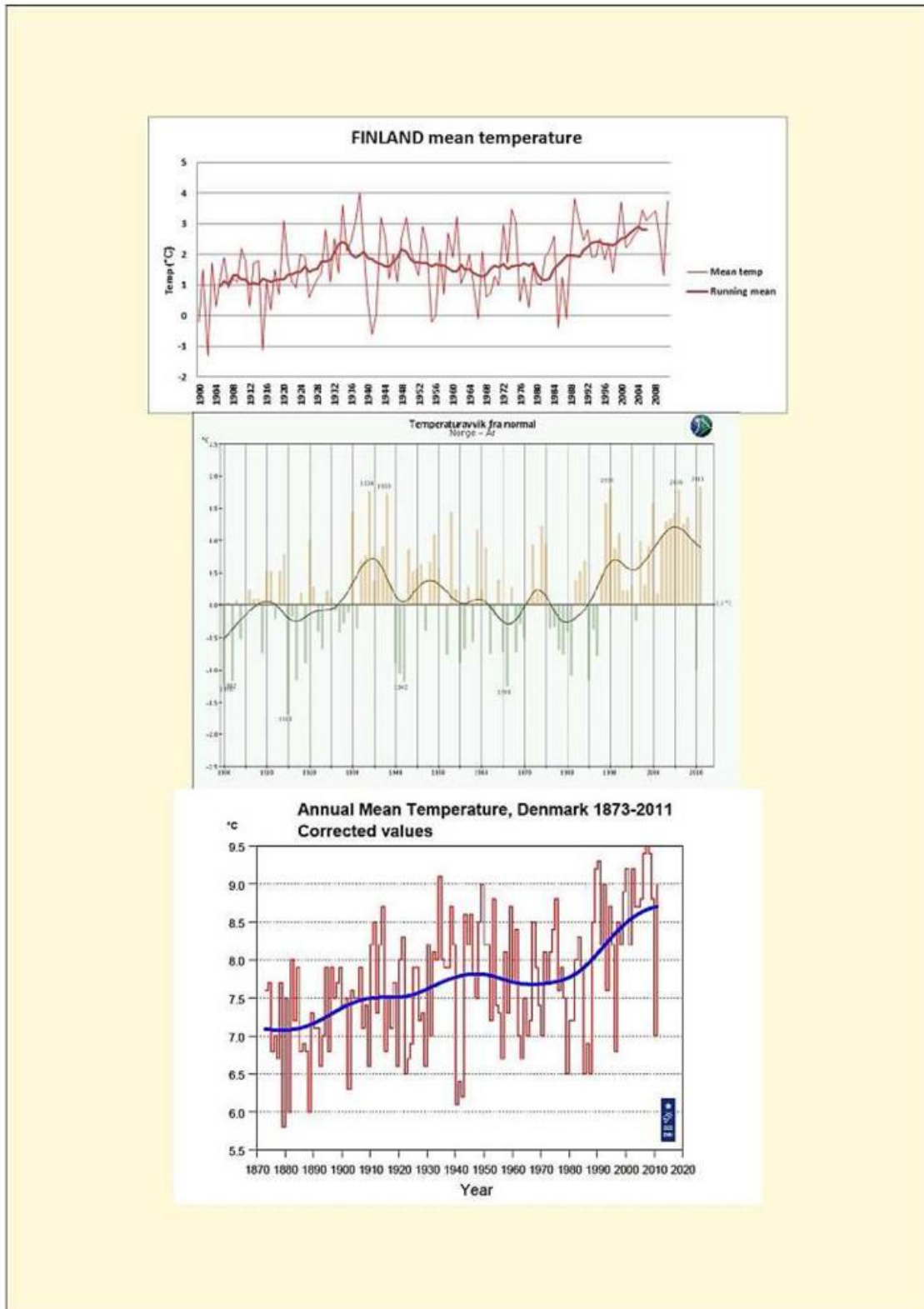


Fig. 2.12 : Mean annual temperatures for Nordic and Baltic countries - Scandinavia and Denmark (Diagrams as provided by the NHMSs)

Nordic and Baltic Countries:

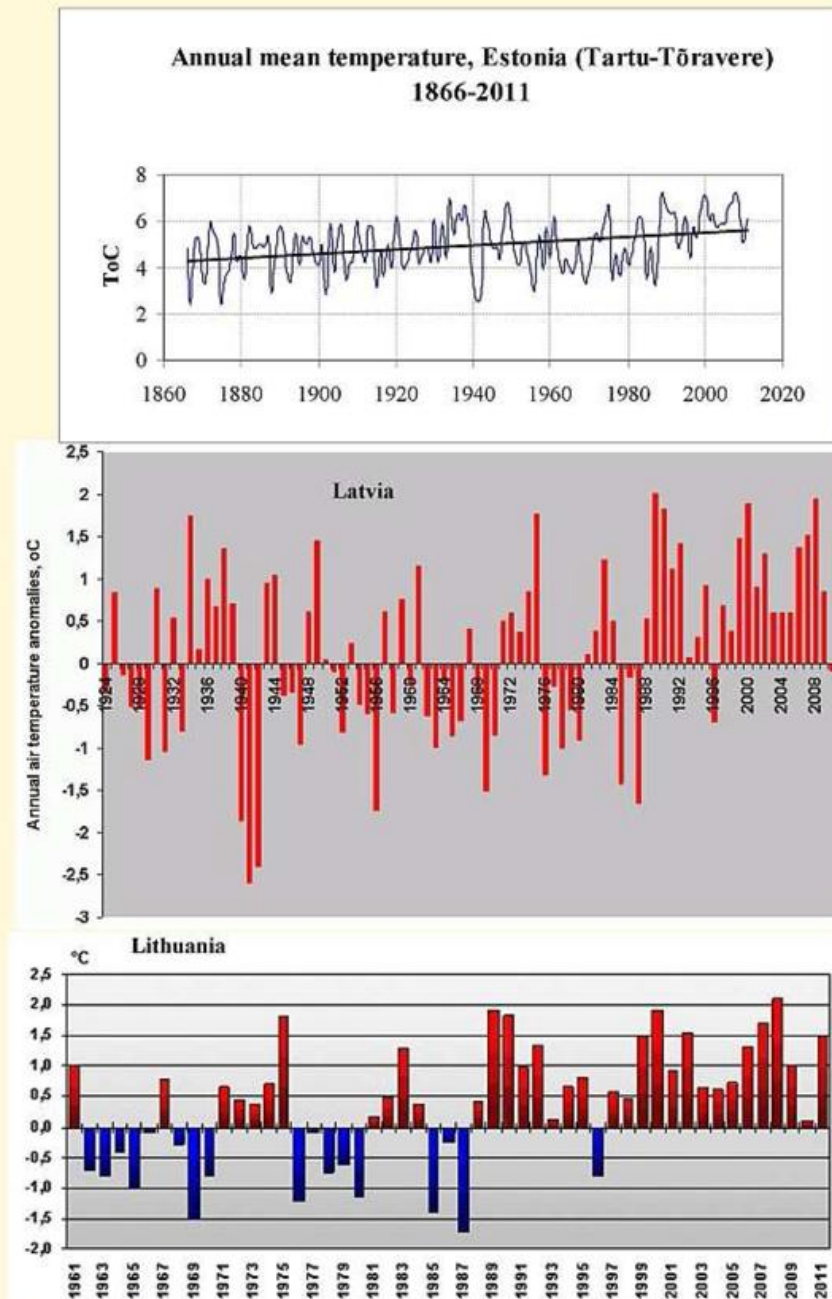


Fig. 2.13 : Mean annual temperatures for Nordic and Baltic countries - Baltic states (Diagrams as provided by the NHMSs)

Iberia:

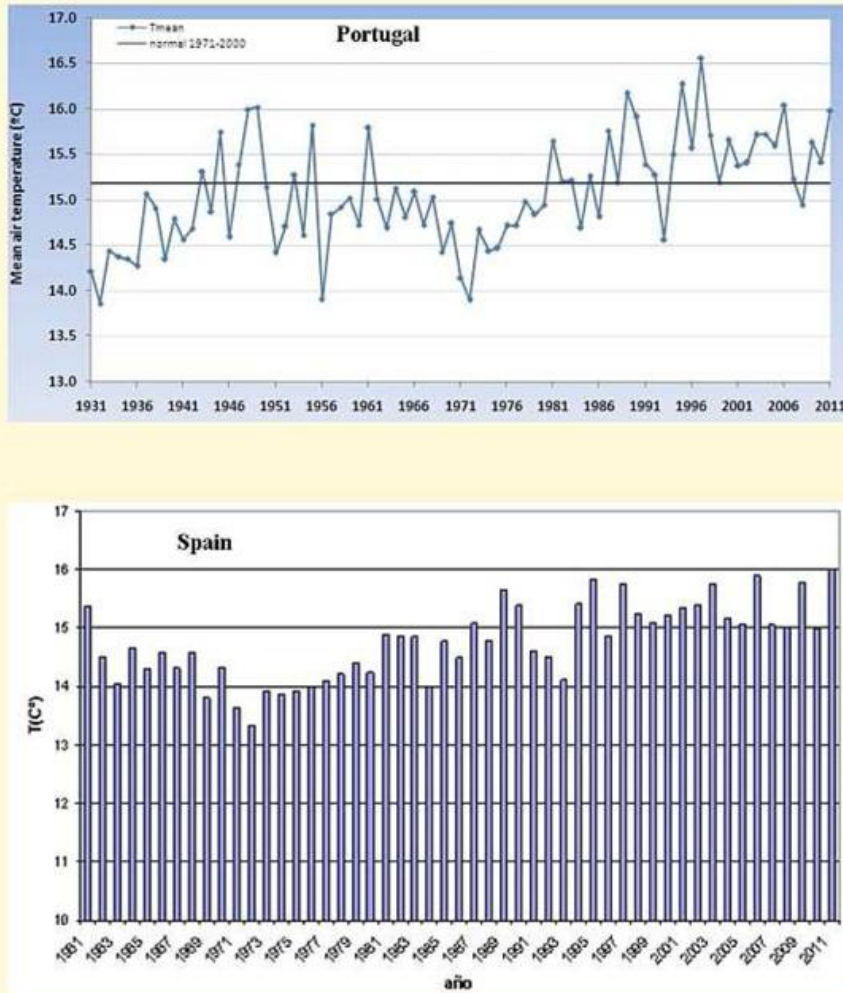


Fig. 2.14 : Mean annual temperatures in Iberia (Diagrams as provided by the NHMSs)

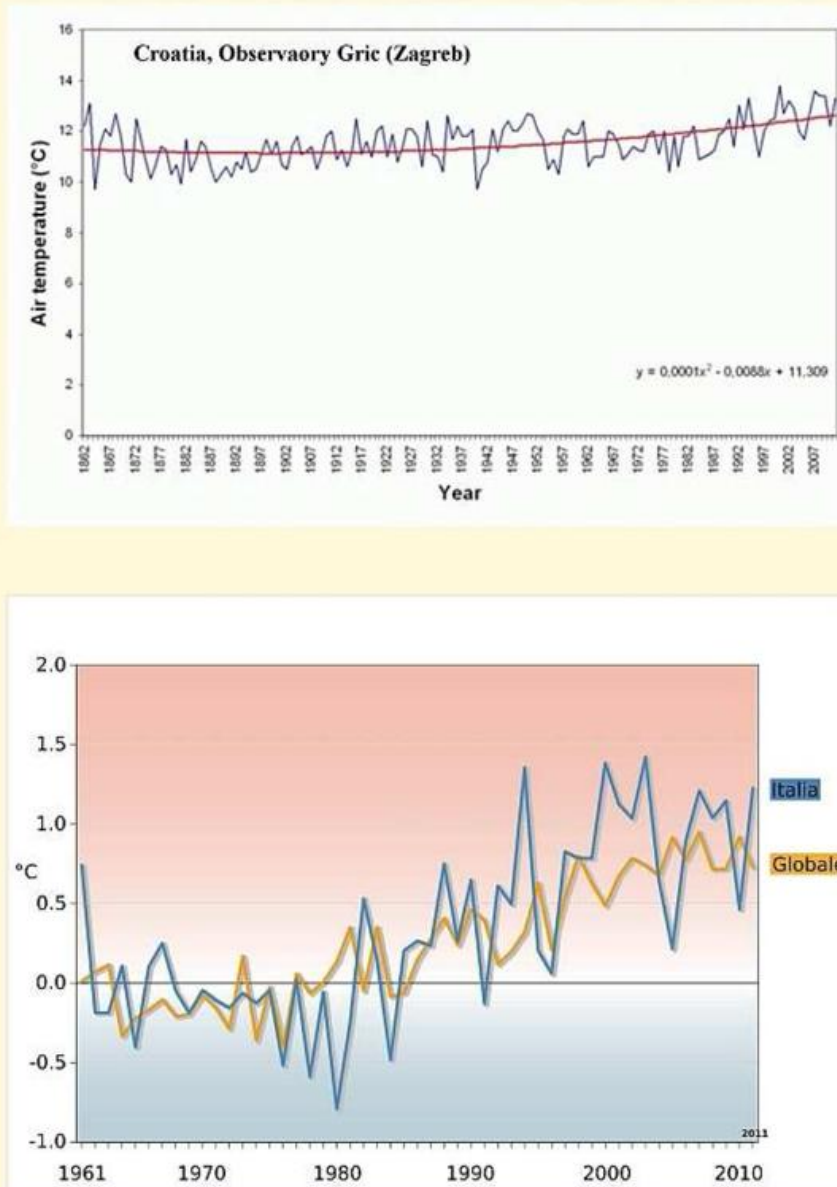
Mediterranean, Italian and Balkan Peninsula:

Fig. 2.15 : Anomalies of mean annual temperatures for the Mediterranean, Italian and Balkan Peninsulas: Italy' and Croatia 'kindly provided by ISPRA
(Diagrams as provided by the NHMSs)

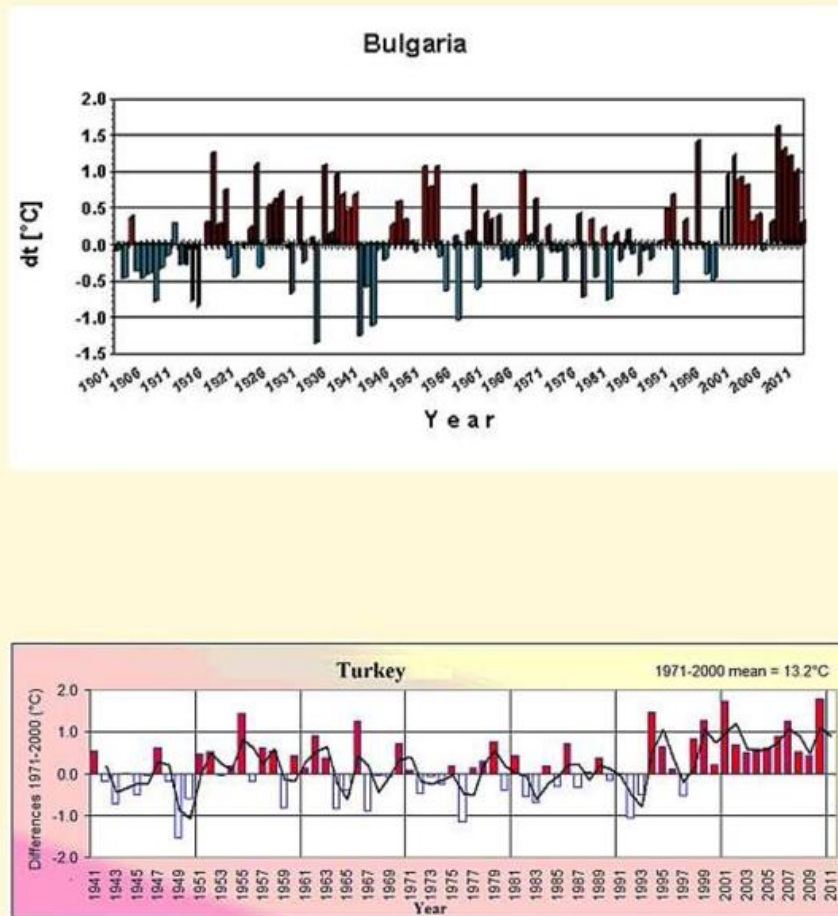
Mediterranean, Italian and Balkan Peninsula:

Fig. 2.16 : Anomalies of mean annual temperatures for the Mediterranean, Italian and Balkan Peninsulas: Bulgaria and Turkey (Diagrams as provided by the NHMSs)

Eastern Europe:

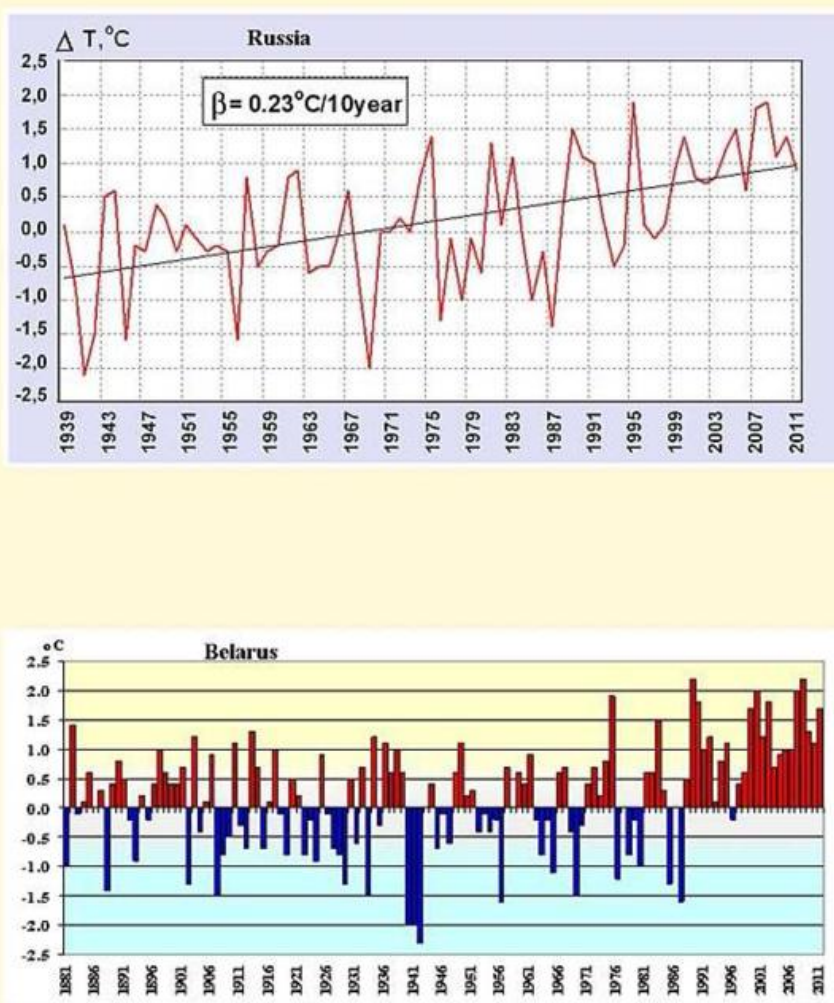


Fig. 2.17 : Mean annual temperature in Eastern Europe (Diagrams as provided by the NHMSs)

Middle East:

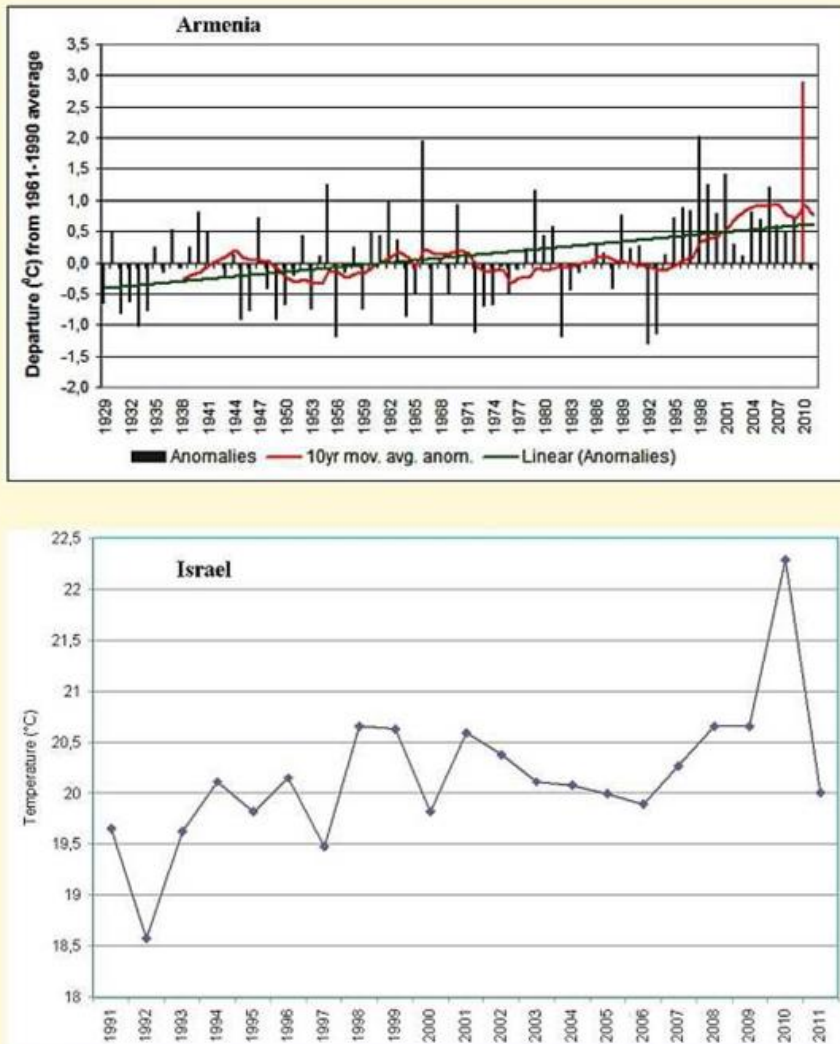


Fig. 2.18 : Mean annual temperatures for the Middle East
(Diagrams as provided by the NHMSs)

Precipitation

Note: *Most countries refer to the standard normal period or 1971-2000 as for the temperature except Israel, which refers to 1981-2010 resp. 1995-2009 for precipitation.*

For precipitation Fig 2.19 to 2.24 show the available time series for 5 subregions (except Eastern Europe).

For precipitation it is far less easy to draw conclusions from time series of areal means than for temperature. The spatial variability is larger and the spatial distribution of stations may have a decisive influence. So the following conclusions must certainly be taken with great care.

A slight growth of the annual precipitation totals with time can be seen for the United Kingdom and Germany in **Western and Central Europe** and a clear growth with time results for Norway and Denmark in the **Nordic and Baltic Countries**, but not for Latvia. In the other 4 subregions we cannot make a similar statement.

Central and Western Europe:

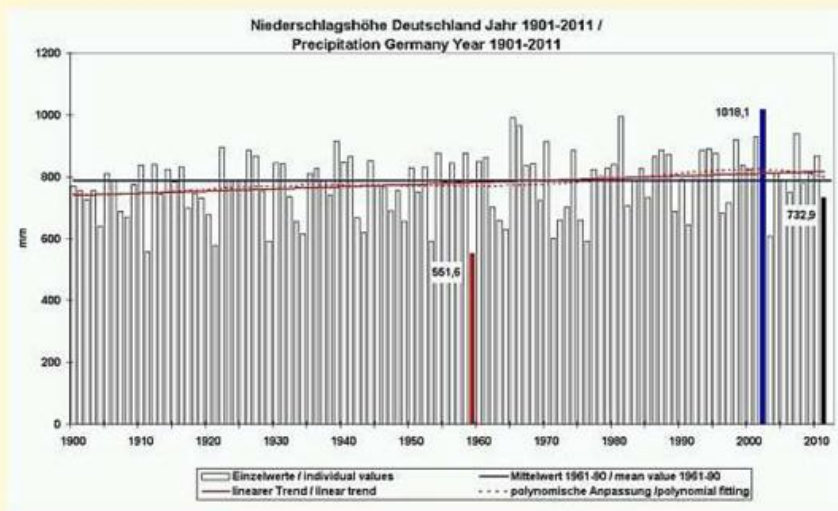
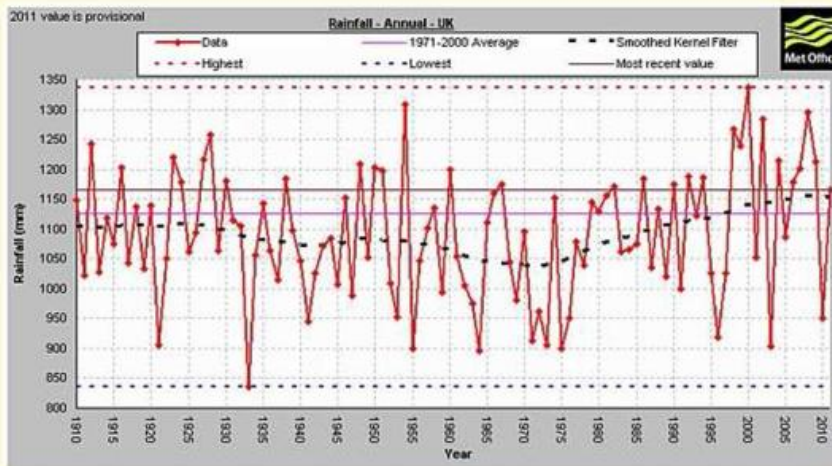


Fig. 2.19 : Annual precipitation totals in western and central Europe (Diagrams as provided by the NHMSs)

Nordic and Baltic Countries:

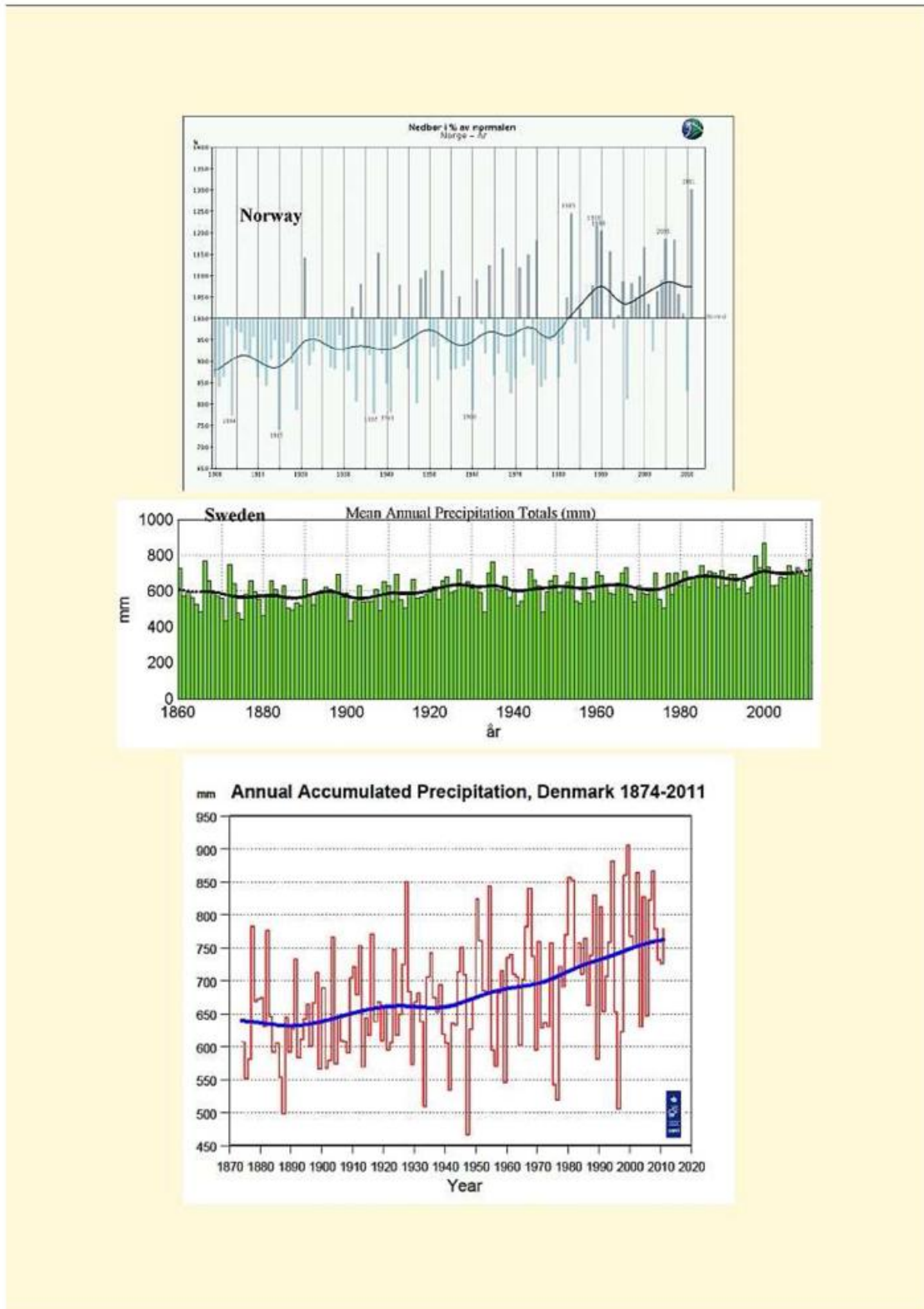


Fig. 2.20 : Annual precipitation totals resp. anomalies for Nordic and Baltic countries: Scandinavia (Diagrams as provided by the NHMSs)

Nordic and Baltic Countries:

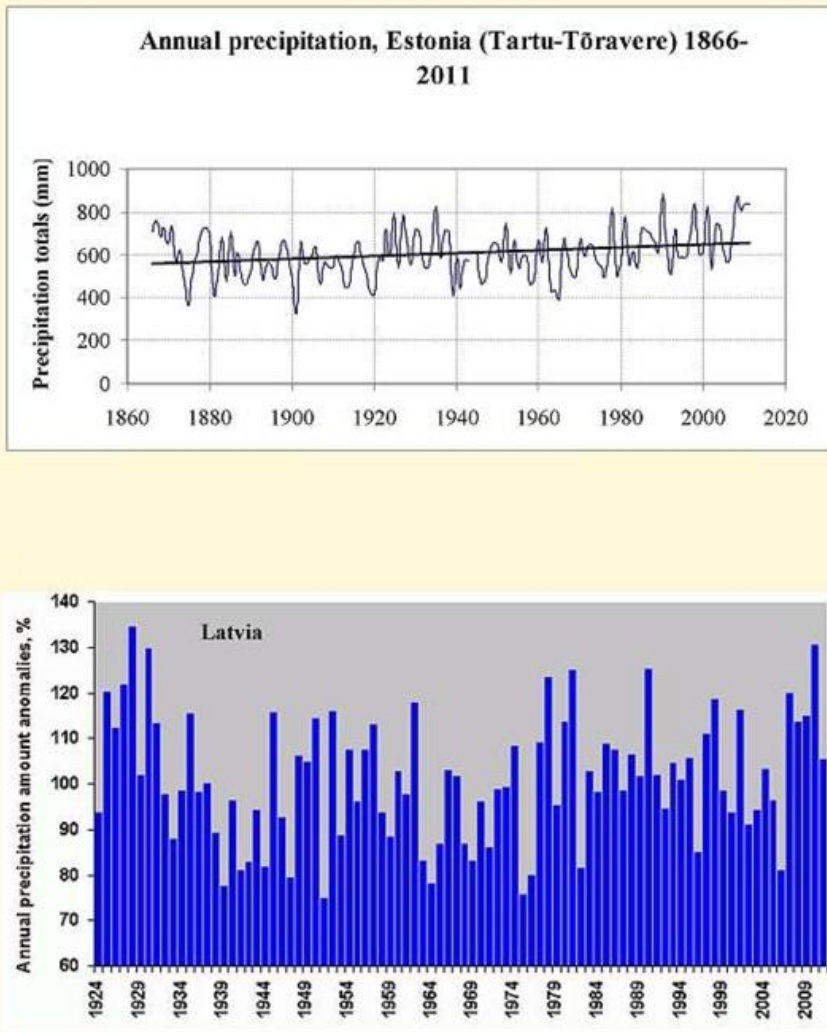
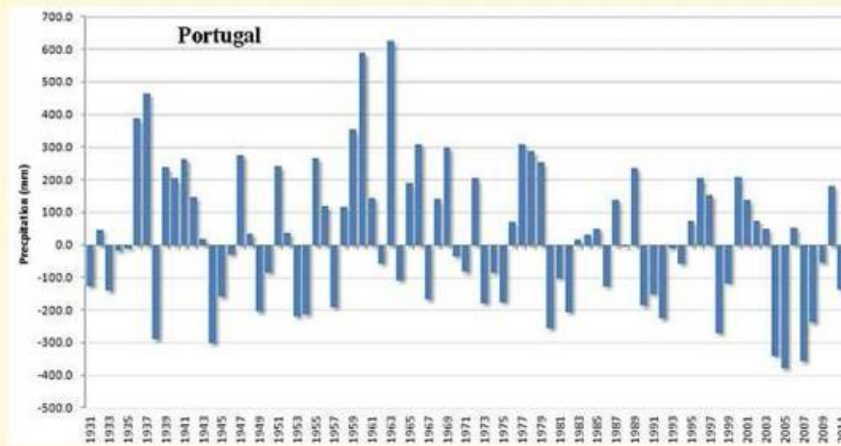


Fig. 2.21 : Annual precipitation totals resp. anomalies for Nordic and Baltic countries: Baltic states (Diagrams as provided by the NHMSs)

Iberia:



*Fig. 2.22 : Annual precipitation totals in Iberia
(Diagrams as provided by the NHMSs)*

Mediterranean, Italian and Balkan Peninsula:

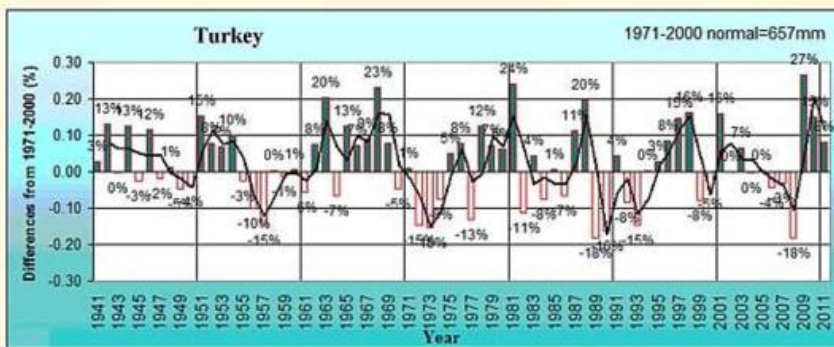
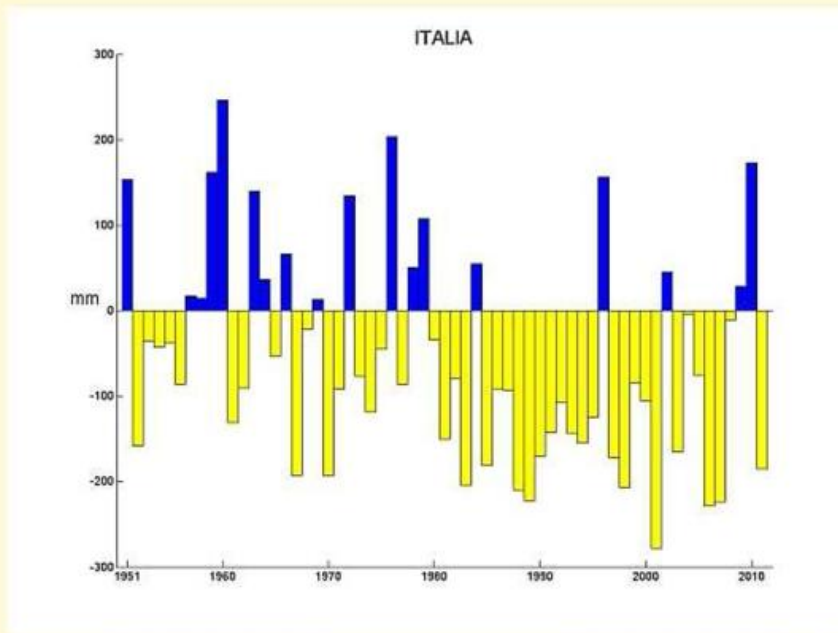


Fig. 2.23 : Annual precipitation totals for the Mediterranean, Italian¹ and Balkan Peninsulas
 'kindly provided by ISPRA
 (Diagrams as provided by the NHMSs)

Middle East:

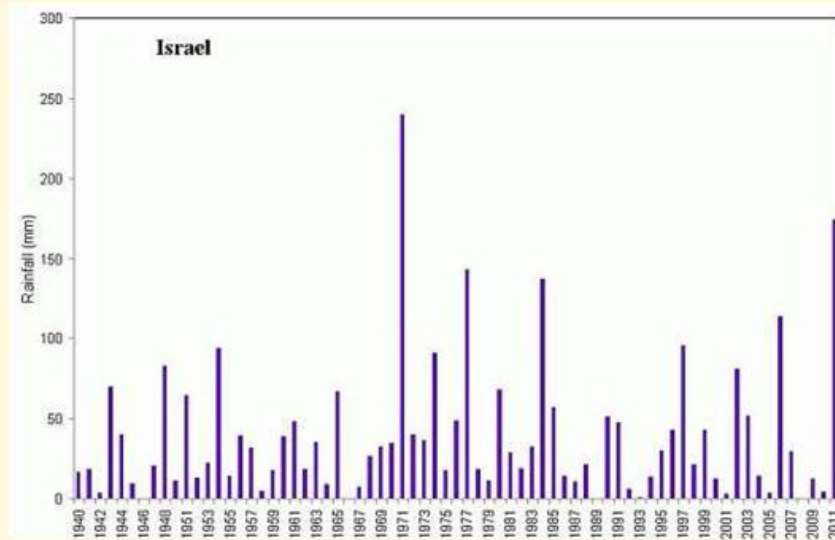


Fig. 2.24 : Annual precipitation totals for the Middle East
(Diagrams as provided by the NHMSs)

Sunshine

Note: *The sunshine duration time series are generally shorter than those for temperature or precipitation. For the reference periods Cyprus refers to 1981-2010 and France to the short period of 1991-2000.*

Only 4 time series are available for sunshine duration. In **Central and Western Europe** (Fig 2.25) the time series for United Kingdom starts in 1929 and the one for Germany starts in 1951. Both series show the year 2003 to have the highest annual sum of sunshine duration hours in the series. But a clear trend cannot be extracted from the graphs.

In Denmark in the **Nordic and Baltic Countries** (Fig. 2.26) also the year 2003 shows a very high annual sum of sunshine duration hours, the highest since a minimum in the early eighties. Still a little higher was the value for the mid forties and only a little less in the mid fifties. The value for 2011 was slightly below the running mean but still does not yet change the rising trend that existed since the mid of the nineteeneighties. The running mean value at the end of the series is more than 150 hours higher than the peak value around the year 1940. The series goes back to 1920. The highest value of the time series is recorded in 2003 in Estonia as well.

Central and Western Europe:

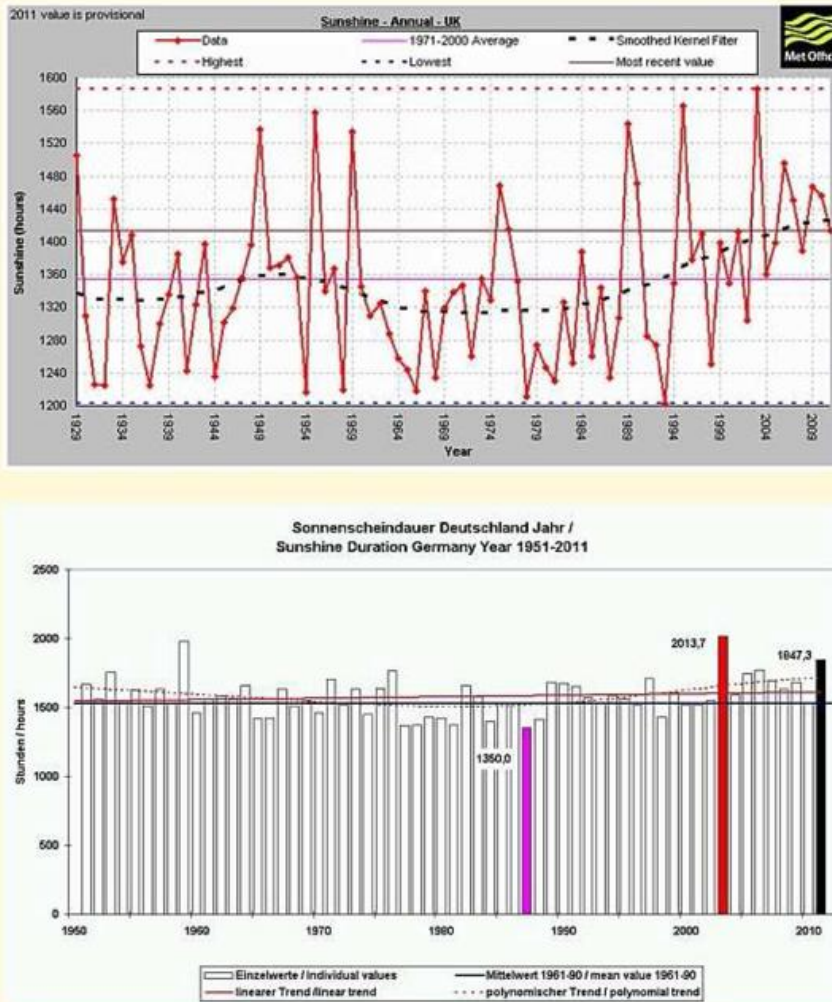


Fig. 2.25 : Mean annual sunshine duration in western and central Europe (Diagrams as provided by the NHMSs)

Nordic and Baltic Countries:

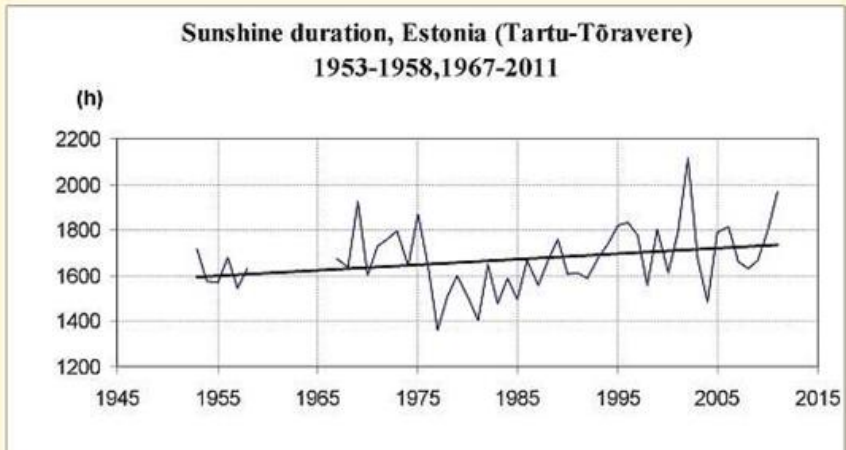
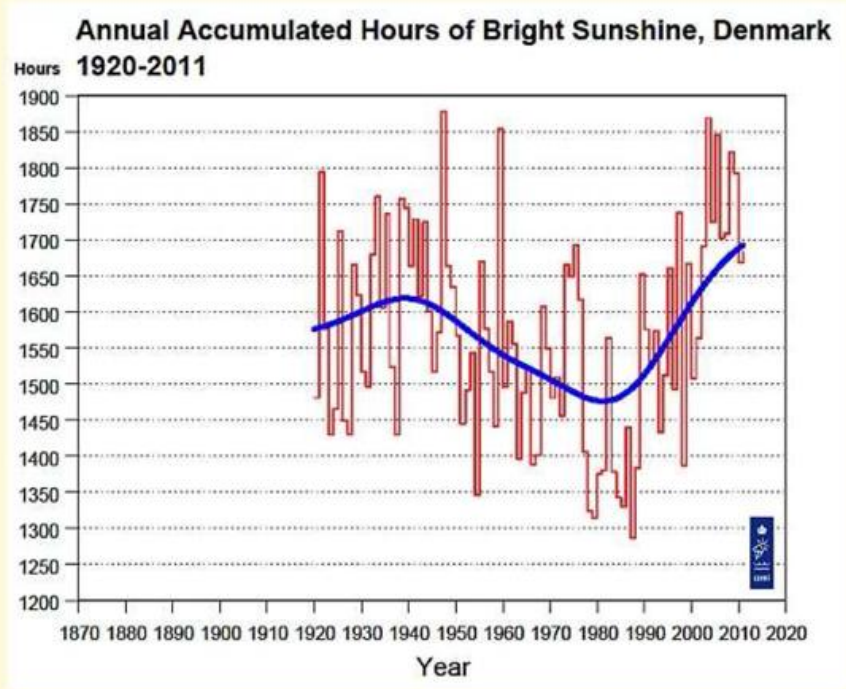


Fig. 2.26 : Mean annual sunshine duration for Nordic and Baltic countries (Diagrams as provided by the NHMSs)

Trends of temperature and precipitation

Figure 2.27 shows the spatial distribution of trends for the mean annual temperature and the annual precipitation total as well as the cold spell duration index and very wet days for the time series 1951 - 2011 for stations in Europe contributing to the ECA&D data set. A warming trend for most of Europe can clearly be seen for the mean annual temperature. A corresponding decrease of the cold spell duration index is more visible for central Europe (perhaps due to the better coverage with stations) whereas elsewhere more stations are not significant.

For the annual totals of precipitation we can state roughly a different behavior between the south (mostly insignificant) and the north (more slightly positive values) and the regions especially influenced by the North Atlantic seem to show clearer positive trends. This feature may eventually be explained by the influence of a warming North Atlantic. But many stations on the other hand are not significant. The distribution of trends for very wet days shows mostly insignificant values.

Trends of Climate Indices for Temperature and Precipitation (ECA&D)

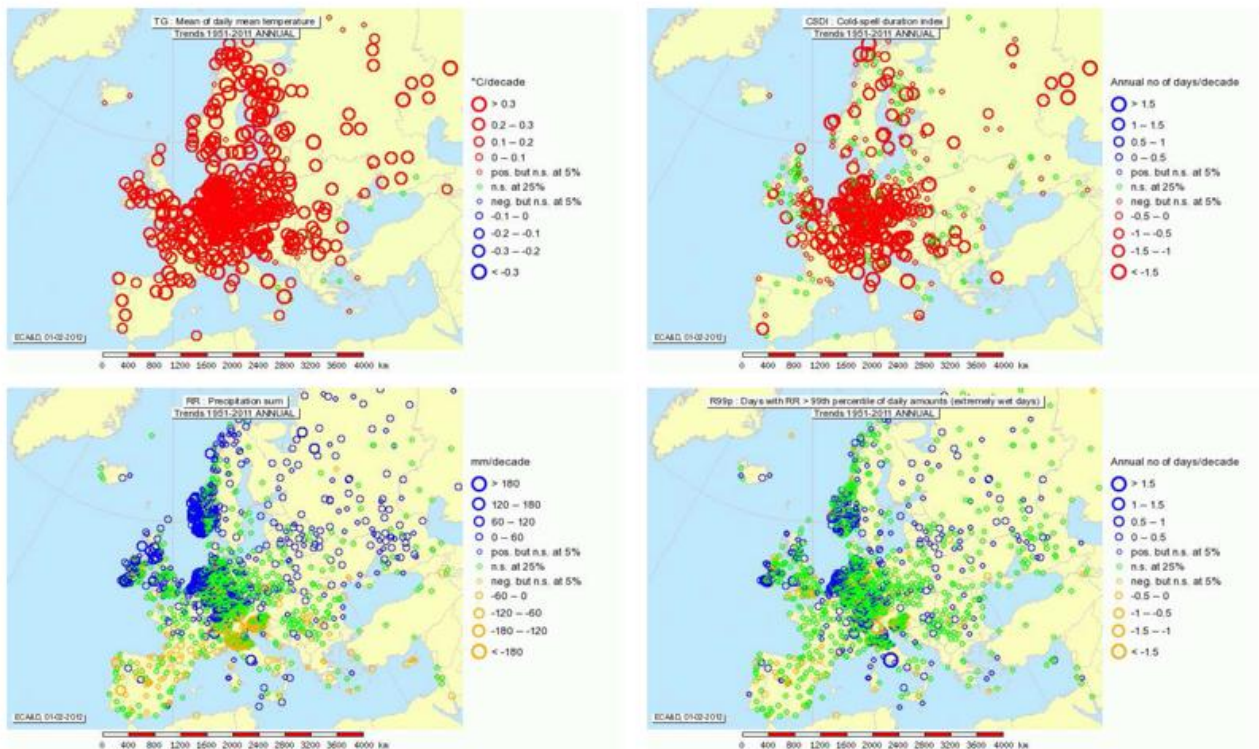


Fig. 2.27: Trends of Selected Climate Indices 1951 to 2011 (Source: ECA&D, <http://www.ecad.eu>):

Upper left: TG (Mean of daily temperature),

Upper right: CSDI (Cold spell duration index),

Lower left: RR (Precipitation sum),

Lower right: RR99p (Days with RR > 99th percentile of daily amounts (extremely wet days))

Long-term temporal development of related phenomena

Fig. 2.28 and 2.29 illustrate 2 phenomena that are closely related to the temporal development of the air temperature.

In Fig 2.28 a ranking of the North Sea surface temperature since 1969 is shown. Note that the 'year' in this case refers to December to November. Presented are the ranks of the years 1969 to 2011. From 1988 until now most (all except 5 years) values are warmer than the median while before 1988 most values were colder. 2011 was on the warm side but close to the median.

In Fig. 2.29 the annual mass balance of the Goldberg glacier in Austria (as a representative of Alpine glaciers) is shown starting 1989. There are 6 years with a positive mass balance. All other years have a negative mass balance and the loss in the individual years is in most cases larger than the largest positive gain in individual years. This impressively illustrates the consequences of higher temperatures during the last years. 2011 had the greatest loss after 2003.

Long time series of more temperature related phenomena also on global scale can be found at [NOAA/NCDC: Climate indicators](#)

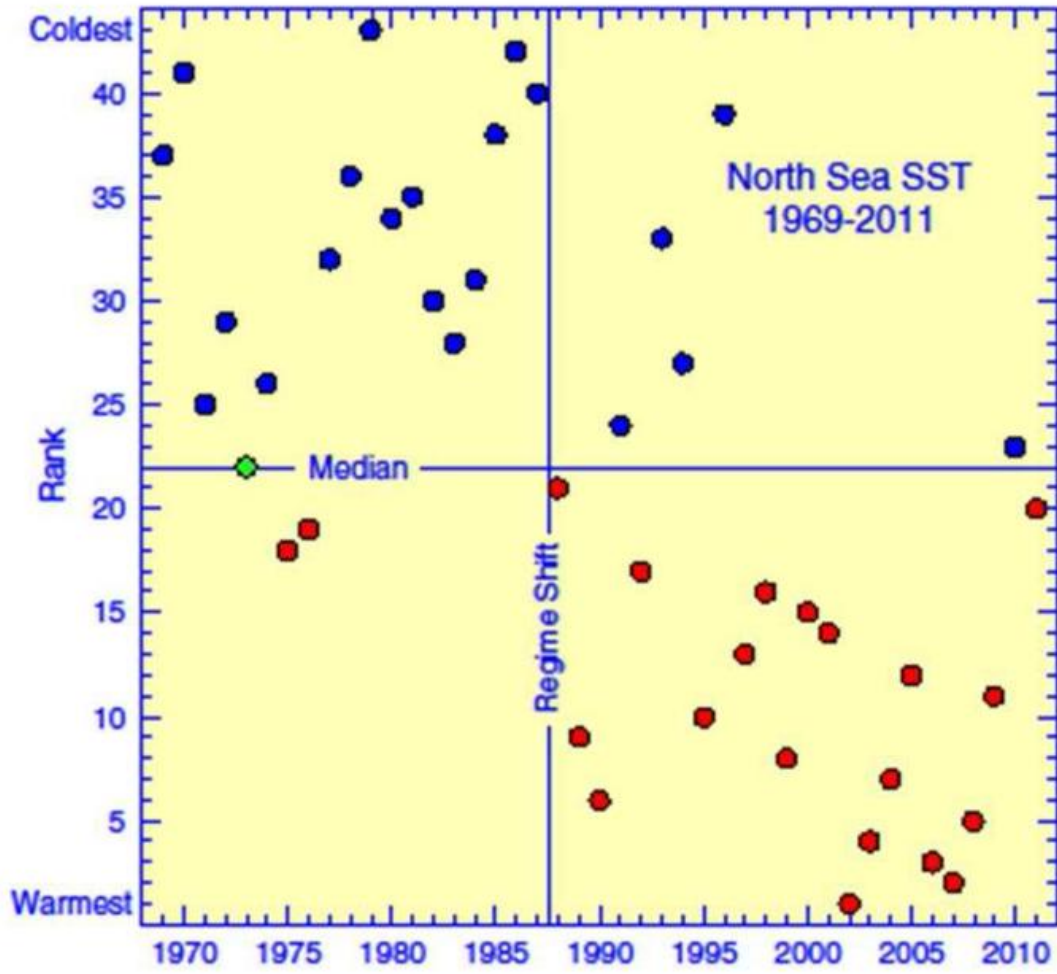
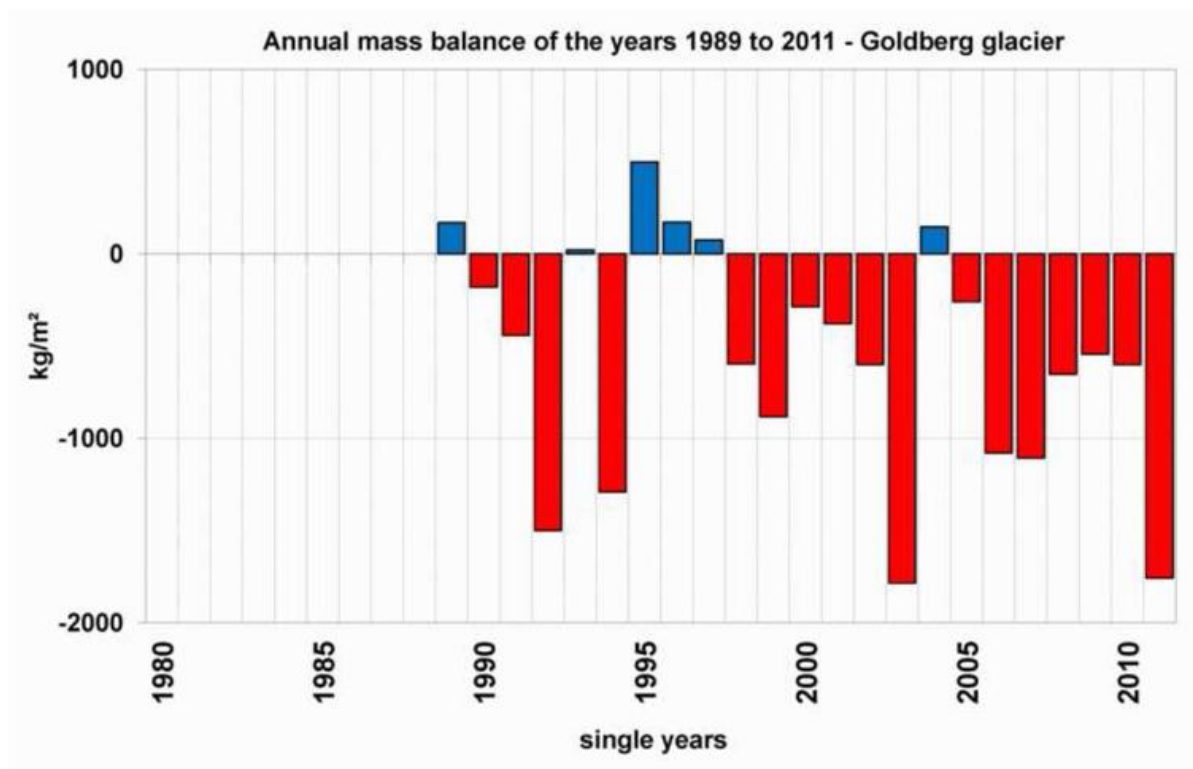


Fig. 2.28: Rank statistics of the North Sea SST form 1969 to 2011
 (Source: Bundesamt für Seeschifffahrt und Hydrographie BSH)
 (year2011 means December 2010 to November 2011)



*Fig. 2.29: Mass balance of the Goldberg Glacier (Austria) 1989 to 2011
(Source: ZAMG, <http://www.>)*

Seasonal Survey

Winter

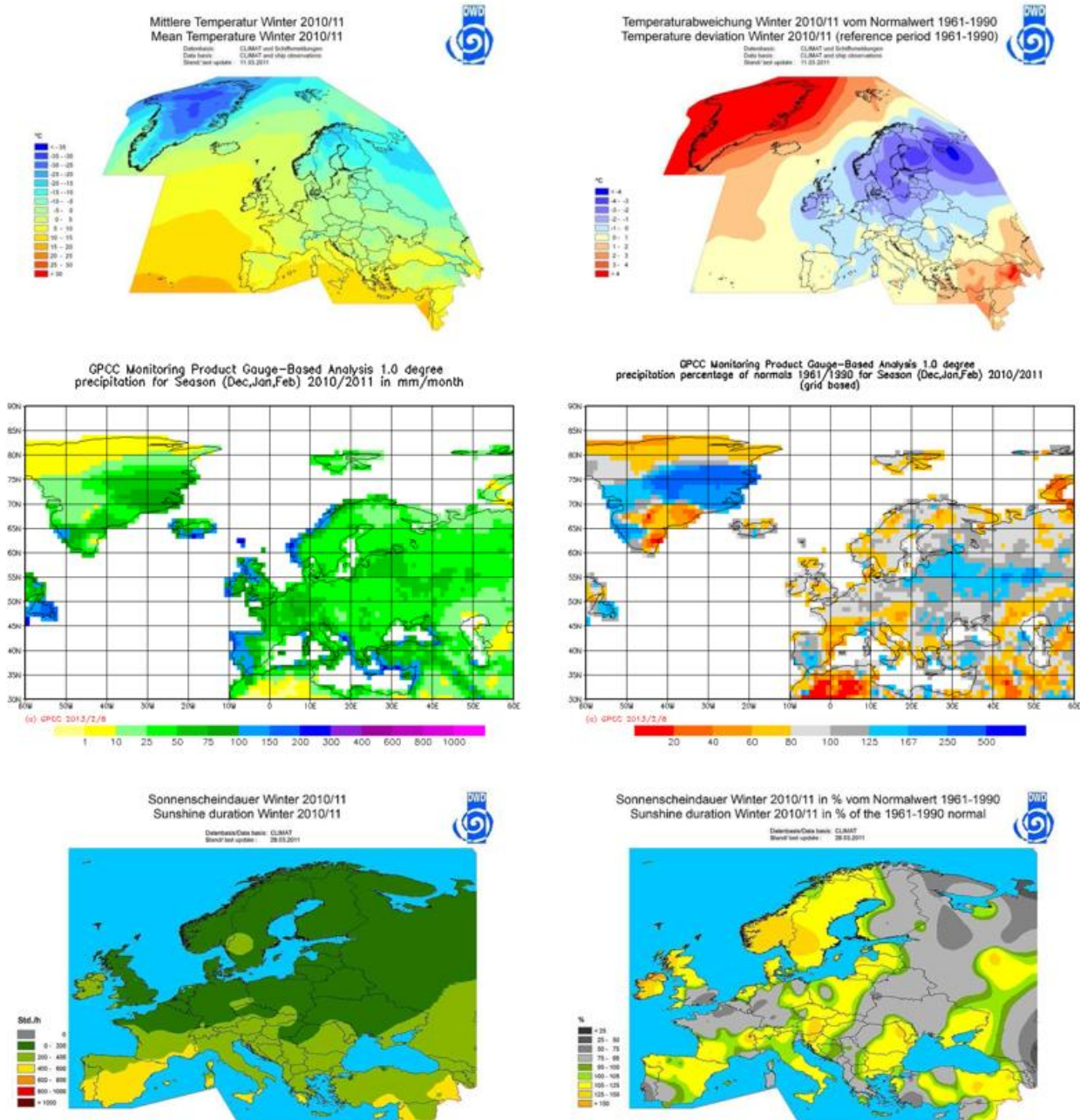


Fig. 2.30: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in winter 2011
 Source: <http://www.dwd.de/rcc-cm>

Winter

Winter 2010/2011 was in western, central, northern and eastern Europe as well as partly in the Mediterranean region colder than normal. The negative anomalies were largest over Scandinavia, the Baltic states and Russia. This is the western edge of a Siberian cold area where locally negative anomalies of more than 4 K were observed. Mean anomalies for Finland and Sweden resulted in -2.7 K resp. -2.2 K, in -1.8 K for the Baltic states Estonia, Latvia and Lithuania, for Denmark as well and in -1.4 K for Poland and -1.5 K for European Russia (see the table on page 21 and the remarks on the areal means from the spatial temperature analysis). Ireland and northern UK were similarly cold (-1.4 K for Ireland). This cold anomaly is mainly the result of the intense cold spell in December 2010. On the other hand it was warmer than normal in the north and northwest, especially in Greenland, where the areal mean of the anomalies resulted in +5.7 K and locally +6.4 K were reached (<http://data.giss.nasa.gov/gistemp/maps>). For 5 stations on Greenland it was the warmest winter on record. Also the Middle East and parts of southeastern Europe were clearly warmer than normal.

Precipitation was less than normal in Winter 2010/2011 over the British Isles and close to the North Sea and the Norwegian Sea on one hand and in southern France, around the Adriatic Sea and in Middle East on the other hand. The dry areas in the north may be related to the influence of high pressure in December 2010 and a low amount of water vapour (<http://www.dwd.de/rcc-cm>) in the atmosphere corresponding to the mentioned cold spell. Southwestern France had less than normal precipitation during each winter month (December 2010, January and February 2011). It was on the other hand wetter than normal on the western Iberian Peninsula as well as in the eastern Baltic Sea region and western Russia.

It was sunnier than normal over the northern North Atlantic, the North Sea and the Baltic Sea, Scandinavia and the eastern Central Europe as well as the western Mediterranean Sea and the Iberian Peninsula. Also the eastern Balkan Peninsula, parts of Turkey and of Russia and the Ukraine had more sunshine than normal.

Drought

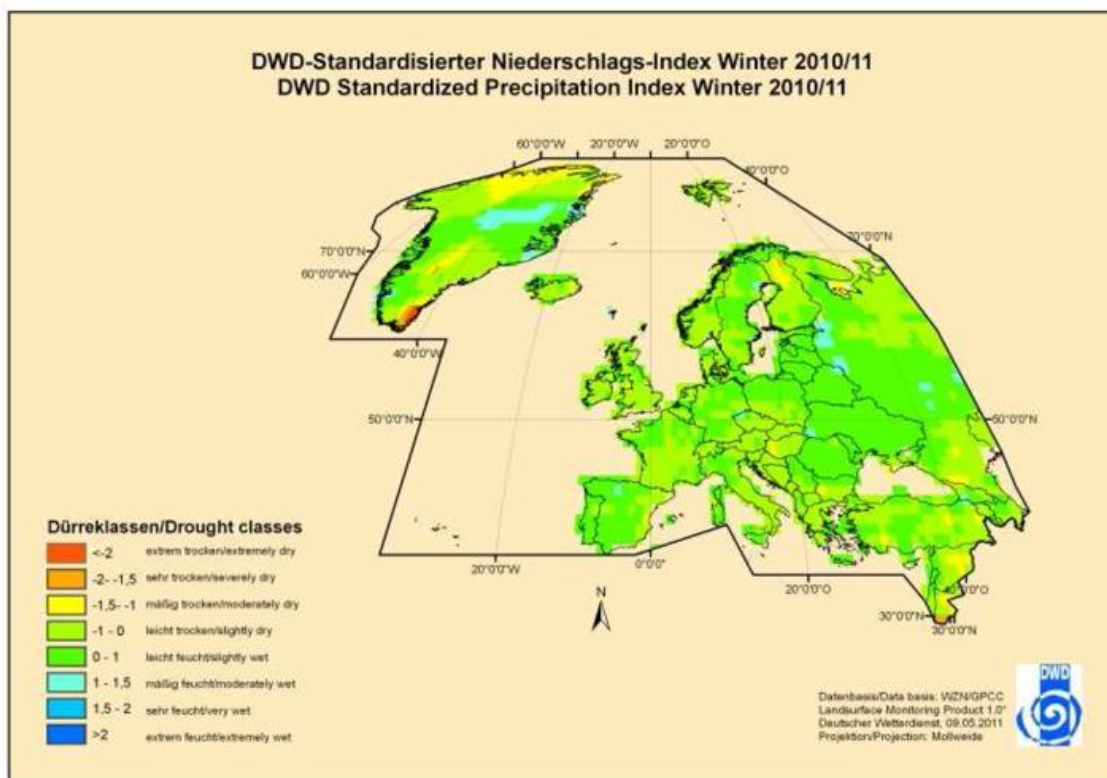


Fig. 2.31: Means of the modified Standardized Precipitation Index (DWD-SPI), winter 2011

Spring

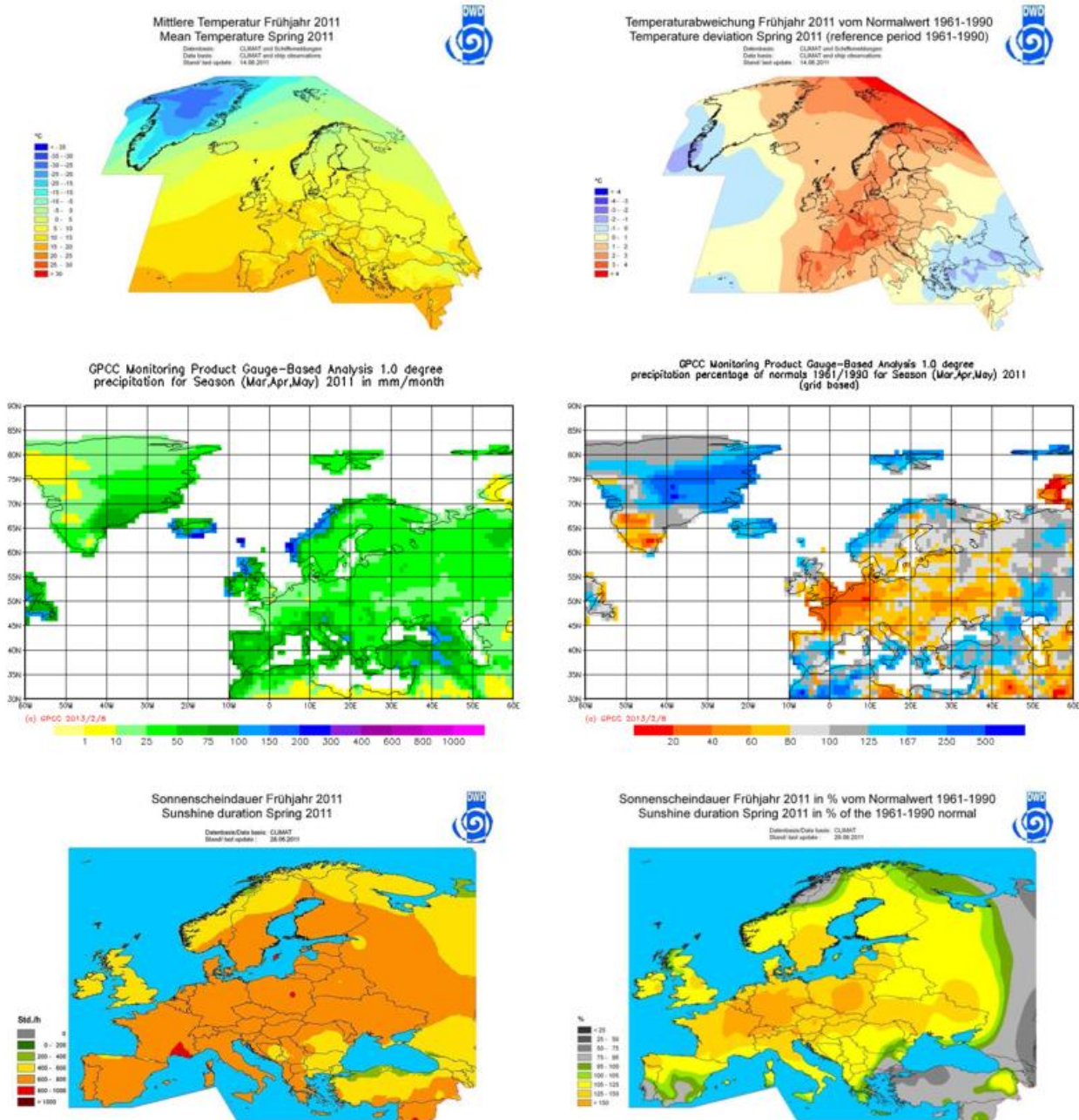


Fig. 2.32: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in spring 2011
 Source: <http://www.dwd.de/rcc-cm>

Spring

Spring 2011 had a nearly inverse distribution of temperature anomalies compared to the winter season. It was warmer than normal nearly in whole Europe. Only the Middle East and the western North Atlantic with southern Greenland were colder than normal. Overall the highest positive anomaly was located in the Arctic region again but in the northeast. Over northern Russia and the Arctic Ocean positive anomalies up to +6.6 K were analysed. The negative anomalies on the continent were restricted to the region of the Black Sea, Turkey and southern Russia and reached -2 K in Turkey. For central England spring 2011 was the warmest spring since 1659 (together with 1893) and it was the warmest spring since 1910 for whole UK. The Netherlands reported spring 2011 the 2nd warmest since 1706. In Spain it was the warmest spring since 1961.

While the northern parts of Europe (Iceland, Scotland, Norway) as well as partly the Mediterranean Sea and Middle East received more precipitation than normal in spring 2011, western and central Europe and southern England were remarkably drier than normal and drier were as well eastern and parts of southern Europe, the Balkan Peninsula and Belarus, Ukraine and parts of Russia. Mostly all 3 months had less precipitation than normal but the driest month in many countries was April. It was the driest spring in parts of southern England and East Anglia (UK) for 101 years, and the 2nd driest since 1910 in England and Wales, where only 45 % of the mean totals fell. In France spring 2011 was the driest since 1959 and in the Netherlands it was the driest spring for at least a century.

Spring 2011 was sunnier than normal nearly over whole Europe. In Germany, France, Belgium, Austria and Poland the sunshine duration exceeded partly more than 150 percent of the normal. It was the sunniest spring at Uccle (Belgium) since 1887 and the sunniest as well since at least a century in the Netherlands.

Overall spring 2011 was influenced by a slightly stronger than normal Azores high which extended far eastwards.

Drought

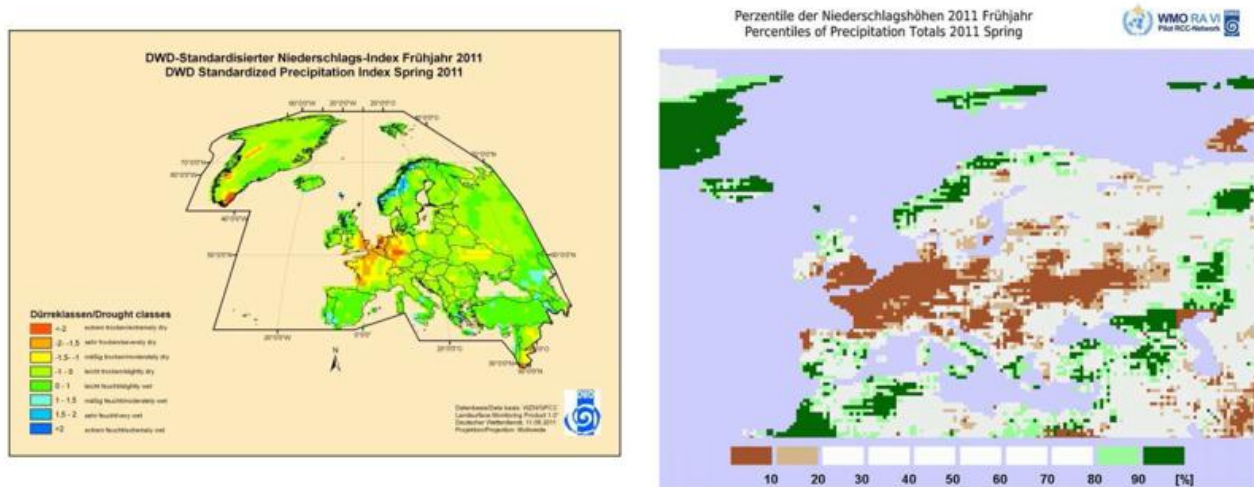


Fig. 2.33: Means of the modified Standardized Precipitation Index (DWD-SPI) and precipitation totals in terms of percentiles based on GPCC data 1951 to 2000, spring 2011

The two maps in Figure 2.33 show impressively the extent and spatial distribution of the standardized precipitation index (SPI) and the percentiles of precipitation in spring 2011. Generally the anomalies of the precipitation totals in percent, the SPI and precipitation percentiles tell the same but the precipitation percentiles make the weights of very small precipitation (below the 10th percentile) and the spatial extent of its area especially in eastern and southeastern Europe clearer.

Summer

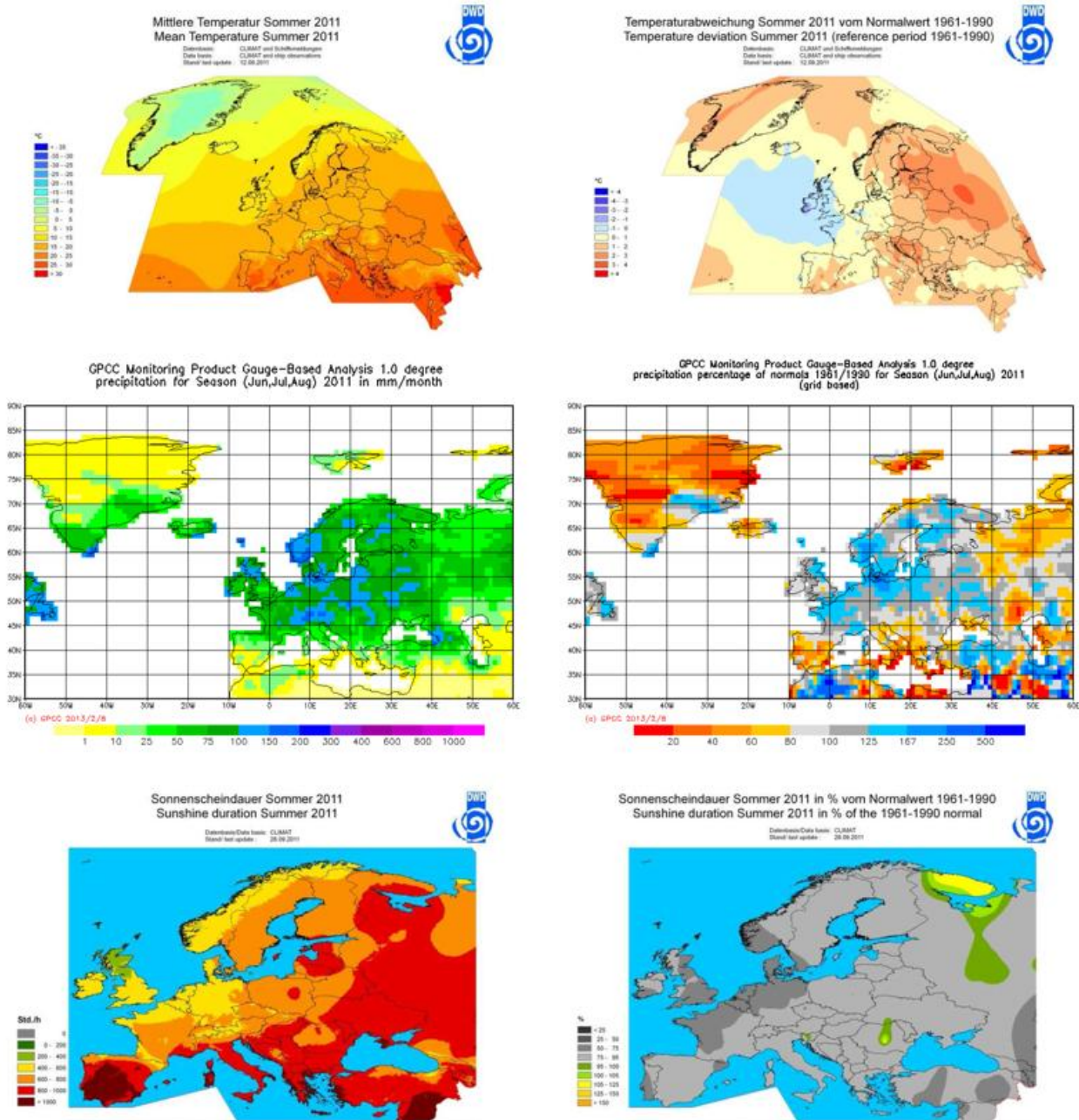


Fig. 2.34: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in summer 2011
 Source: <http://www.dwd.de/rcc-cm>

Summer

In western Europe the British Isles and France were influenced by a negative temperature anomaly over the Atlantic in Summer 2011. Everywhere else it was warmer than normal. The highest positive anomalies occurred in a small area around Moscow, Russia, where in July the anomalies came up to +5.3 K. Seasonal anomalies of +2 K or more as spatial means over the countries occurred in the Baltic states, Finland, European Russia, Belarus and on the Balkan Peninsula. In Estonia it was the warmest summer since 1866 (together with 2010). For Helsinki, Finland, it was the warmest summer since the early part of the 19th century as well. In contrast it was the coldest summer for 25 to 75 years in places in Ireland with -0.9 K as a spatial mean over the country. The evaluation of anomalies for climate indices (see [European Climate Assessment & Dataset - Indices of extremes](#)) shows the following features:

- The southwestern British Isles and Ireland had more cold days (days with a mean temperature below the 10th percentile of daily mean temperatures) than normal.
- the British Isles, southern Norway and the northwestern continent had less warm days (days with a mean temperature above the 90th percentile of daily mean temperature) than normal.
- The number of tropical nights was clearly above normal in the south around the Mediterranean Sea as well as around the Black Sea.
- The warm spell duration index had mostly slightly negative anomalies in western Europe and northern central Europe and slightly positive anomalies in southern and southeastern Europe.

Summer 2011 was wetter than normal mostly in western, central and northern Europe but drier than normal in southern and eastern Europe. It was the wettest summer since at least 1906 in The Netherlands. The evaluation of anomalies for climate indices (see [European Climate Assessment & Dataset - Indices of extremes](#)) shows the following features:

- Extremely wet days (days with a precipitation above 99th percentile of daily amounts) were more often in Norway, and close to the southern coasts of the North Sea and the Baltic Sea
- days with very heavy precipitation (equal or above 20 mm) were more often there as well as elsewhere in Central Europe, especially in the Alpine region.
- The highest daily amounts were clearly higher than normal in southern Norway, northeastern Germany and western Poland, the eastern Alps and locally in southern France, Italy and the Aegean Sea.
- In southern Norway, northeastern Germany and western Poland as well as locally the Baltic States, Ukraine and southeastern France also the highest 5-day amounts were remarkably higher than normal.

Summer 2011 had nearly everywhere less sunshine than normal. The dullest region with partly less than 50 percent of the normal was around the North Sea and at the western Atlantic coasts.

Drought

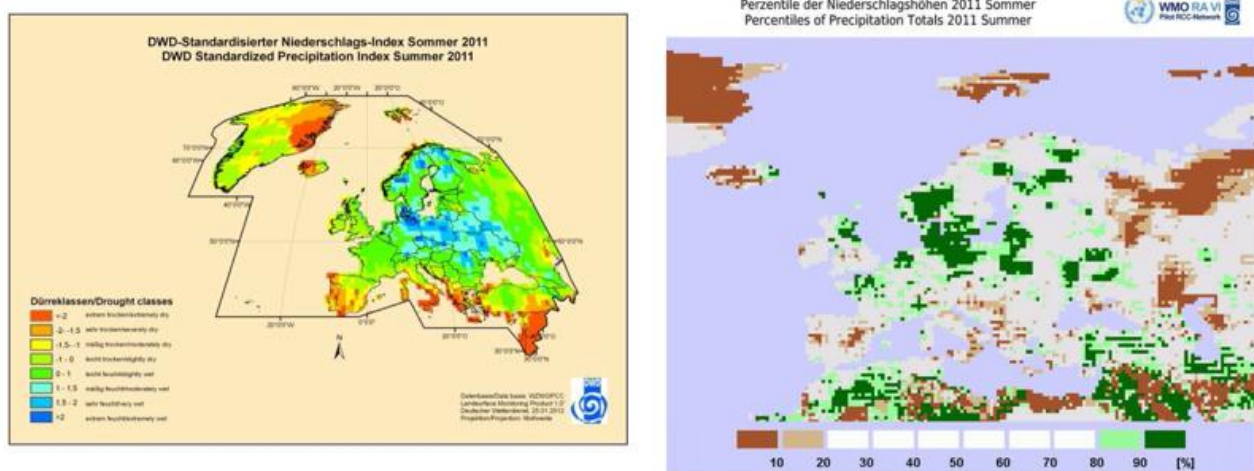


Fig. 2.35: Means of the modified Standardized Precipitation Index (DWD-SPI) and precipitation totals in terms of percentiles based on GPCC data 1951 to 2000, summer 2011

In summer 2011 more precipitation than normal fell in areas which were affected by the spring drought. The SPI shows a large area of 'very wet' or 'extremely wet' conditions in eastern central Europe and eastern Europe as well as northern Europe. The percentiles show that the areas of much more than normal precipitation are smaller, meaning that they are often still less than the 80th or 90th percentiles. Also within regions which received close to normal precipitation totals there were still some areas with precipitation below the 20th or even 10th percentiles. Thus water resources may not have filled up enough during this time.

Autumn

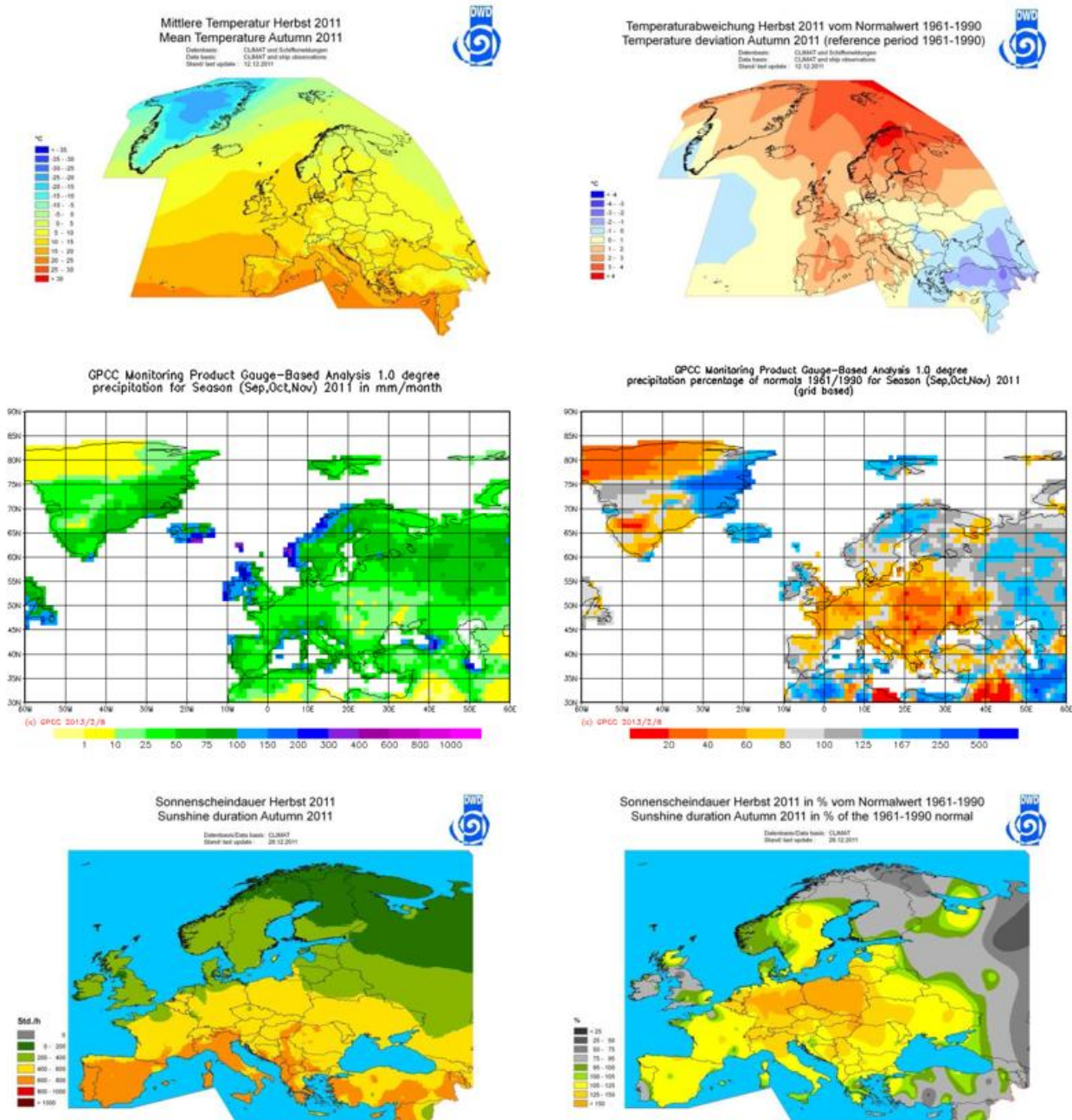


Fig. 2.36: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in autumn 2011
 Source: <http://www.dwd.de/rcc-cm>

Autumn

The distribution of positive and negative anomalies of autumn 2011 resembles the one of spring 2011. An area centered over the Caucasus with anomalies of -2 K and more over Turkey, the Caucasus countries and southern Russia, was colder than normal. Colder than normal was also the western North Atlantic and the southwesternmost part of Greenland. Everywhere else it was warmer than normal. The highest positive anomalies occurred in northern Scandinavia and the northeastern Arctic. It was the warmest autumn since 1900 in Norway, where the areal mean over the country came up to +3.1 K, and also the warmest autumn on record in places of Ireland (for 150 years in Dublin). Though the ranks are not reported it may be the same in Sweden (areal mean +2.9 K) and Finland (areal mean +3.3 K). Svalbard reached an areal mean of positive anomalies for autumn 2011 of +3.8 K). For the Baltic states the areal means of anomalies ranged from +1.4 K to +2.5 K, UK had +2.2 K, Iceland and the Faroer Islands +2.0 K. Autumn 2011 achieved rank 2 of warm autumn seasons since the beginning of the 20th century in France.

Summer days occurred remarkably more often than normal in southwestern, southern and southeastern Europe and tropical nights occurred locally unusually often in the central and eastern Mediterranean Sea area (see [European Climate Assessment & Dataset - Indices of extremes](#)).

Autumn 2011 was drier than normal on most of the continent, namely in central, western and southern Europe and parts of eastern Europe and of the Middle East. The precipitation totals for the season remained below 80 % overall, in eastern Europe and in western and partly central Europe below 60 percent and partly below 40 percent in eastern Europe and on the Balkan Peninsula. The greatest negative absolute anomalies in mm occurred around the Adriatic Sea. During the most outstanding month November 2011 a region extending from the North Sea to the Black Sea received less than 10 mm per month, partly less than 1 mm. This meant up to -70 mm in absolute anomalies (mm) and less than 20 % in relative anomalies. More information on November 2011 will be provided in the section 'Monthly Survey'. It was on the other hand wetter than normal in northern UK and Ireland, Scandinavia, Russia and most of the Middle East. But not only here but also in the dry areas heavy to extremely heavy precipitation fell in places like for instance in northern Italy in late October and in southern France in early November.

Autumn 2011 was sunnier than normal in Central Europe and in most of western, southern and eastern Europe and partly in the south of Scandinavia. See for comparison the maps of the number of days with cloud cover below 2 octa or above 6 octa (see [RCC-CM: Products - Monitoring Europe - Cloud Cover](#)).

Drought

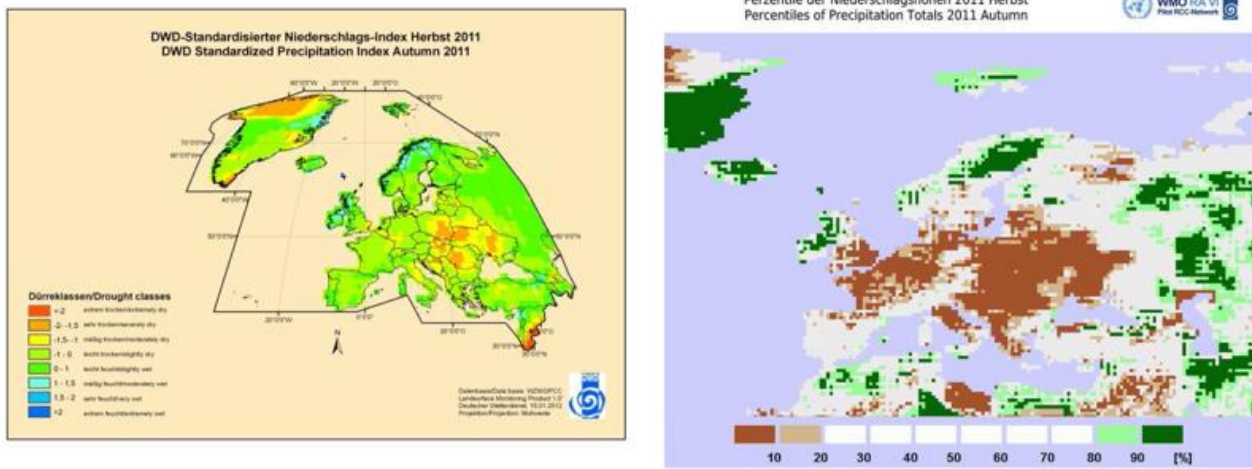


Fig. 2.37: Means of the modified Standardized Precipitation Index (DWD-SPI) and precipitation totals in terms of percentiles based on GPCC data 1951 to 2000, autumn 2011

In autumn 2011 the percentile map gives more weight of the dry area to the western and central European countries than the map of the SPI, though both clearly coincide that the largest coherent area with the driest conditions covers the northern Balkan Peninsula, eastern central Europe and western central Russia.

Monthly Survey

The following monthly survey integrates relevant information from the Monthly Bulletins 2011 on the Climate in WMO Region VI - Europe and Middle East - which are available on Internet under <http://www.dwd.de/rcc-cm>.

January

Highlights:

- *Temperatures were above normal in Europe with few exceptions of British Isles, southwestern France and western Mediterranean Sea.*
- *Wet in northern Russia and Finland, mostly neutral or dry in western, central and southern Europe*
- *Dull in northern and northeastern Europe, mostly sunny elsewhere*

Overview:

Temperature:

January 2011 had above normal temperatures in RA VI with few exceptions. It was cooler than normal for Ireland (with an anomaly of -1 to -2 K), parts of Britain, southwestern France and the western Mediterranean area as well as locally in the eastern Mediterranean, parts of the Black Sea, the Sea of Azov and the southeast of Ukraine. Temperatures of western Greenland were clearly above normal with an anomaly of more than +4 K. Most of Belarus and the northwest of Ukraine had positive anomalies of +3 to +4 K as well as eastern Turkey were even more than +4 K occurred.

Most striking is the positive anomaly of more than 4 K for Greenland. Some stations on Greenland had their warmest January on record. The Swiss mountain station Jungfrau Joch had its 3rd highest January maximum temperature of +0.7 °C.

Precipitation:

Much of the area of interest was dry or normal in January 2011 except northern Russia, Finland and central Russia as well as locations mainly in the central and Eastern Mediterranean sea (Sicily, Greece, western Turkey, Cyprus), west and south of the Black Sea and in the Middle East. It was especially fairly dry for southern France and northern Spain, the Alpes and the northern and western Balkan Peninsula as well as the Caucasus region and relatively dry for the British Isles and Ireland. Some remarkably high daily precipitation sums are reported especially from Norway 109 mm, United Kingdom 103 mm, Austria 110 mm, Portugal 133 mm, Turkey 116 mm and Greece 114 mm.

Lithuania and Latvia reported very high snow depths in January 2011. Lithuania had 60 to 68 cm of snow in the west at the beginning of the month. Latvia reported damages caused by the snowload. In Russia St Petersburg had the highest January precipitation total since observations began. 84.4 mm correspond to more than twice the normal value.

Sunshine:

The sunshine duration in January 2011 was remarkably below the normal in the north of European Russia, where a large area was nearly completely cloudy with 7 octa over the month (see Satellite-based Regional Climate Monitoring). Also in Germany a large portion of the country was as cloudy. Nearly as cloudy was the rest of central Europe, part of the Baltic Sea, parts of the northern Balkan Peninsula and the Ukraine where the sunshine duration was as well below the normal. Also rather dull was the northern North Atlantic with at least 16 dull days and further north in the Norwegian and the Arctic Sea at least 21 dull days. 6 - 10 fair days occurred for most of the Peninsula Iberica and in the western and the eastern Mediterranean Sea, as well as over the Alpes. Here as well as in a smaller region of northern Spain and the adjacent sea and for the eastern and southeastern Mediterranean even more than 10 fair days occurred but hardly more than 15. The British Isles and Ireland had a little more fair days with up to 10, the same for southern Norway and dull days were below 11 over the British Isles, the North Sea, much of Scandinavia and most of the central and eastern North Atlantic. This distribution of cloudiness corresponds to the positive sunshine duration

anomalies for Ireland and Scotland and southern Scandinavia and it explains also the patchy distribution in the Mediterranean and for the Balkan Peninsula. Only the positive anomaly in Central Europe does not match the cloud distribution well. But this is matter of small differences and possibly of spatial resolution of the satellite data in this case.

Monthly Means or Totals and Anomalies :

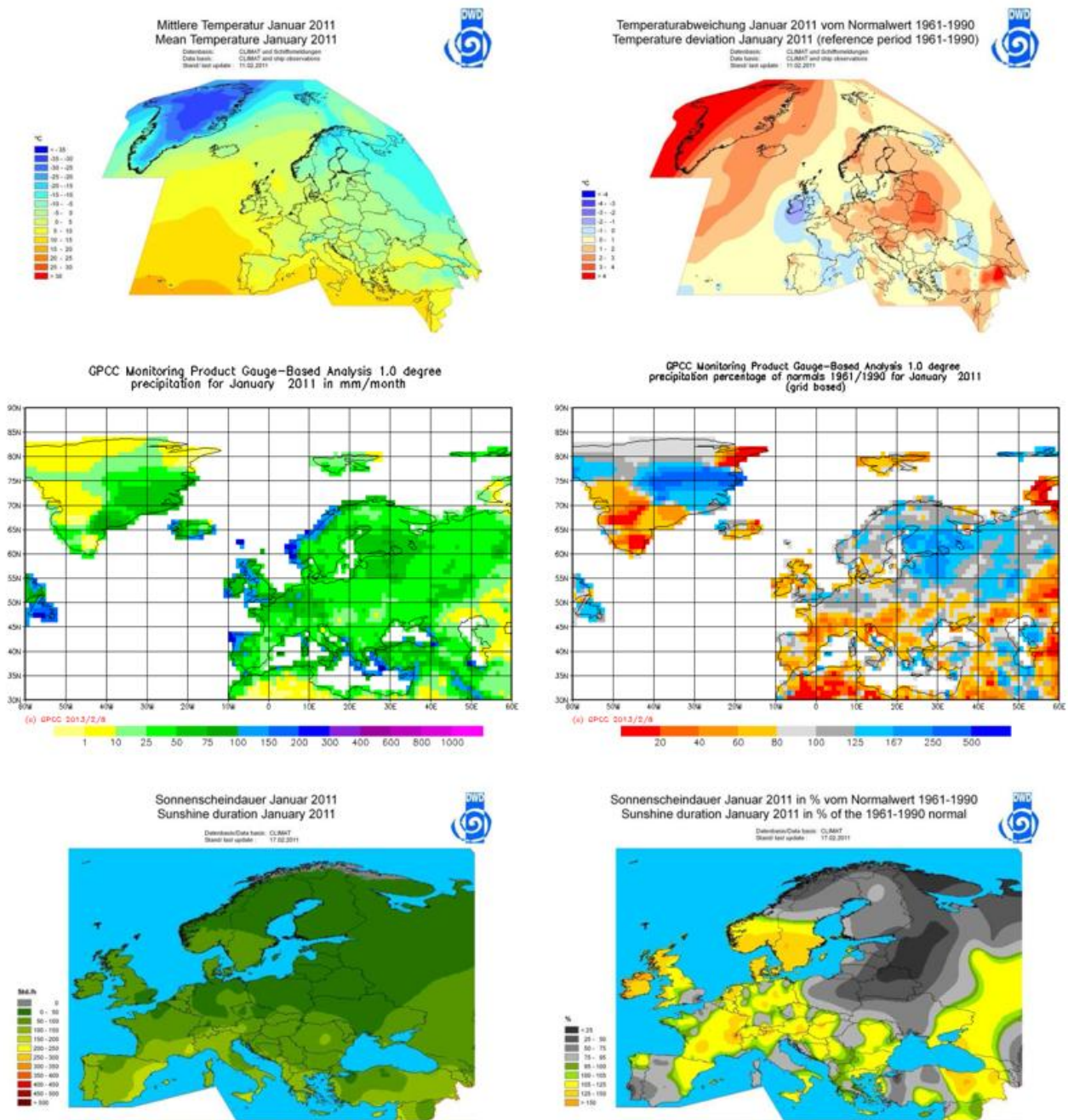


Fig. 3.1: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in January 2011

Monthly Climate Extremes and Events:

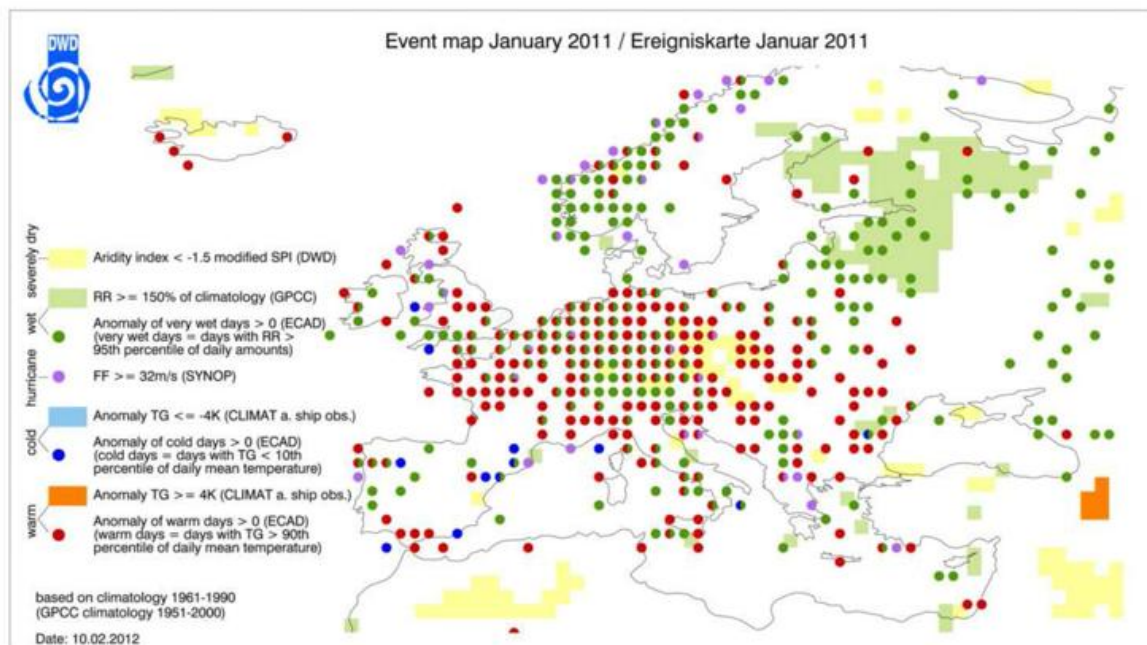


Fig. 3.2 : Monthly Map of Climate Extremes and Events January 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

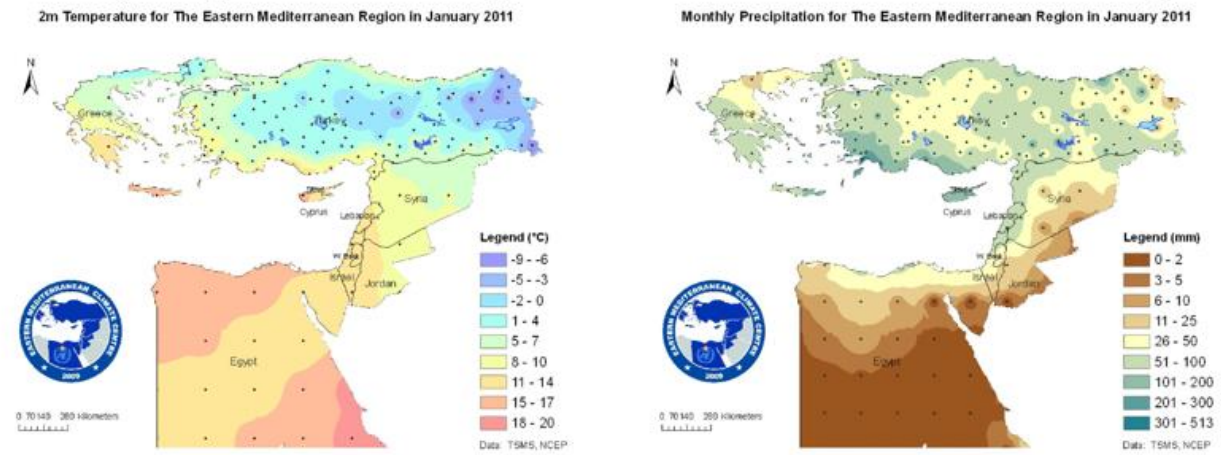


Fig. 3.3 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) January 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

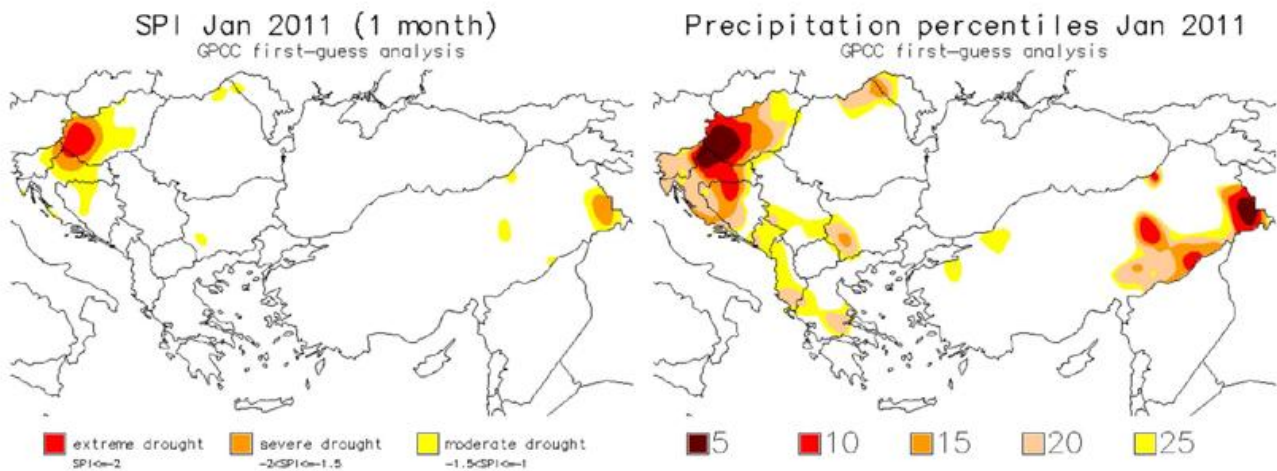


Fig. 3.4 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) January 2011

February

Highlights:

- *Very cold in eastern Europe, warm in the west.*
- *Mostly dry with regional exceptions mainly for the British Isles, the Mediterranean Sea and the Caucasus region.*
- *Sunny except the northwest of the continent and the British Isles, parts of the Balkan Peninsula and the Caucasus region*

Overview:

Temperature:

February 2011 was warmer than normal on the North Atlantic, in western and southern Europe and in the Middle East as well as over Greenland and the Arctic Sea. The anomalies in the north exceed +4 K, in England there is a secondary maximum of 3-4 K. On the other hand it was very cold in Russia, Finland and northern Sweden with anomalies below -4 K. Generally the negative anomalies also included all Scandinavia, Eastern Europe, the Balkan Peninsula, the Black Sea region and the Caucasus region as well as the central Mediterranean Sea. Rather impressive is the spatial distribution of the anomalies of the number of ice days (see the anomaly map of ECA&D).

It was the warmest February on record on the Faroe Islands and as well for at least on station on Greenland. The Austrian station Reichenau/Rax recorded its 3rd highest temperature maximum of February since start of the time series in 1865 with 20.6 °C. It was on the other hand one of the 10 coldest February months on record for European Russia, with anomalies well below -3 K for the whole region and up to -8 K in the center of the cold. Minimum temperatures of -46 °C were recorded.

Precipitation:

Most of Europe was dry in February 2011 with some exceptions which can partly be related to heavy precipitation like in Ireland, Scotland, Denmark, southern Sweden and northern Germany. Also the Mediterranean Sea received more precipitation than normal and remarkable highest daily totals were reported by Portugal (74 mm), Spain (57 mm), France (136 mm), Italy (151 mm), Greece (135 mm), Turkey (87 mm), Syria (92 mm), Israel (52 mm) and Lebanon (49 mm) (see table). Also the Caucasus area had more precipitation than usually. Georgia reported between 92 and 463 percent of the normal (corresponding 72-696 mm) in the west and 26 to 345 percent of the normal (corresponding ??) in the east.

In Estonia the snow depth was exceptionally high.

Sunshine:

Sunny conditions were prevailing in February 2011 in most of the area except Britain, most of France, Belgium, the Netherlands and western Germany, parts of the Balkan Peninsula, Middle East and the Caucasus region. The sunniest regions were the Baltic states, Finland, northern Russia and northern Sweden and Norway with more than 150 percent of the normal.

Monthly Means or Totals and Anomalies :

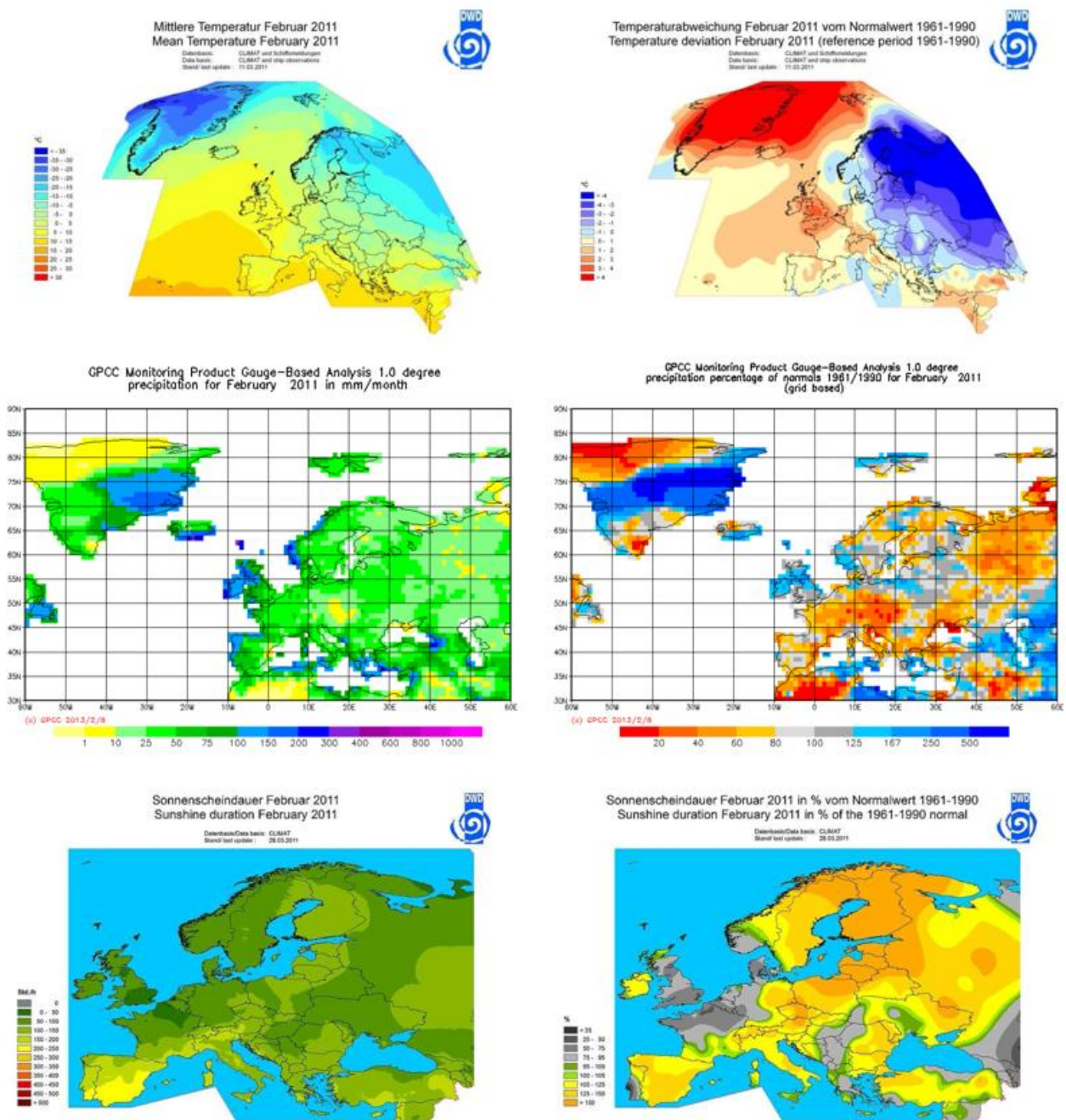


Fig. 3.5: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in February 2011

Monthly Climate Extremes and Events:

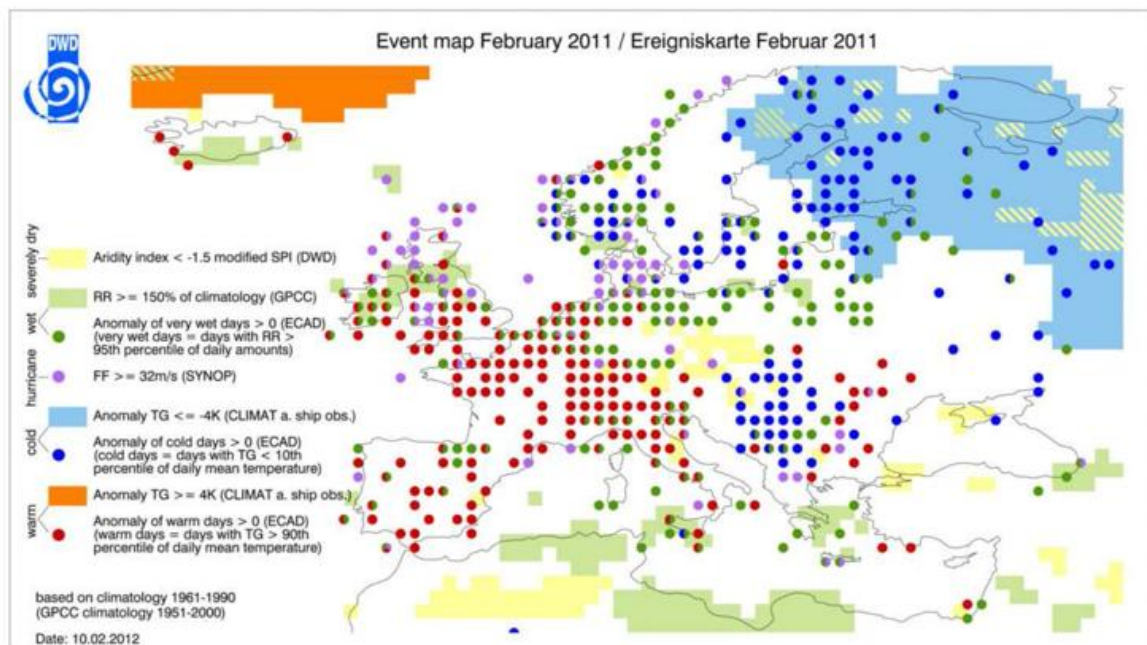


Fig. 3.6 : Monthly Map of Climate Extremes and Events February 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

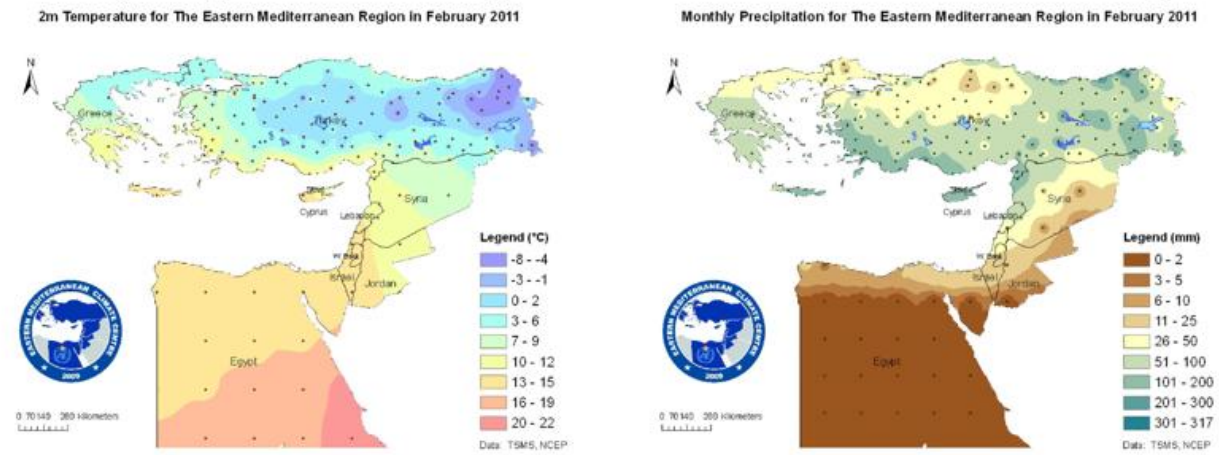


Fig. 3.7 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) February 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

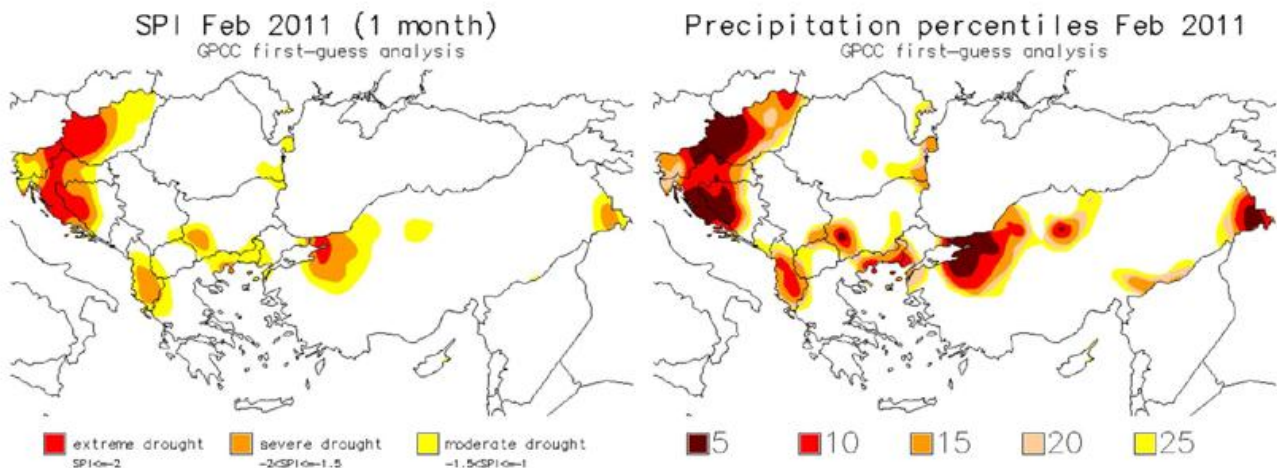


Fig. 3.8 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) February 2011

March

Highlights:

- *Mostly warm except parts of the eastern Mediterranean Sea, the Black Sea and the Caucasus and southern Russian region as well as south of Greenland.*
- *Mostly dry, except the northern North Atlantic and Arctic Sea, the Mediterranean Sea and southern Russia.*
- *Mostly sunny*

Overview:

Temperature:

March 2011 was relatively warm in most of the region except the southern Balkan Peninsula, the Black Sea region and southern Russia as well as the North Atlantic south of Greenland. The positive anomalies were highest for the Arctic regions but still were in the range of 2-3 K in the Alpine region and southwestern parts of Germany. Maximum temperatures close to 20 degrees C or even above were reached in many central and western European countries and even Denmark, Sweden and Norway achieved maximum values above 15 deg C.

On 10 March the Greek station Helliniko recorded its coldest March minimum temperature with -1.8 °C.

Precipitation:

March 2011 was remarkably dry for most of the region. Only southern Iceland, Scotland and western and northern Norway and parts of the Mediterranean Sea, especially southern Spain and Portugal, southern France, Italy and Lebanon received more precipitation than usual. The latter are related to some extreme events, see the event calendar. The lack of precipitation is on the other hand remarkable for large areas. The DWD standardized Precipitation Index shows areas of the class 'severely dry' or even 'extremely dry' in southern England, the low countries, Germany, Latvia, Belarus and Ukraine and parts of Russia, southwestern Turkey and Eastern Syria and Jordan.

In Germany March 2011 was the 7th driest since 1881.

Estonia and Russia (upper Volga region) reported exceptionally high snow depths. St Peterburg had record-breaking 73 cm of snow on 5 March and Estonia up to 82 cm in the northeastern parts.

Sunshine:

March 2011 was a sunny month almost everywhere except the Peninsula Iberica, western Turkey and eastern Bulgaria and Greece and eastern Russia. Most of Germany, Austria, the lowlands, the adjacent parts of France, Poland, and much of the Ukraine and a smaller part of Sweden had more than 150 percent of the normal. Correspondently the anomalies of the mean cloud cover are negative in March 2011 almost everywhere, except the Peninsula Iberica and the northern Mediterranean Sea area. Large areas in central and southern Europe had more than 6, partly more than 11 fair days and the number of dull days mostly below 10, in the Mediterranean Sea area, over the British Isles and in much of Scandinavia, the Baltic states, Belarus, Ukraine and Molova below 5 days.

In Germany it was the 2nd sunniest March since 1951.

Wind:

On 7-9 March strong gale winds with gusts up to 34.7 m/s occurred over the Aegean Sea.

Monthly Means or Totals and Anomalies :

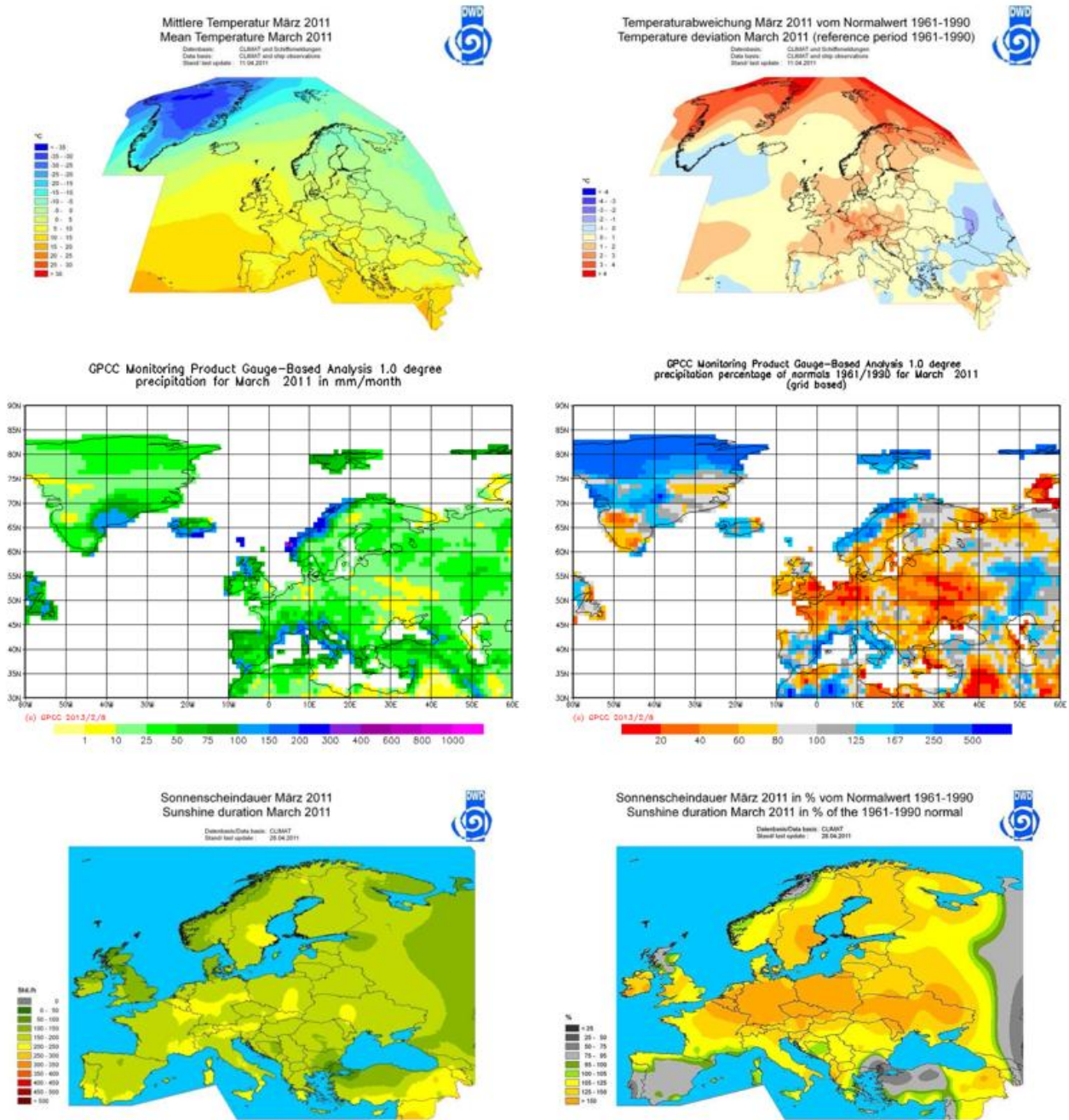


Fig. 3.9: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in March 2011

Monthly Climate Extremes and Events:

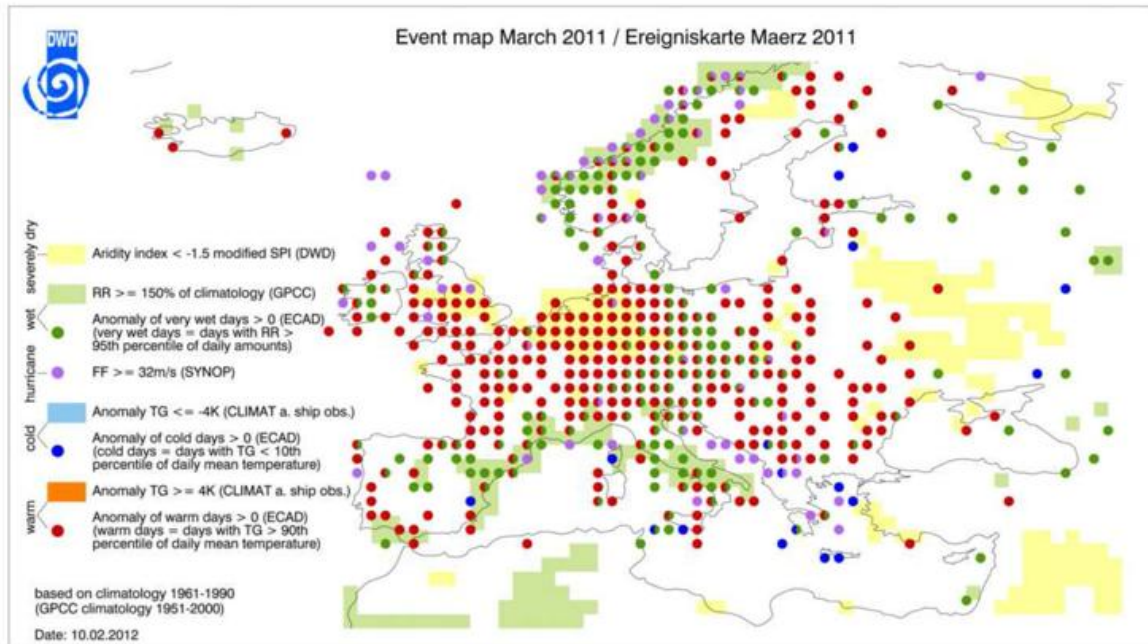


Fig. 3.10 : Monthly Map of Climate Extremes and Events March 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

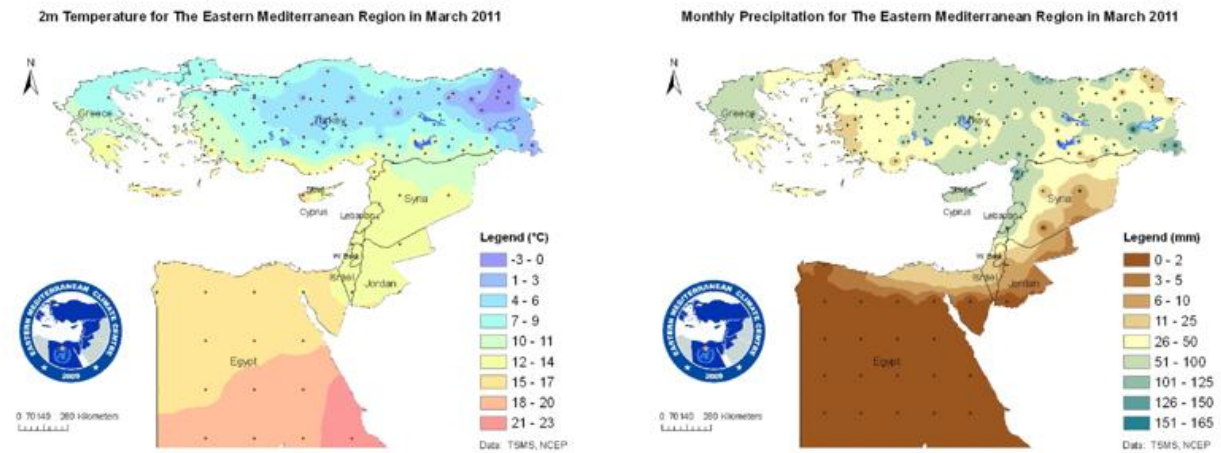


Fig. 3.11 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) March 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

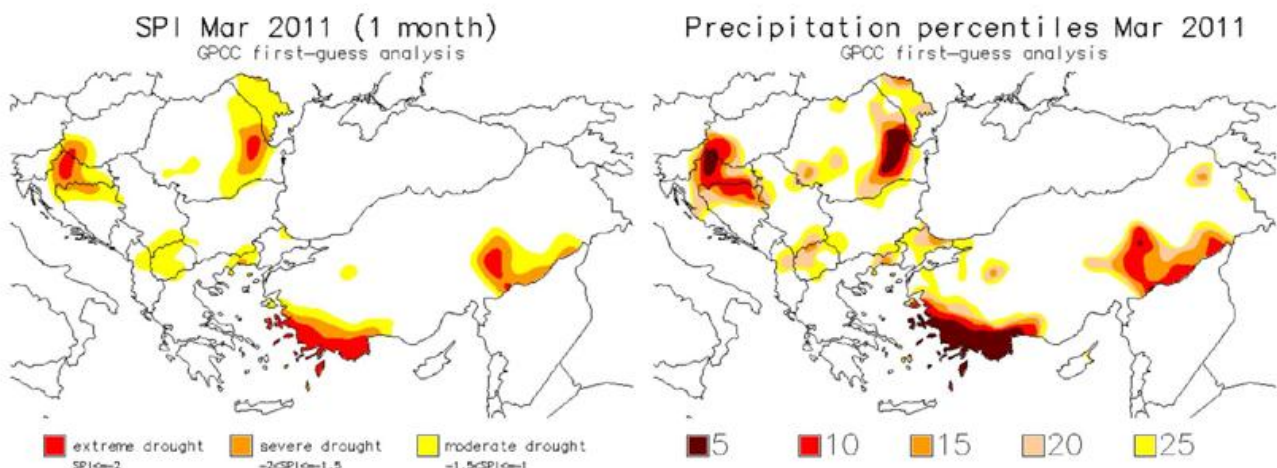


Fig. 3.12 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) March 2011

April

Highlights:

- *Very warm in most of Europe*
- *Very dry in most of Europe*
- *Sunny in most of Europe*

Overview:

Temperature:

April 2011 was warmer than normal in central, southern and northern Europe, but cooler in the eastern Mediterranean, around the Black Sea and in the Caucasus area and the western North Atlantic and western Greenland. The positive anomalies in most of the European countries were above 3 K or even above 4 K on much of the Peninsula Iberica, in France, the Benelux countries, Germany, Poland, Switzerland, the Czech Republic, Denmark, as well as parts of Sweden, Norway, Finland and southern England. Also for the eastern part of Iceland it was one of the warmest April months of record. Many records were broken. Ireland reported the 'warmest April on record' at most of the northern and some southwestern stations. UK registered the warmest April since 1910 and the warmest for over 350 years in central England. In the Netherlands it was the warmest April since 1706 together with April 2007 and 2009. In Denmark it was the warmest April on record. In Norway it was the warmest April since 1900, in Sweden it was the warmest April on record at several southern as well as northern stations. Also the Faroe Islands had their warmest April. In Germany April 2011 was on rank 2 since 1881 after 2009. In France it was the second warmest April since 1900, after 2007. In Switzerland April 2011 was the second warmest after 2007 since the records started in 1864. In Austria it ranged on the third place since 1800. In Portugal it was the warmest April since 1931.

Slovakia recorded the first 'summer day' on 7 April at most stations in the west and north-east. This is at many stations the earliest recorded 'summer day'. Switzerland as well reported such high temperatures on 7 April. On 9 April even 31.8 °C were recorded in Locarno-Monti. Spain reported 37.4 °C on 9 April in Murcia which means as well a new record.

Precipitation:

April 2011 was dry in most of central, western and eastern Europe as well as in northern Europe except the Norwegian coast. It was on the other hand wet in most of the Mediterranean Sea area, the Black Sea area and the Middle East. The dry weather lasted already the third month and consequences of the drought occurred.

In France it was one of the driest April months in 50 years with below 30 percent of the normal precipitation totals. The years 1982 and 1984 were similarly dry in France. In Montenegro it was the driest April since measurements began for parts of the country. The coastal areas received only 2 percent of the normal precipitation. In Israel on the other hand it was the 2nd or 3rd wettest April of the last 70 years in places and the number of rainfall days was the largest of the last 60 or 70 years.

Sunshine:

The sunshine duration was above normal in April 2011 nearly everywhere except Russia, the Caucasus, the eastern Mediterranean Sea and the Middle East. In most of France, Germany, Switzerland and in parts of the Netherlands, Austria and northern Italy as well as Poland and Lithuania and in central England it came above 150 percent of the normal.

Monthly Means or Totals and Anomalies :

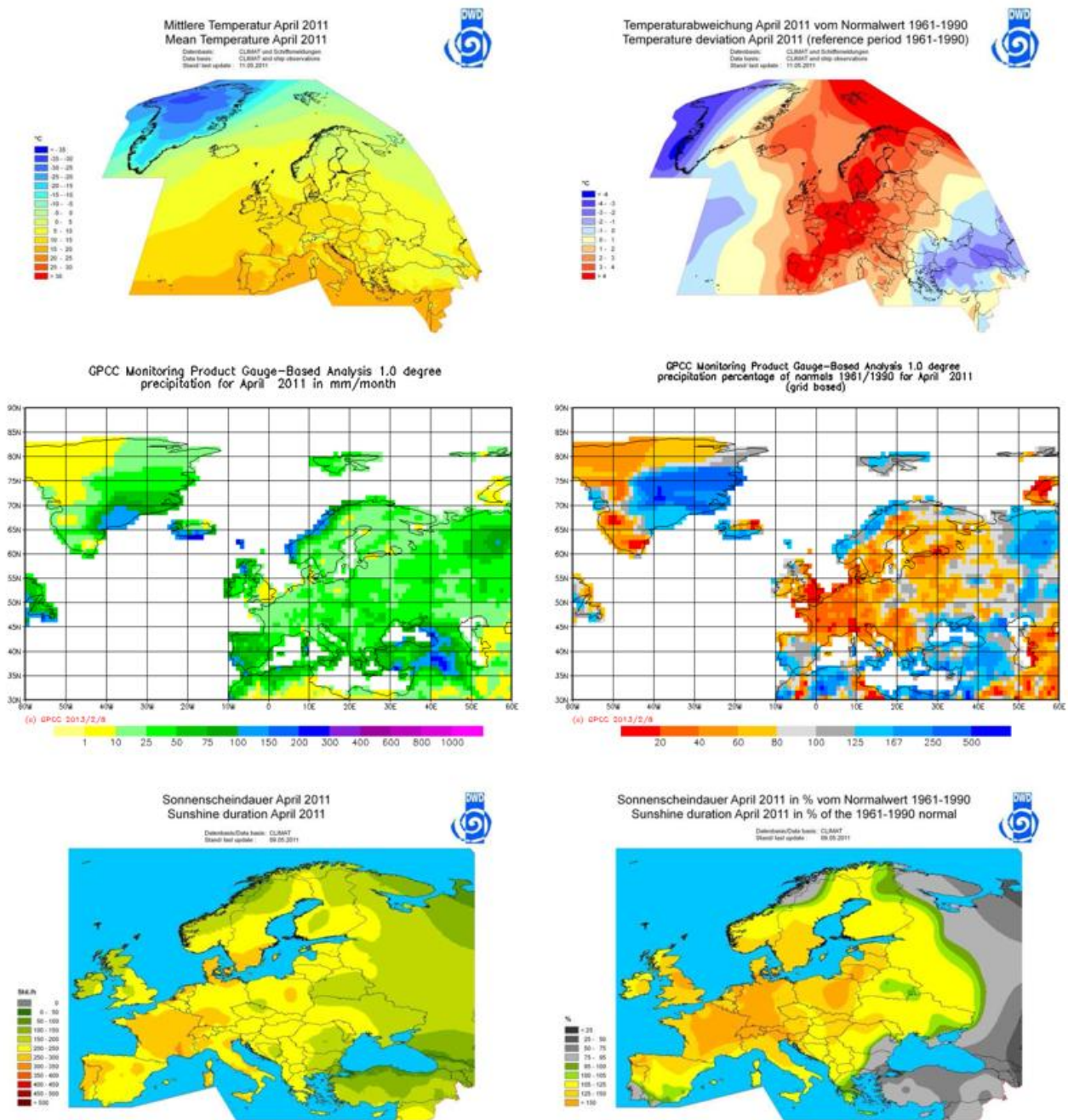


Fig. 3.13: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in April 2011

Monthly Climate Extremes and Events:

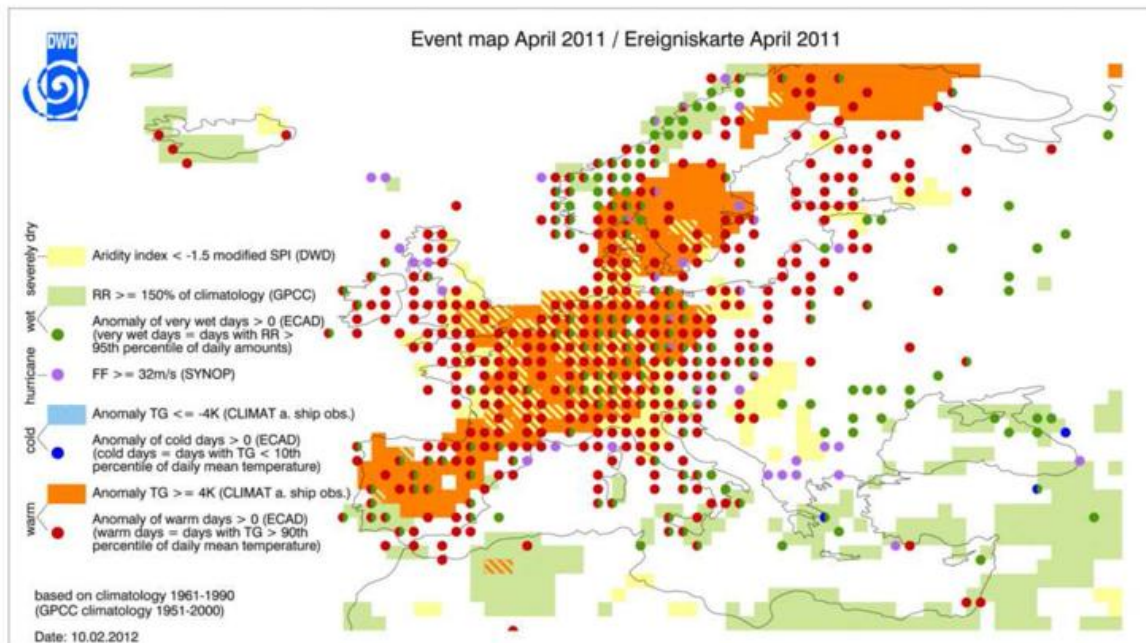


Fig. 3.14 : Monthly Map of Climate Extremes and Events April 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

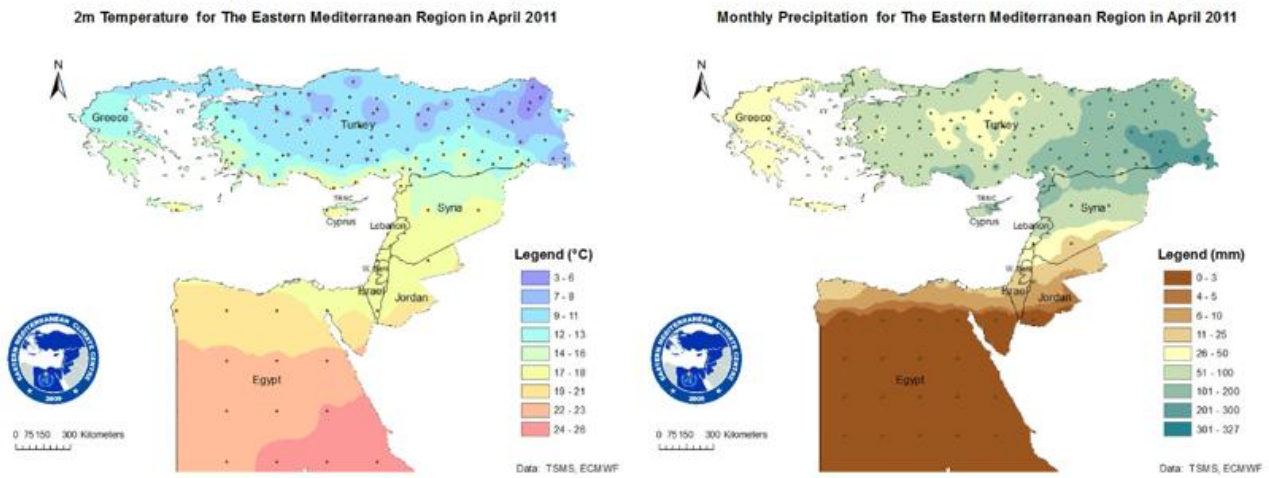


Fig. 3.15 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) April 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

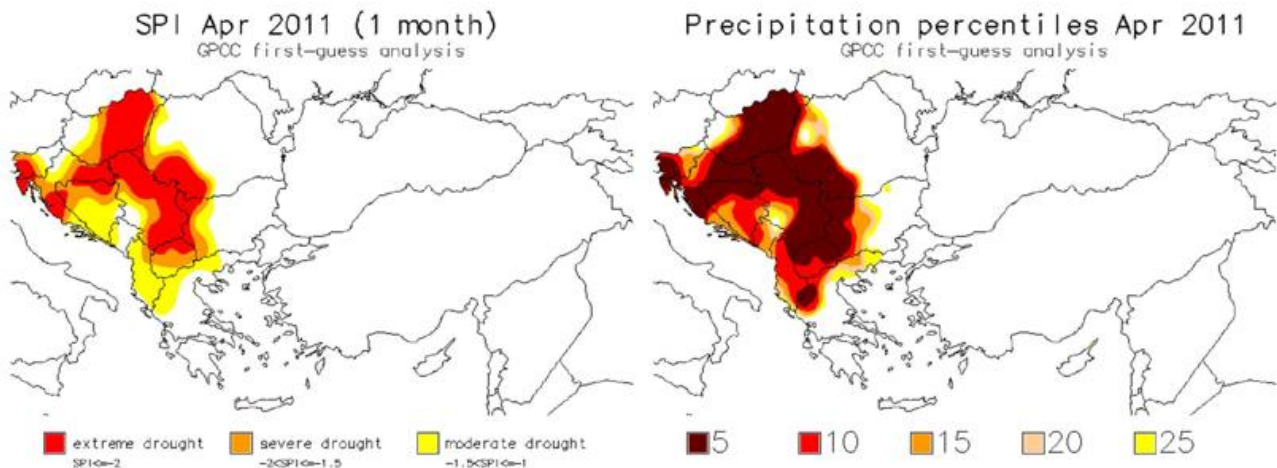


Fig. 3.16 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) April 2011

May

Highlights:

- *Warm in western and southwestern Europe*
- *Ongoing drought in western Europe but many heavy precipitation events on the other hand*
- *Sunny for most of the European continent*

Overview:

Temperature:

Western and southwestern Europe including the east of the British Isles were warmer than normal in May 2011. The anomalies exceeded 3 K in Portugal, parts of Spain and France and Austria. The the eastern Mediterranean area and partly Balkan Peninsula as well as much of the North Atlantic were cooler than normal or close to normal. In central Turkey the negative anomalies range between -1 and -2K. In Poland in Torun with -7.2 °C the lowest May temperature since 1951 was measured.

France recorded its warmest May since 1900. Switzerland had the 3rd warmest May since 1864. Portugal had its warmest May since 1931.

Precipitation:

In western and southern Europe it was mostly extremely dry. The drought lasting from February 2011 on was ongoing (see http://www.wmo.int/pages/mediacentre/news/drought_en.html). Also it was dry in southern Ukraine and central European Russia as well as parts of the Middle East. It was on the other hand wet in Ireland, Scotland, most of Scandinavia and parts of northern Russia as well as the southwestern Mediterranean area and the southern Peninsula Iberica and the northern central and eastern Mediterranean Sea and parts of the Middle East as well as the eastern Black Sea region and southern Russia.

In France it was the driest May of the last 50 years with only 37 percent of the normal.

Sunshine:

Most of the European continent was sunnier than normal. Scandinavia - except in the south - , Ireland and western UK, the southern Iberian Peninsula, the eastern Mediterranean Sea, most of the Black Sea region, the Caucasus and the southern and northeastern parts of European Russia were slightly dull. In Austria it was the sunniest May since the beginning of measurements in 1884.

Wind:

In Ireland the highest winds during the last 25 years were recorded in places. The station Belmullet in County Mayo registered the absolutely highest wind gust ever recorded in May with 40 m/s.

Monthly Means or Totals and Anomalies :

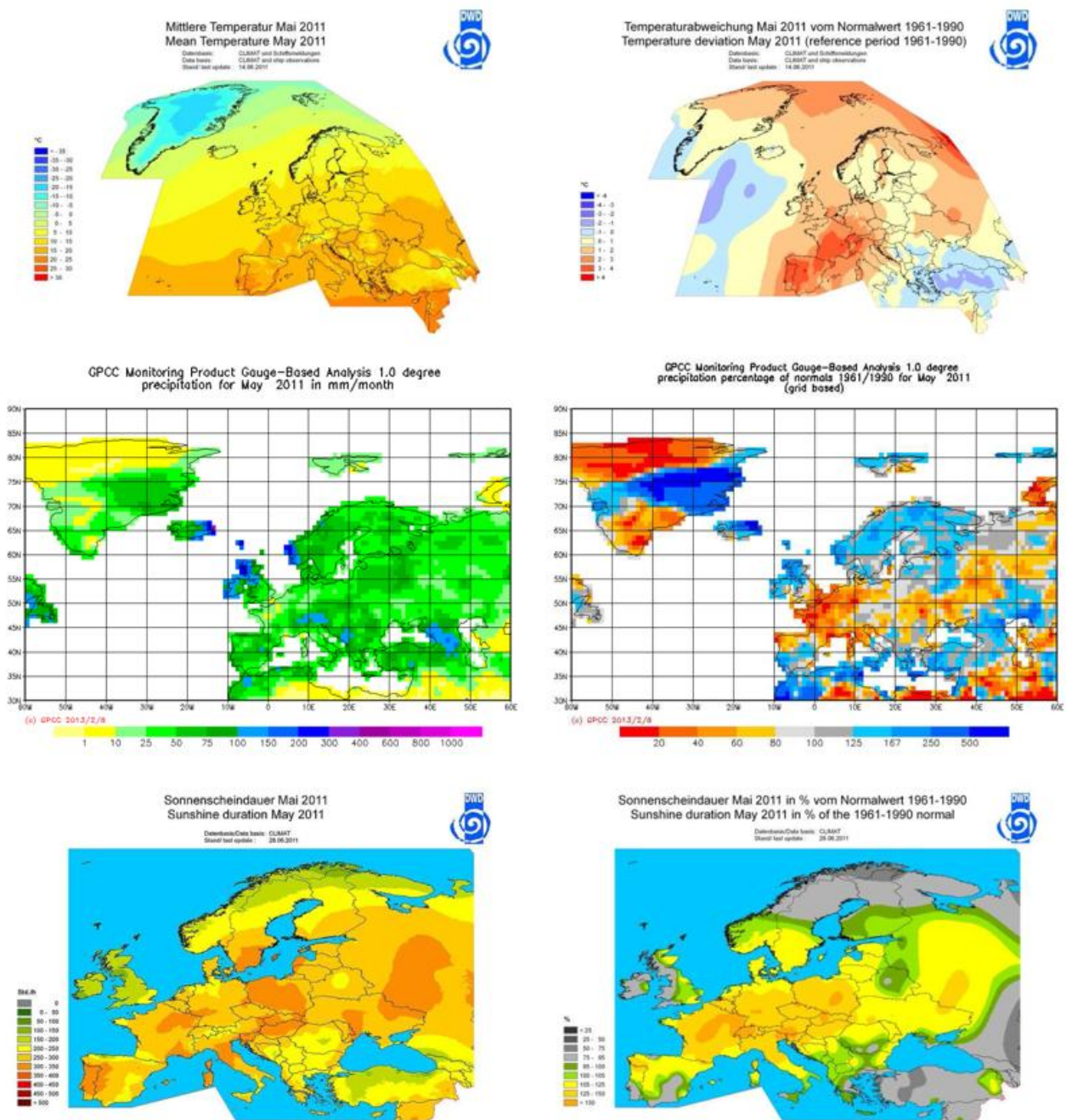


Fig. 3.17: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in May 2011

Monthly Climate Extremes and Events:

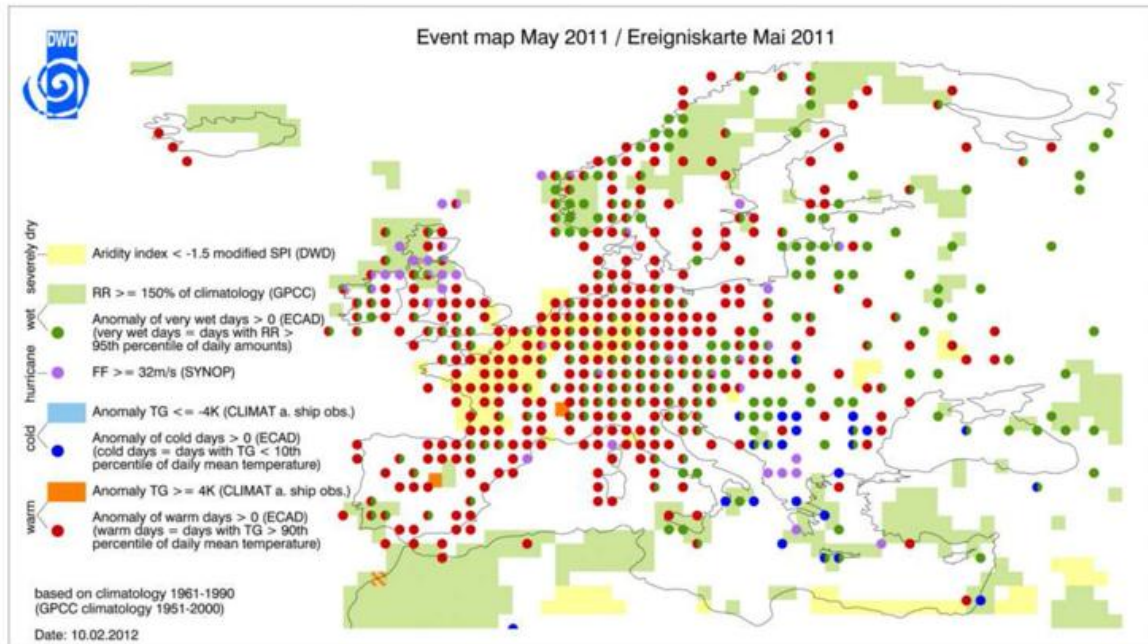


Fig. 3.18 : Monthly Map of Climate Extremes and Events May 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

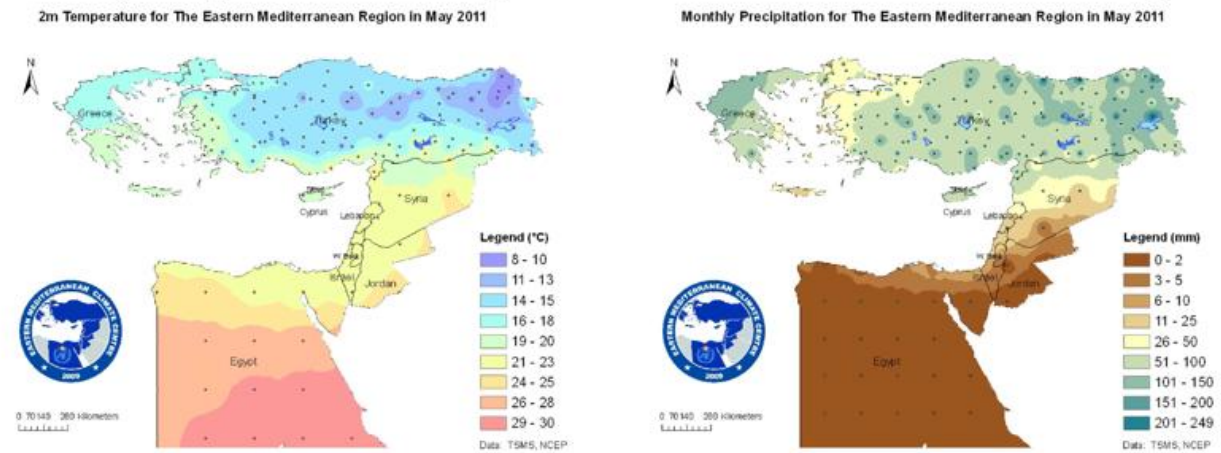


Fig. 3.19 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) May 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

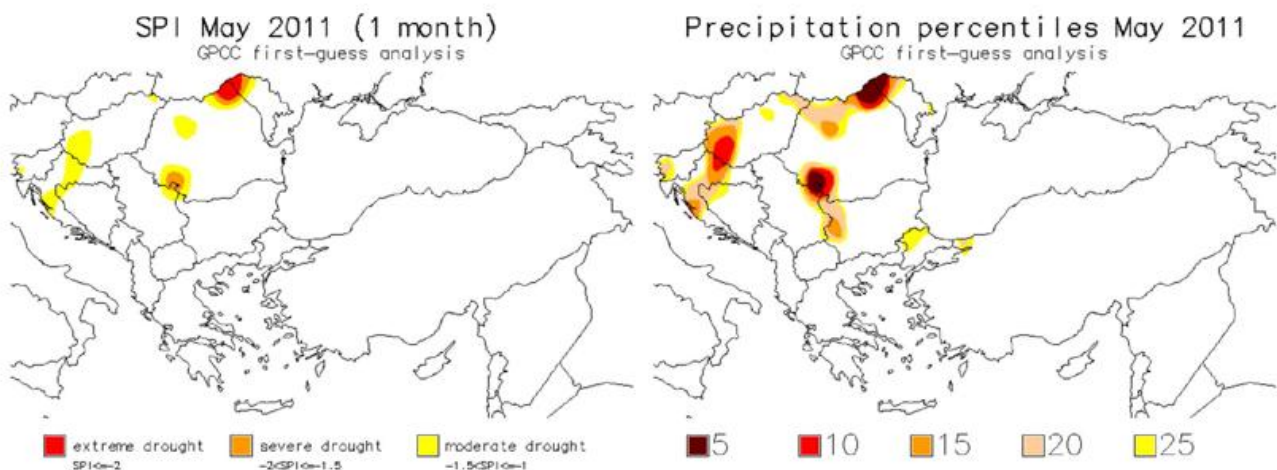


Fig. 3.20 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) May 2011

June

Highlights:

- *warmer than normal*
- *More precipitation than normal except in southwestern Europe, eastern and southeastern parts of central Europe and the east*
- *Mostly fairly sunny in eastern central Europe, western Russia, the Balkan Peninsula and parts of the Mediterranean*

Overview:

Temperature:

The temperature anomalies were close to or above normal everywhere except over the northeastern North Atlantic with negative anomalies below -1 K for western Ireland and for Iceland and 0 to -1 K in most of Turkey. The highest positive anomalies occurred in the Arctic and westernmost Greenland with more than 3 K but on the continent in most of Finland, northern Sweden and Norway, the Baltic states, Poland, Belarus, Ukraine and western and northeastern European Russia as well as partly in the Adria region and on the southern and central Iberian Peninsula the anomalies also exceeded 2 K. Latvia had the 2nd warmest June (and July as well) within 88 years while Israel recorded the coldest June since 1980. It was as well abnormally hot in Murmansk where 29.4 °C were registered on 8 June.

Precipitation:

Positive anomalies of the total precipitation amount in June 2011 were received by partly the British Isles, the northern and northwestern continent, northern Europe with a maximum in southern Norway and Denmark, western and southern Russia, the eastern Balkan Peninsula, the western Caucasus region and Turkey as well as the Alps. Less precipitation than normal fell on most of the Iberian Peninsula, in southwestern France, on the western and central Balkan Peninsula, in the Baltic states, northern and partly central and southern Russia and also in parts of central Europe. Much of the precipitation fell as heavy precipitation connected to convective activity.

In Norway it was the 2nd wettest June since 1900 with 170 percent of the normal. On 10 June the Italian station La Stella in the region Emilia-Romagna received precipitation of extreme intensity with 67 mm within 1 hour. On 27-28 June Switzerland received very intense precipitation.

Sunshine:

It was especially sunny in June 2011 in Poland with positive anomalies up to 150 percent of the normal and also fairly sunny for Ireland, the Iberian Peninsula, Italy, the western Balkan states and the east of central Europe except Slovakia, the Baltic states, Belarus and western Russia, southern Sweden and Finland and northern Russia as well as the Netherlands. Elsewhere it was close to normal or slightly dull.

Wind:

On 4 June a downburst of thunderstorms uprooted 100000 m² of wood in Sweden.

Other Phenomena:

Switzerland had heavy thunderstorms and hail in the beginning of June. On 1st of June a remarkable snowfall occurred at the Swiss station Adelboden (1320 m a.s.l.) with 11cm of freshly fallen snow.

Monthly Means or Totals and Anomalies :

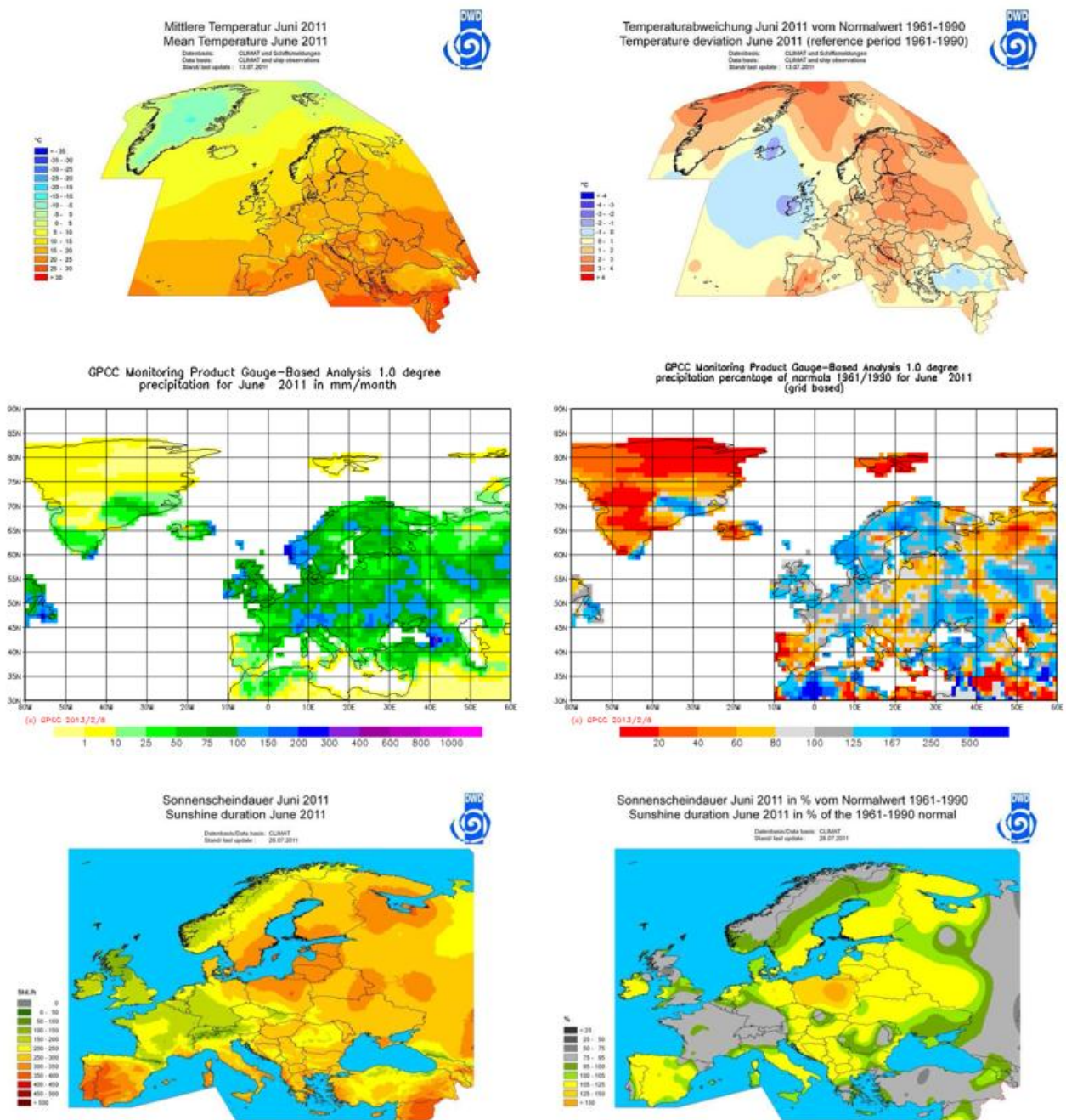


Fig. 3.21: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in June 2011

Monthly Climate Extremes and Events:

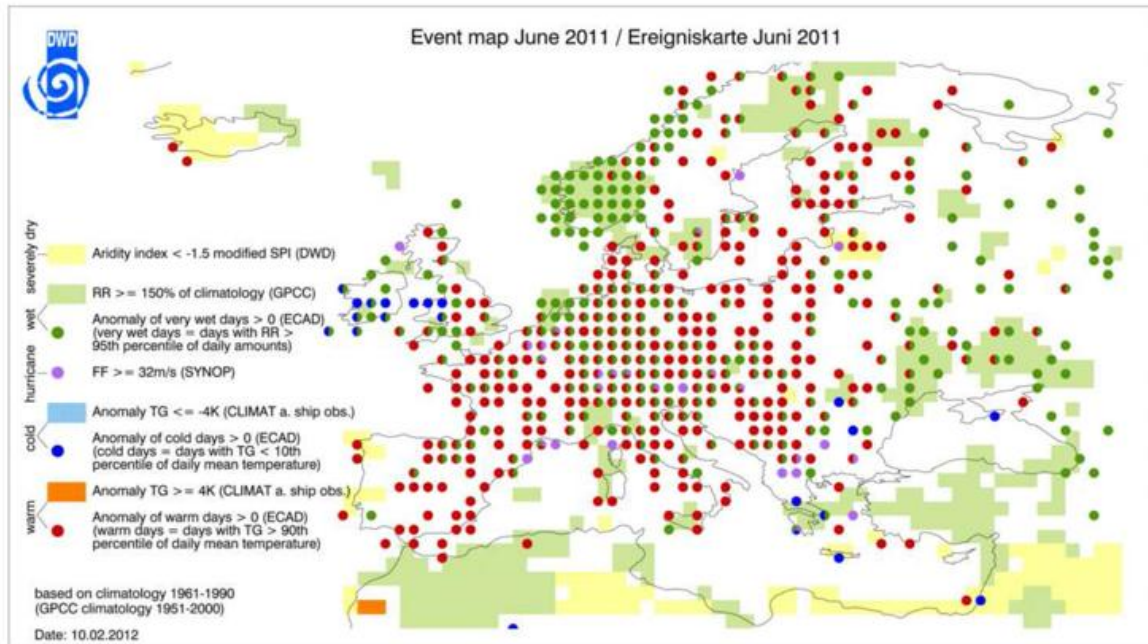


Fig. 3.22 : Monthly Map of Climate Extremes and Events June 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

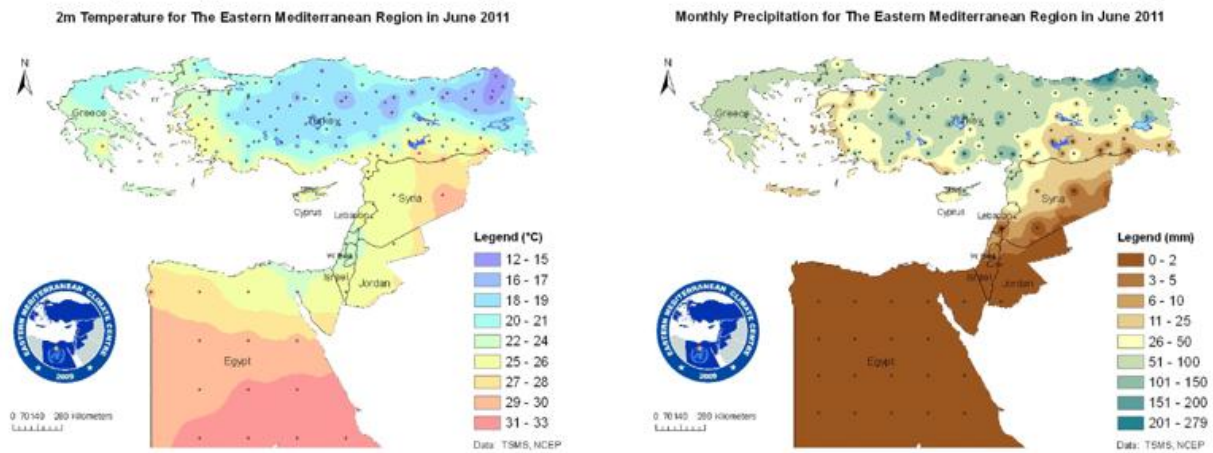


Fig. 3.23 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) June 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

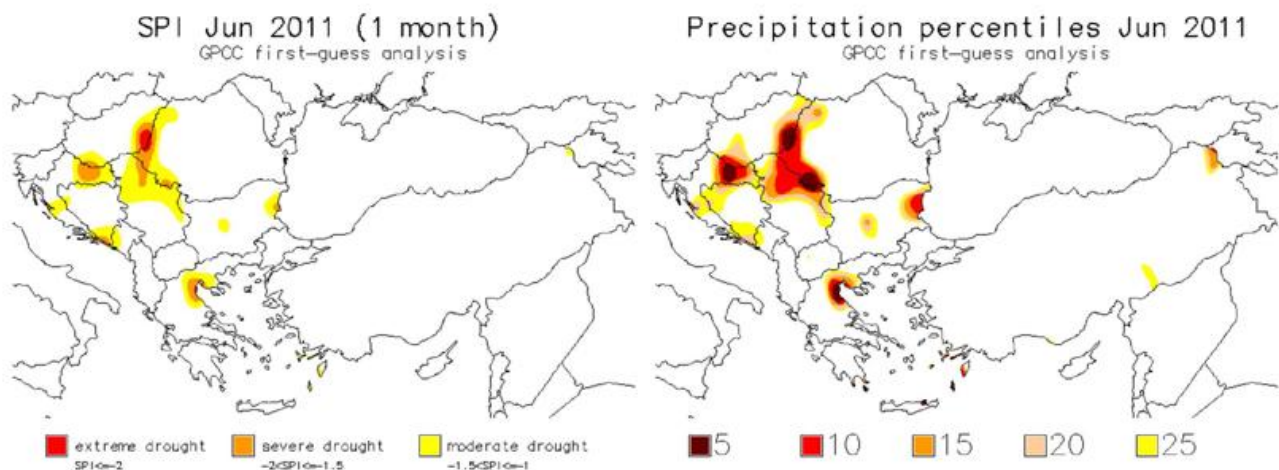


Fig. 3.24 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) June 2011

July

Highlights:

- *Colder than normal in western and central Europe, warmer in the north, east and southeast*
- *Wet to very wet in most of continental Europe*
- *Mostly dull except in the east and southeast.*

Overview:

Temperature:

In July 2011 central, western and southwestern Europe was colder than normal but northern, eastern and southeastern Europe was warmer. France, Belgium and southwestern Germany had negative anomalies in the range of -1 to -2 K. Russia on the other hand had positive anomalies of more than 4 K. It was the 2nd warmest July of European Russia since the beginning of observations there. In Portugal the station Corvo registered 29.7 °C on 26 July and Punta Delgada on the Acores had 28.8 °C on 24 July. A highest maximum temperature of 44.3° C was reported for Russia. Also in Georgia maximum temperatures of 42 °C were achieved and Armenia had the highest July temperature ever recorded in Armenia on 31 July in Meghry. Such high values also occurred in Israel, Jordan (46.5°C in Rwaished, eastern Jordan) and Syria (45° C). Sweden reported a tropical night on 23 July for Stockholm. Finland reported July 2011 as one of the warmest July months of the last 50 years and more hot days than normal. In Latvia July 2011 was (like June) the 2nd warmest if the last 88 years.

Precipitation:

Most of the European continent had more precipitation than normal in July 2011. Most striking were the positive anomalies for eastern Germany with more than 500 percent of the normal, but also in Denmark, southeastern Poland, and southern Norway and also smaller areas in France, Switzerland, the Balkan States, the Baltic States and Ukraine. Only the Mediterranean Sea area, most of the British Isles, central Skandinavia, northern, eastern and southern Russian and the Caucasus were dry. Precipitation fell often as convective precipitation with partly extremely high intensities.

In Denmark extremely heavy precipitation occurred on 2 July which brought 135.4 mm in 24 hours in Copenhagen. On 20 July the station Nizhni Novgorod in European Russia received 91 mm precipitation within 2 hours and 47 minutes. In Romania the station Siria received the highest July precipitation total on its record with 235.2 mm. 5 Romanian stations had 24 h precipitation totals which exceeded their former records.

Sunshine:

Most of western, northern and central Europe was dull while the Iberian Peninsula, Scotland and eastern and southeastern Europe were sunnier than normal.

Wind:

In Northern Lithuania a F2 tornado occurred on 27 July.

Monthly Means or Totals and Anomalies :

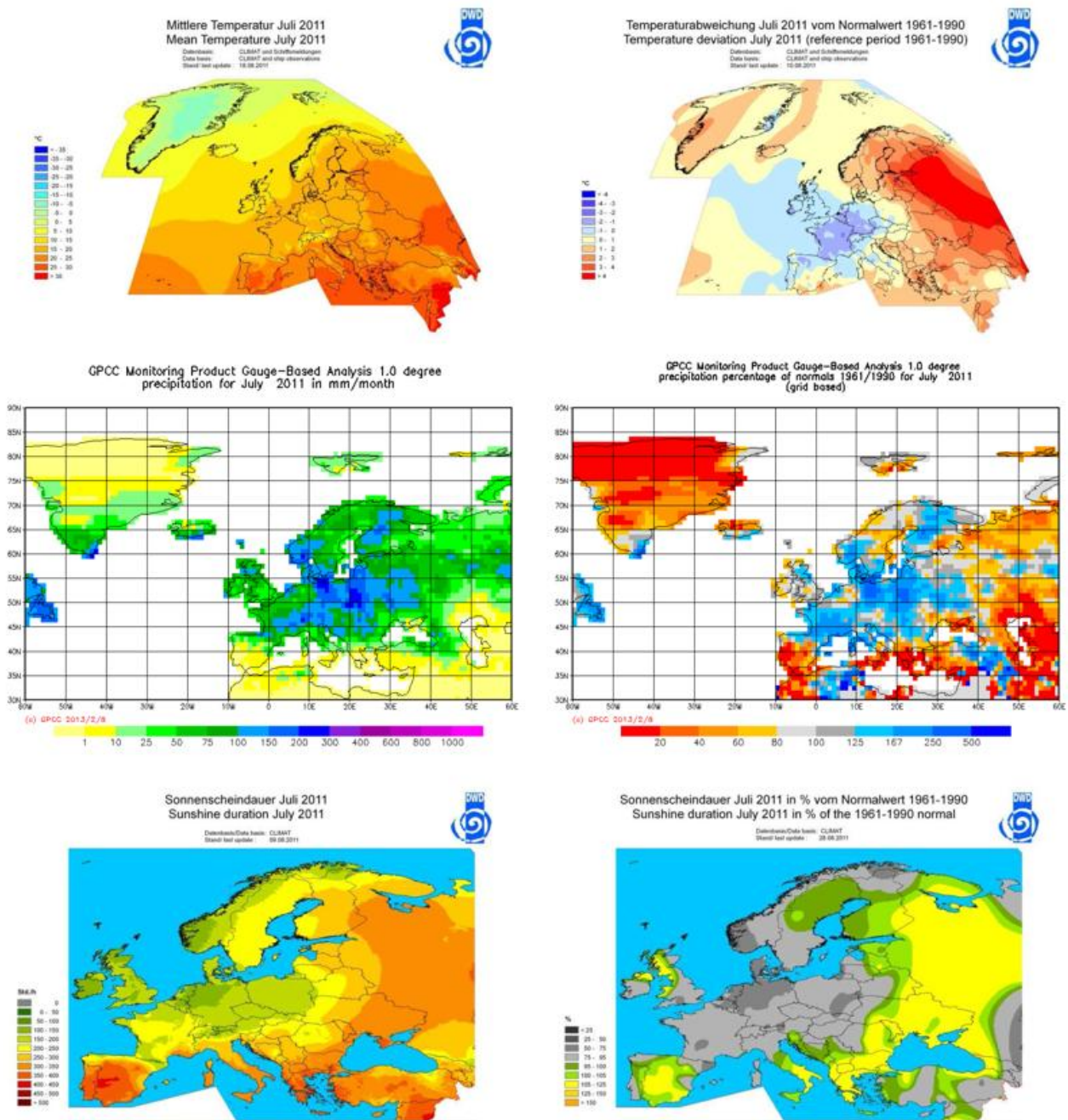


Fig. 3.25: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in July 2011

Monthly Climate Extremes and Events:

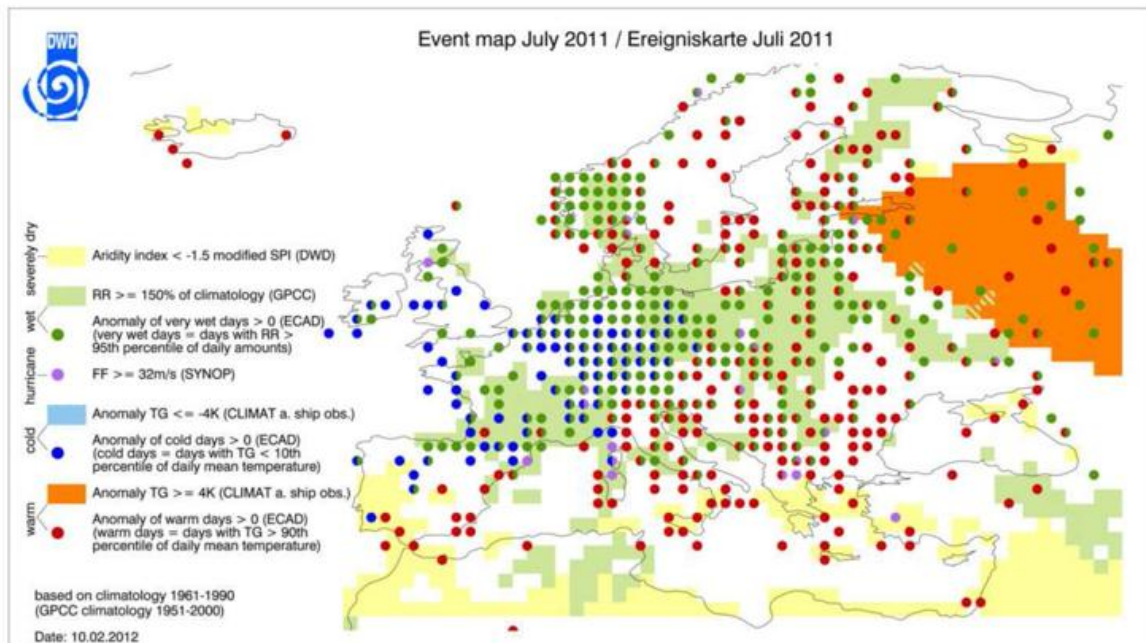


Fig. 3.26 : Monthly Map of Climate Extremes and Events July 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

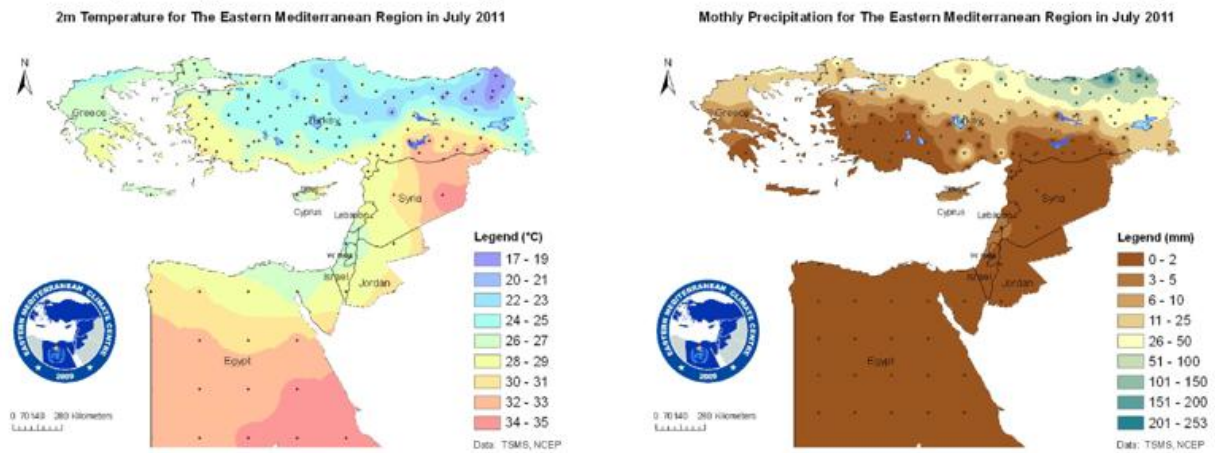


Fig. 3.27 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) July 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

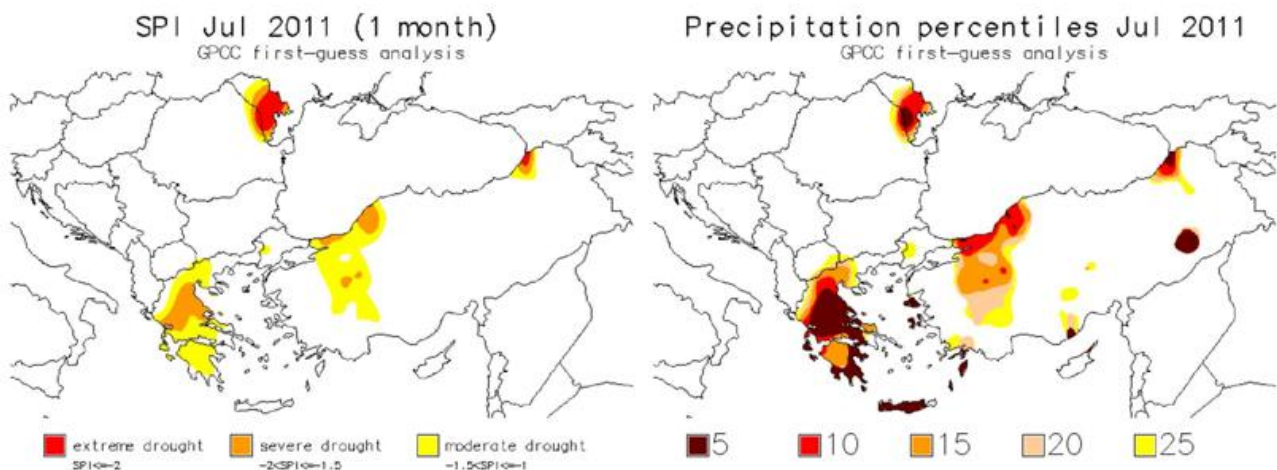


Fig. 3.28 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) July 2011

August

Highlights:

- *Cooler than normal in the northwest under influence of the North Atlantic, warmer especially on the Balkan Peninsula*
- *Mostly dry in the Mediterranean Sea and Balkan regions as well as the Middle East and Russia. Wet in the north and northwest.*
- *Mostly sunny except in the north and northwest.*

Overview:

Temperature:

August 2011 was warmer than normal on most of the European continent with a maximum of the positive anomalies of up to 4 K over the Adriatic Sea and the adjacent Balkan countries and Italy. Montenegro reported for the station Podgorica 4 consecutive days (23 to 26 August) with daily maximum temperatures above 40 °C, which happened for the first time since 60 years. But also Switzerland reported August 2011 to be one of the 10 warmest August months since 1864. Germany reported August 2011 to be on rank 23 since 1881. The British Isles and the central North Atlantic as well as northeastern Russia were on the other hand cooler than normal.

Precipitation:

The western Iberian Peninsula, Scotland, the western and northern European continent and most of Scandinavia as well as locally regions around the Black Sea and the Caucasus area received more precipitation than normal, while the western Mediterranean and the Balkan area, most of the countries around the Black Sea as well as central European Russia were dry. So in France the Haute-Normandie had the wettest August of the last 40 years while the Island of Corsica had the driest August in the last 40 years. Northern Caucasus, particularly Dagestan, received 300 to 400 percent of its normal precipitation in August 2011. In spite of the positive precipitation anomalies the soil moisture anomalies are still negative in most of France and southern UK according to the global analysis of the NOAA Climate Prediction Center (http://www.cpc.ncep.noaa.gov/cgi-bin/gl_Soil-Moisture-Monthly.sh). The long-term reference is based upon 1979-2007.

Sunshine:

The Alpine Region and the eastern European countries Poland, the Czech Republic and Hungary were mostly very sunny and overall most of Europe except the west and northwest and the Middle East were sunnier than normal.

Monthly Means or Totals and Anomalies :

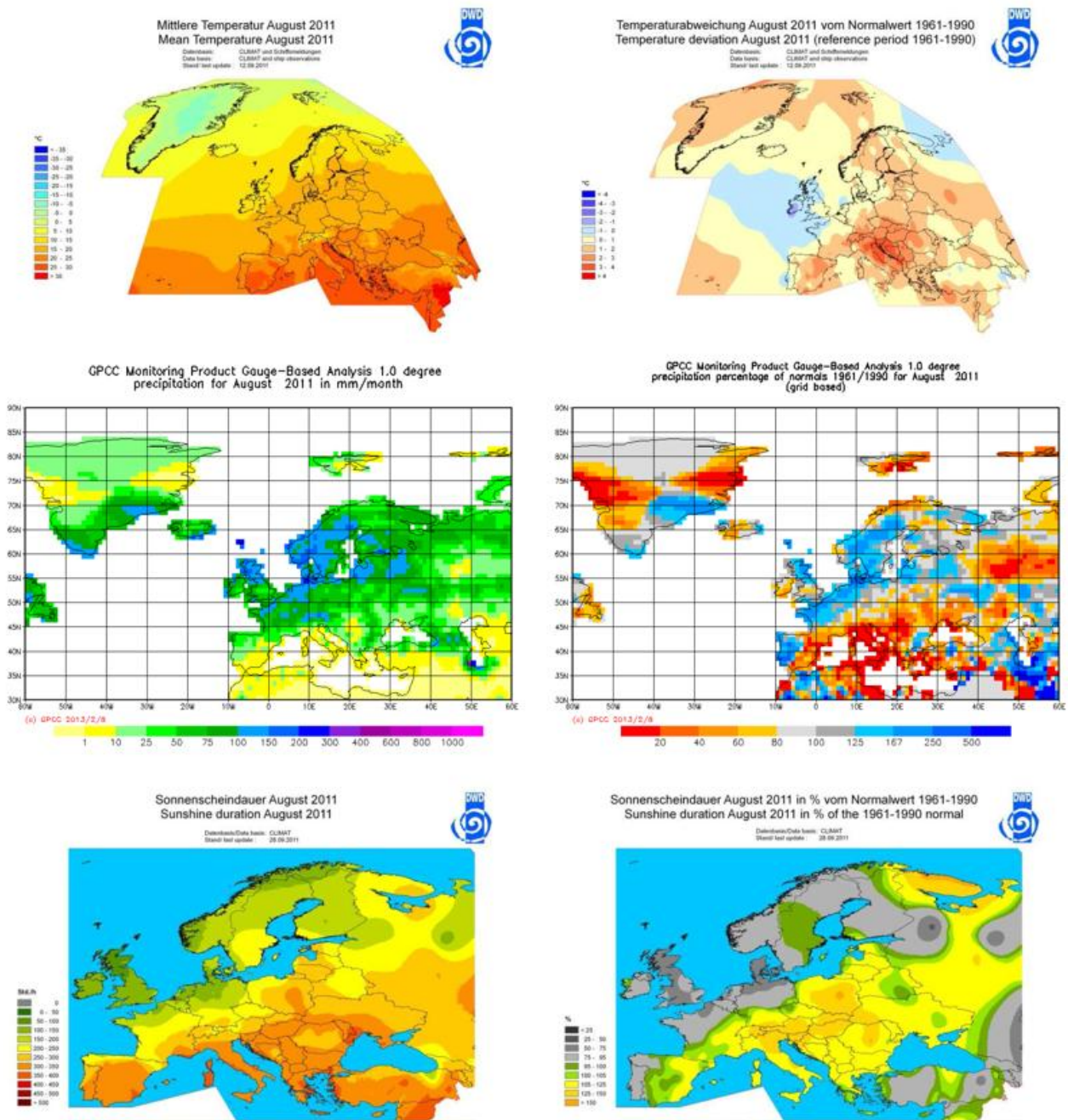


Fig. 3.29: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in August 2011

Monthly Climate Extremes and Events:

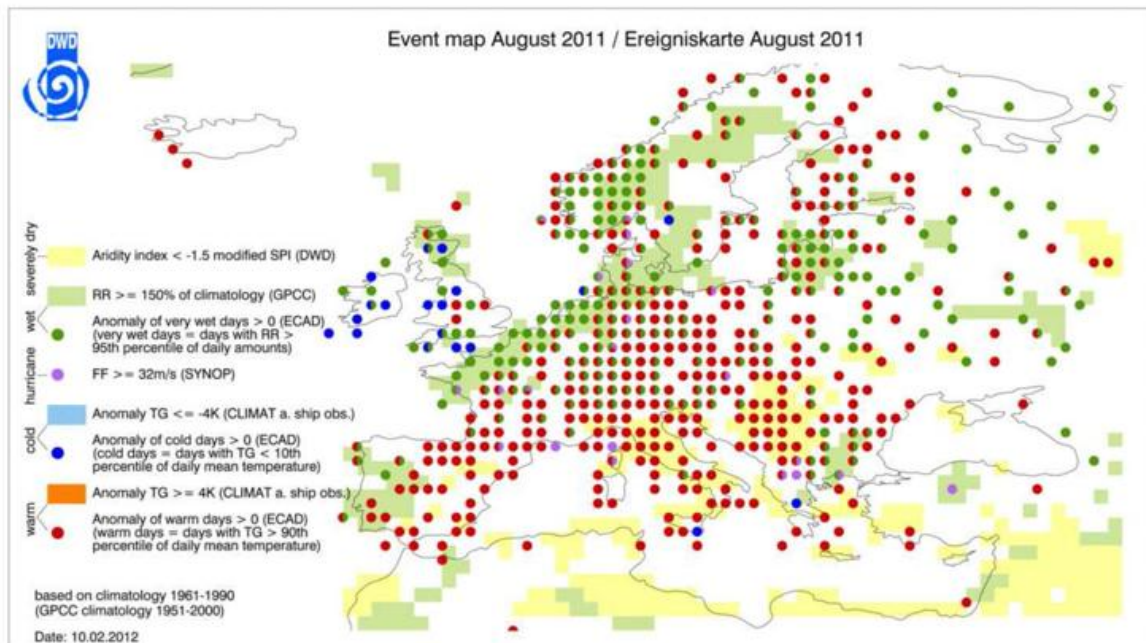


Fig. 3.30 : Monthly Map of Climate Extremes and Events August 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

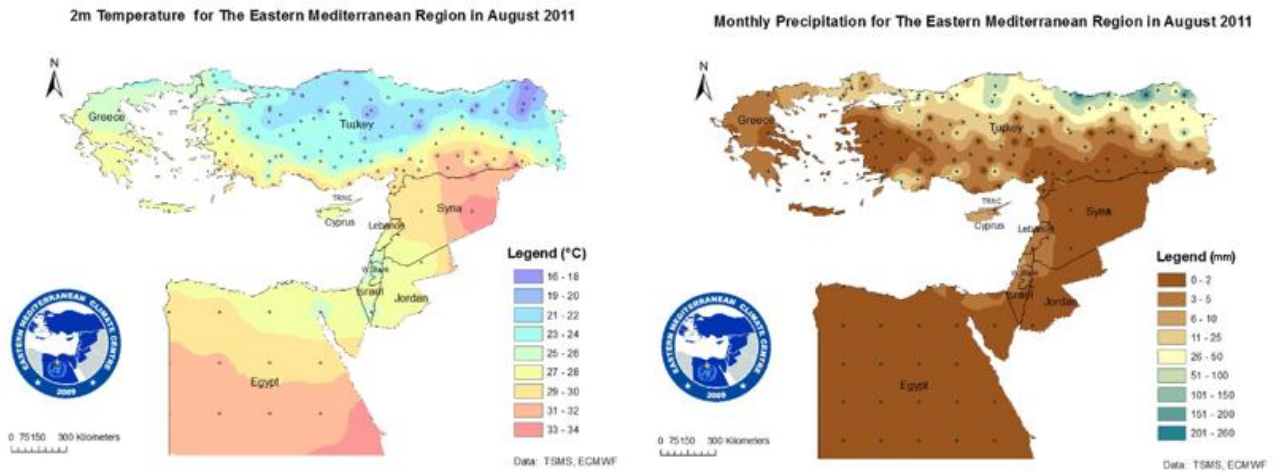


Fig. 3.31 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) August 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

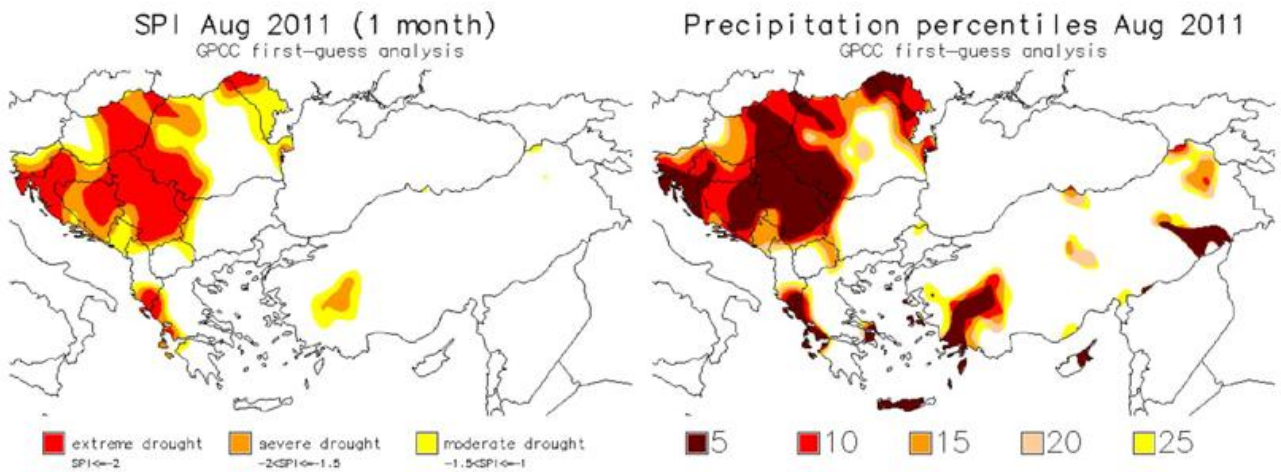


Fig. 3.32 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) August 2011

September

Highlights:

- *Warmer than normal on the continent as well as in the Arctic Sea*
- *Drier than normal in the west and southwest, the western Mediterranean, northern Balkan Peninsula and eastern central Europe, wetter than normal for Ireland, Scotland, most of Scandinavia except the north, Russia, the Caucasus, parts of the Eastern Mediterranean and Middle East*
- *Sunnier than normal over the western and central European continent, the south and the southeast around the Black Sea, less sunny in the north and northeast and the Middle East.*

Overview:

Temperature:

September 2011 was warm except on the central North Atlantik and regionally in the southeast (northeastern Turkey). It was particularly warm on the Balkan Peninsula and the Adriatic Sea as well as in the Arctic Sea. Records were broken in several countries: In UK September 2011 was the warmest September since 2006 and the equal-sixth warmest in the last 100 years. September 2011 was also one of the warmest months ever recorded in northernmost Sweden. In Germany September 2011 was warm on rank 10 since 1091 resp. rank 11 since 1881. In Switzerland it was the 4th warmest and locally the warmest September since 1864. In the southern and southeastern parts of Austria it was the warmest September since the beginning of observations in 1813. Also in the Netherlands rank 10 since 1901 was achieved. Norway had the 5th warmest September since 1900. Record high temperatures were measured during the first days of September at some locations and 29 september the highest temperature ever recorded so late in September occurred at Hudiksvall in central Sweden with 25.6 °C. As well southern Finland was exceptionally warm on 30 September with temperatures over 20 °C. The highest maximum temperature here was recorded at Porvoo with 22.3 °C. Serbia had the hottest September since 1994. Montenegro reported the warmest September since measurements started. The anomalies ranged between +3.5 K to 5.1 K. During all first 7 days of September the maximum temperature rose above 33 °C in Podgorica for the first time after 60 years. In Bulgaria september was one of the three warmest months. Croatia was mostly extremely warm (above the 98th percentile, reference 1961-1990). In Slovakia the mean temperatures were mostly on rank 1 to 5 since 1961. In Slovenia daily maximum temperatures broke former records at some stations on 4 September and overall the country reported a record warm September. Sinaia in Romania recorded the highest September maximum temperature in its time series in 14 September 2012 with 27.2 °C.

Precipitation:

September 2011 was drier than normal in western, southwestern, mostly southern, far northern and in eastern central Europe. In Slovakia the monthly precipitation totals only ranked between 41 and 49 out of 51 years since 1961 and in the southeast of the country it was locally the driest September since 1901. It was wetter than normal in northern and northeastern Europe, northern UK and Ireland, partly in Germany and in the Alps and regionally in the central and eastern Mediterranean region and Middle East. The surplus was often caused by heavy precipitation. In Sweden in the region Norrland some stations registered new records of monthly precipitation totals since 1860 resp. 1876.

Sunshine:

September 2011 was sunny for most of the continent except the northwest, north, east and southeast. It was most sunny in Poland and most dull in northern Russia. In Slovakia for instance the sunshine duration of September 2011 was on rank 1 to 3 since 1961.

Other Phenomena:

In 2011 the lowest September average sea level pressure (995 hPa) on Iceland since measurements started in 1822 was recorded.

Monthly Means or Totals and Anomalies :

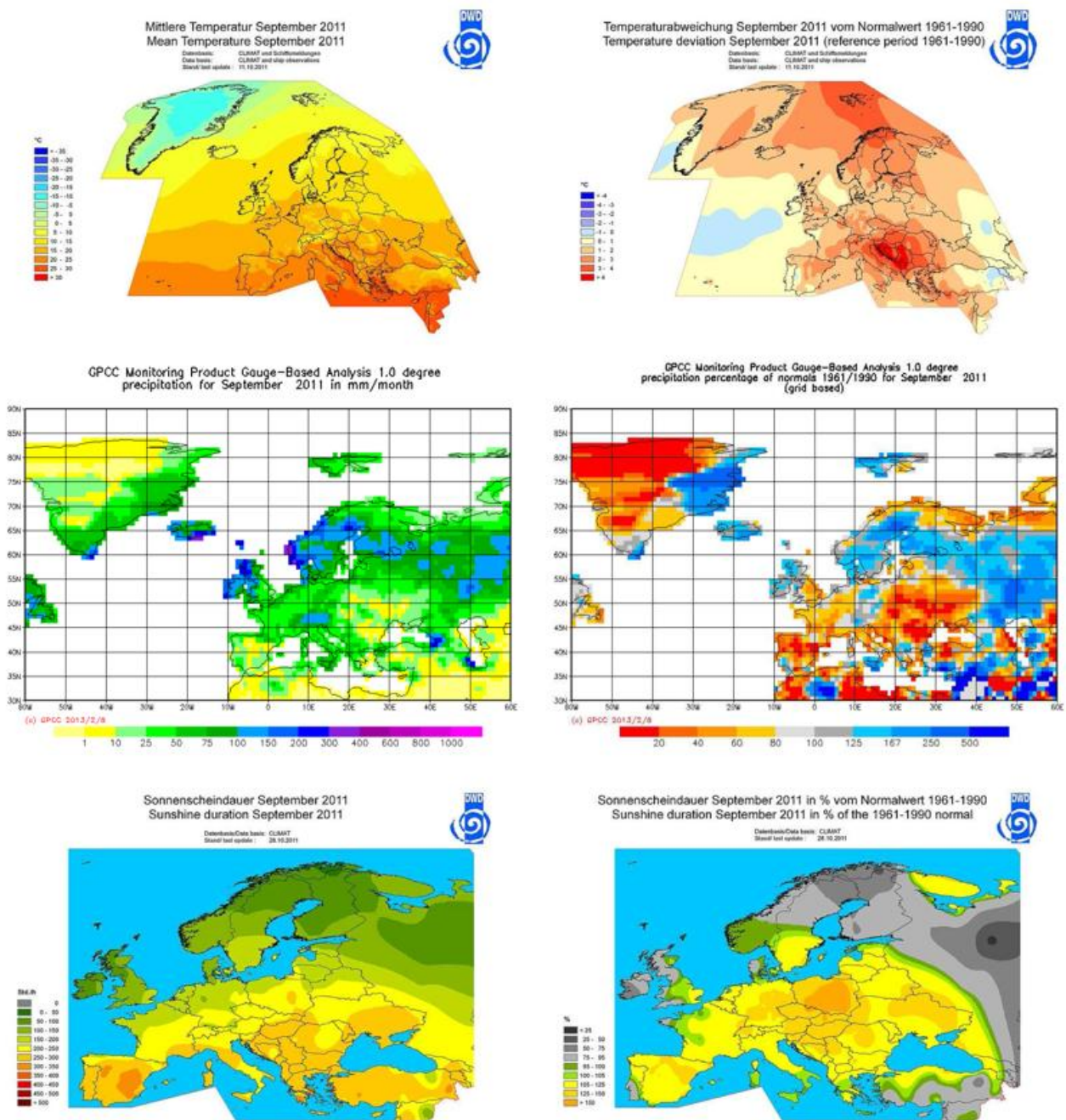


Fig. 3.33: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in September 2011

Monthly Climate Extremes and Events:

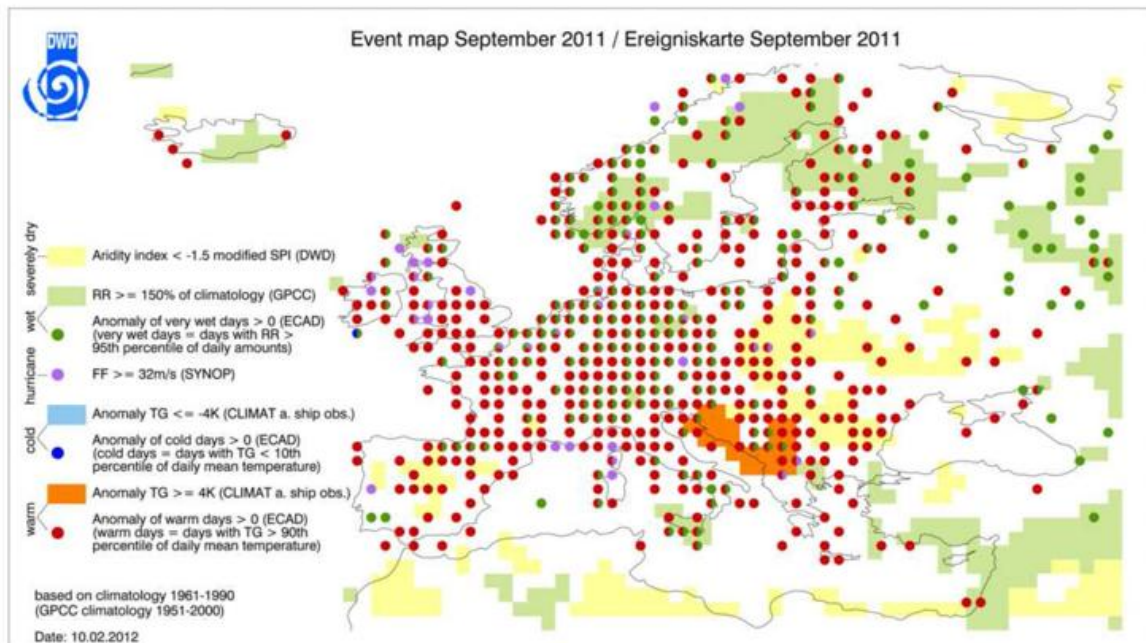


Fig. 3.34 : Monthly Map of Climate Extremes and Events September 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

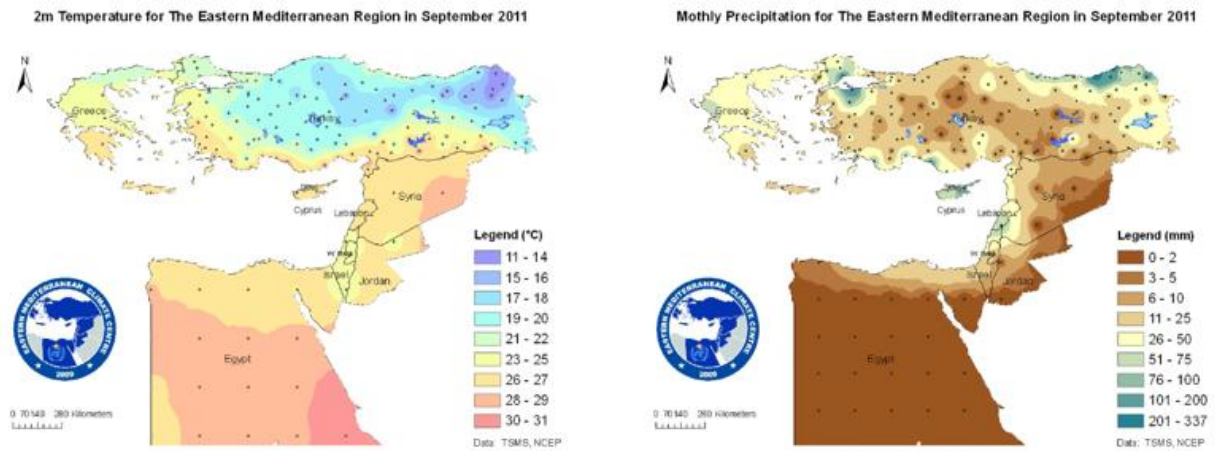


Fig. 3.35 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) September 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

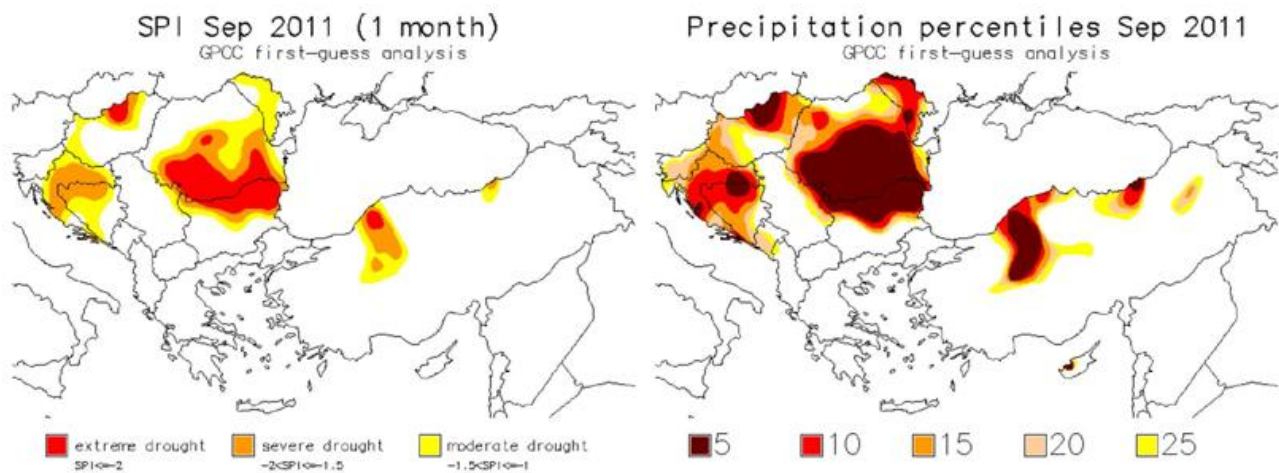


Fig. 3.36 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) September 2011

October

Highlights:

- *Colder than normal in the southeast, mostly warmer elsewhere*
- *Widely drier than normal except in the central and eastern Mediterranean Sea, the Black Sea and under northern North Atlantic influence*
- *Mostly sunny, except in the east and the British Isles.*

Overview:

Temperature:

October 2011 was warmer than normal in northeastern, northern, western and southwestern Europe. The northeast was warmest with anomalies above 3 K. But also in the north for instance in Norway many stations broke their former records for the highest maximum temperatures for October. The British Isles as well as the Peninsula Iberica had anomalies above 2 K and southern England and in southwestern Spain and Portugal the positive anomalies exceeded 2 K. In Portugal October 2011 was the warmest October since 1931. Spain had a new temperature record with 36.5 °C on 12 October in Jerez de l Frontera. Also Russia had a very warm October. Both reported anomalies of more than +4 K. Poland reported an extreme maximum temperature in Opole of 25.7 °C. Slovakia had as well a new record for October with 28.2 °C on 1 October in Dolne Plachtince. Slovenia recorded the 2nd highest October temperature in Ljubljana with 26.1 °C. In France a heat wave during 25 September to 4 October with more than 30 °C in western and southern parts of the country brought record-breaking temperatures for October at some sites. This was as well the case in UK where the heat wave lasted 28 September to 3 October with more than 28 °C wide in central and western England and the provisionally highest October temperature ever recorded in UK with 29.9 °C in Gravesend on 1 October. 1 October also brought the highest October temperature ever recorded in Denmark (26.9 °C). It was colder than normal in the southeast, mainly the eastern Mediterranean Sea with Greece, the Aegean Sea, western Turkey, Bulgaria and Romania with anomalies of -1 to -2 K as well as the western North Atlantic. The greatest negative anomalies were registered in northwestern Turkey with anomalies of -2 to -3 K. In Central Europe it was slightly warmer or close to normal.

Precipitation:

October 2011 brought totals of more than 150 mm under Atlantic influence at the western coasts of Scandinavia, in the north and west of the British Isles, on Iceland and in the northwest of the Peninsula Iberica. In Norway more than 400 mm were regionally achieved and several stations broke their former maximum values for October totals and also some stations broke their former records of maximum daily totals for October as well. Totals of more than 150 mm occurred also in the east, the west and south of the Black Sea, in southwestern Turkey, western Greece, southern Italy and in Slovenia and Croatia. This was absolutely (in mm) much more than normal especially in southern Italy and Algeria, in western Turkey and in Bulgaria and Romania, and east and west of the Black Sea as well as for places in Scotland and Northern Ireland, on Iceland and partly in Norway. But also northern Scandinavia received much more precipitation than normal. In terms of relative anomalies (percentages) the surplus around the Black Sea and western Turkey is even more pronounced and moreover the southeast (Iraq, Jordan) as well as northwestern Africa had much more precipitation than normal. Much of the precipitation fell as extremely heavy precipitation with daily totals of 50 mm and more. Daily totals of 100 mm were exceeded in Turkey, Slovenia, Croatia, Greece, Bulgaria, Spain, Italy and France. In Italy a disastrous precipitation event occurred in Liguria on 25 October, when rain intensities between 50 mm/h and 153 mm/h occurred in the areas Cinque Terre, Val di Vara and Lunigiana. Borghetto di Vara received more than 50 mm/h during 6 hours and overall a total 472 mm over 6 hours. Much damage occurred and 13 people came to death. It was on the other hand drier than normal in western, southwestern and mostly central Europe. In parts of Poland October 2011 was extremely dry.

Sunshine:

October 2011 was sunnier than normal in northern, central, western and southwestern Europe and most of the Balkan Peninsula, but dull over most of the British Isles, the east and the southeast. The sunshine duration was exceptionally high in some countries (Belgium, Netherlands and Germany ranking below 10 for the sunny October months since time series begun).

Wind:

During 16-18 October disastrous storms with a lot of damages occurred in Bulgaria.

Monthly Means or Totals and Anomalies :

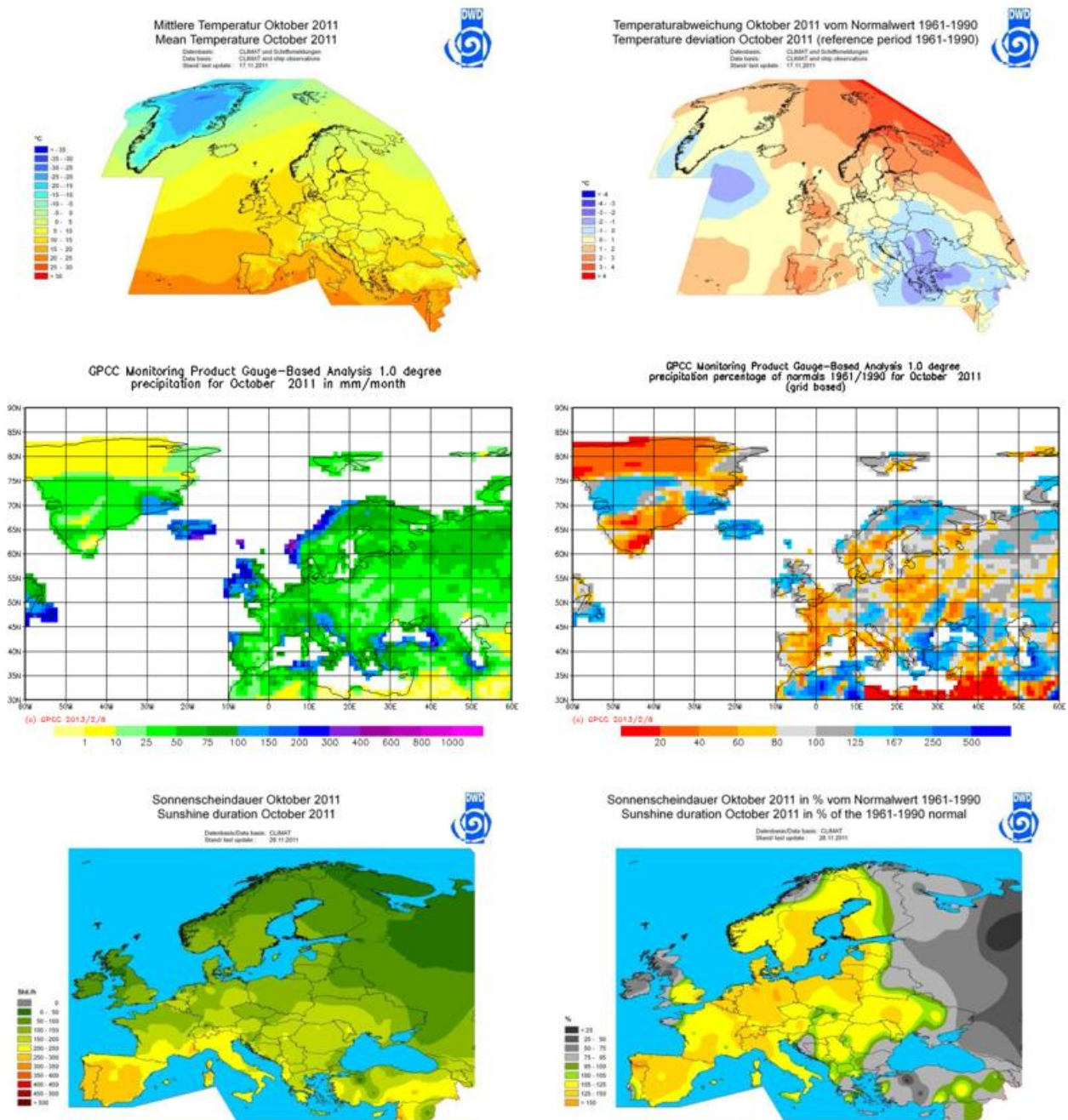


Fig. 3.37: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in October 2011

Monthly Climate Extremes and Events:

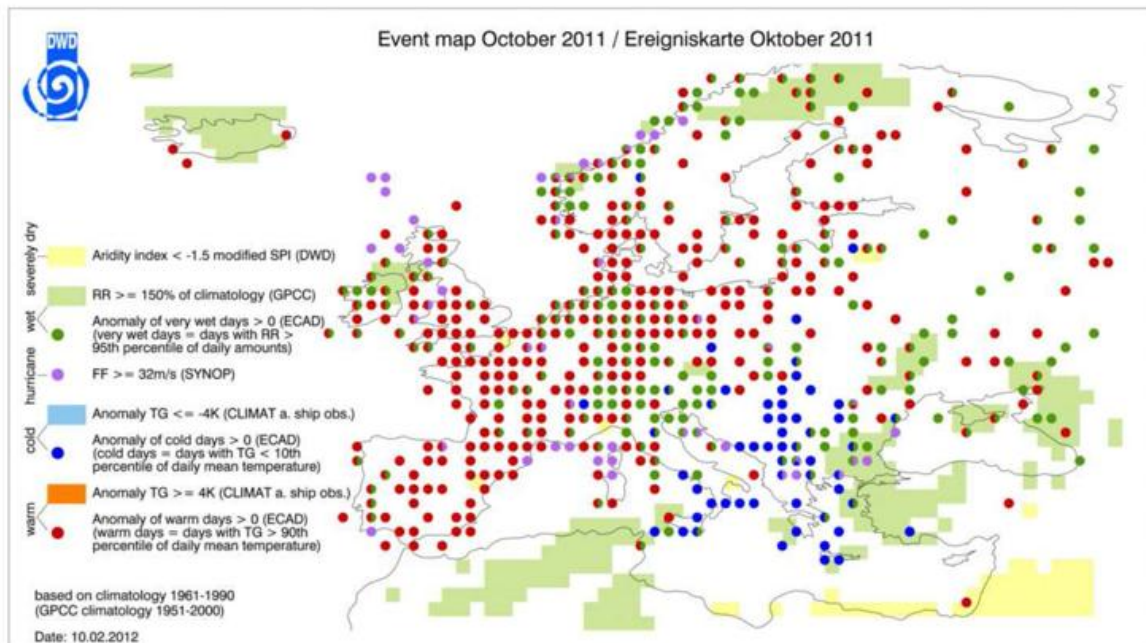


Fig. 3.38 : Monthly Map of Climate Extremes and Events October 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

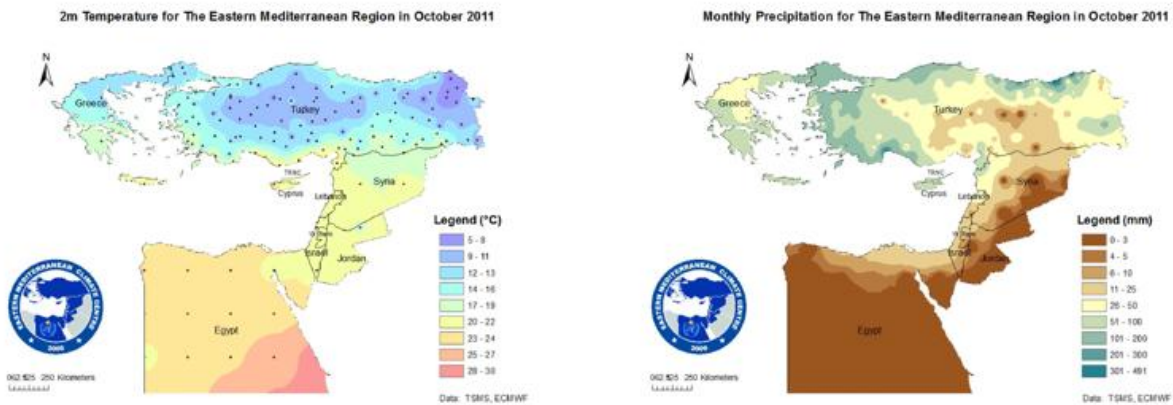


Fig. 3.39 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) October 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

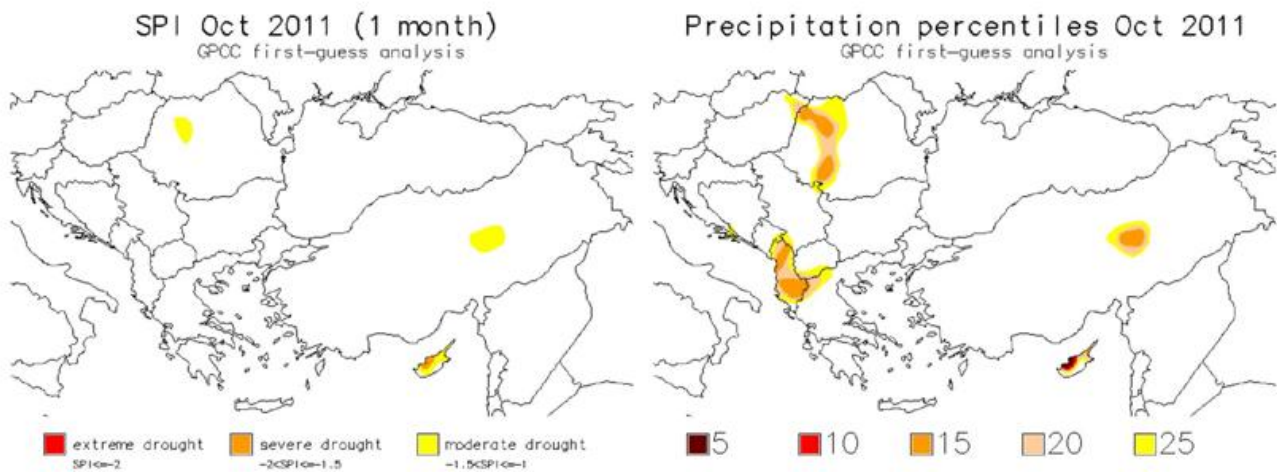


Fig. 3.40 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) October 2011

November

Highlights:

- *Warmer than normal in the Arctic region and in northern, western and southwestern Europe. Colder in the Middle East.*
- *Dry on the European continent but partly very wet in coastal regions of the Atlantic and the Mediterranean Sea.*
- *Mostly sunny on the continent, very sunny in Central Europe.*

Overview:

Temperature:

There is a strong positive temperature anomaly of more than +4 K in the Arctic region and most of Scandinavia and a similarly strong negative anomaly in the Middle East with more than -4 K over Turkey and the eastern Black Sea region as well. Western and southwestern Europe was as well warmer than normal with up to 3-4 K in parts of United Kingdom and western France.

Most striking was the large positive anomaly in the Arctic region. The Faroe Islands for instance had an anomaly of + 8.9K. And Iceland reported 'one of the warmest Novembers on record'. In northern Sweden some locations had their warmest November. November 2011 brought some new records for daily temperature values. So Switzerland reported a maximum temperature of 23.1 °C on 4 November in Altdorf in a Foehn situation and nearly a 'tropical night' (19.7 °C) in Glarus on 3 to 4 November. In Switzerland November 2011 was the mildest November since 1864 in the summit regions. The mountain station Säntis had an anomaly of +6 K (reference 1961-1990). Also in Germany it was the warmest November at many summit stations at least since 1900 (at Hohenpeissenberg since 1781). In France it was the 2nd warmest November since 1900 with an anomaly of + 3 K. In Norway it was the warmest November at least since 1900 with an anomaly of +4.6 K. The Norwegian station Svinoy fyr had the highest monthly mean since its start of the time series in 1867. In Sweden it was also the warmest November on record for several stations.

The western North Atlantic was cooler than normal up to -2- -3 K. As well in the Middle East it was colder than normal. So Armenia had the coldest November on record with negative anomalies of -4.5 to -6 K. Similarly cold was November 2011 in the south of European Russia. And in Israel it was the coldest November since 1980.

Precipitation:

Very dry conditions with monthly totals below 10 mm prevailed from the North Sea to the northeastern Mediterranean Sea and Black Sea region in November 2011. This dry period is extraordinary in both aspects, the spatial extent and the amount. The map of precipitation anomalies shows the European continent and southeastern United Kingdom, most of Scandinavia (except the western and northwestern parts, southeastern Europe and the most of the eastern Mediterranean region below 80 percent of the normal (reference 1961-1990) and also the modified SPI (DWD) was in most of the area below -1.5, meaning at least 'severely dry' (figures 3.41 and 3.42). The maps of South Eastern Europe (fig. 3.45) show 'extreme drought' and precipitation percentiles below 5 for most of the Balkan Peninsula, Greece and western Turkey (possible slight differences in the SPI-definition do not result in differences in this case). In Germany the average amount of precipitation in November 2011 was 2.3 mm compared to a normal of 66.4 mm (reference 1961-1990). It was even the driest month over all seasons (ahead of April 1893 with 3.7 mm). In Uccle, Belgium it was the driest November since 1833. Also Denmark and the Netherlands broke their records. Poland as well reported an extremely dry November for the whole country with many stations without any precipitation.

The drought situation is also described in "State of the Climate 2011" (p.197-198). Fig. 3.43 provides some more details concerning the climatological assessments for Greece, Slovakia, Hungary and Bulgaria. Bulgaria had up to 28 (of 30) days without rain in some areas. Moldova reported for the biggest part of the country 0 mm, or 1-3 mm only, as November precipitation totals. This was a new record since the beginning of Moldovan precipitation observations. Romania received only 3 % of the normal precipitation (1.2 mm) in November 2011. Ranking information is provided in the following table:

Country	Rank of dry November months	since (* = beginning of records)
Austria	1	1858*
Belgium	1	1833 (Station Uccle)
Germany	1	1881
Hungary	1	1901
Luxembourg	1	1947*
Slovakia	1	1881
Sweden	1 (locally)	*
Switzerland	amongst driest	1864*

The high temperatures and low precipitation led to a new phenomenon in the Swiss Alps: for the first time since snow measurements began in 1931 the Säntis (2502 m a.s.l.) had no fresh snow in November 2011. In Arosa (1840 a.s.l.) this phenomenon occurred two times before 2011 in the series since 1890, namely 1899 and 1920.

The European Atlantic coasts, the western Mediterranean Sea, the Levante coast and the eastern Black Sea area received on the other hand partly extremely large precipitation totals. France received 300 to 400 percent of the normal in the Pyrenees and the Mediterranean areas and in Italy the area of Liguria received the second devastating rain within only 10 days. In the area of Geneva intensities of 180 mm/h resp. 400 mm/12h occurred and 6 people came to death. The rain intensities between 3 and 6 hours were estimated to have return periods between 200 and 500 years. This was partly caused by the Mediterranean depression ROLF which had tropical character. The event is as well described in . Wetter than normal conditions in the north coincide with the warmer than normal conditions there. So it was the wettest November for Jan Mayen since the start of registrations there in 1908.

Sunshine:

November 2011 was mostly sunny in Europe except on the Iberian Peninsula, around the North Sea, northern Scandinavia, the easternmost region and the Middle East. In Central Europe it was very sunny with more than 150 % of the normal. For instance in Germany November 2011 became the second in the line of relatively sunny November months since 1951 (behind 1989 and ahead of 1983). In Austria it was the sunniest November since 1884 in large parts of the country. In Switzerland it was the 2nd sunniest November since 1961 at stations in the central and eastern Alps.

Wind:

Greece reported strong gale winds with gusts up to 30.8 m/s in the Aegean Sea on 13-14 November.

Monthly Means or Totals and Anomalies :

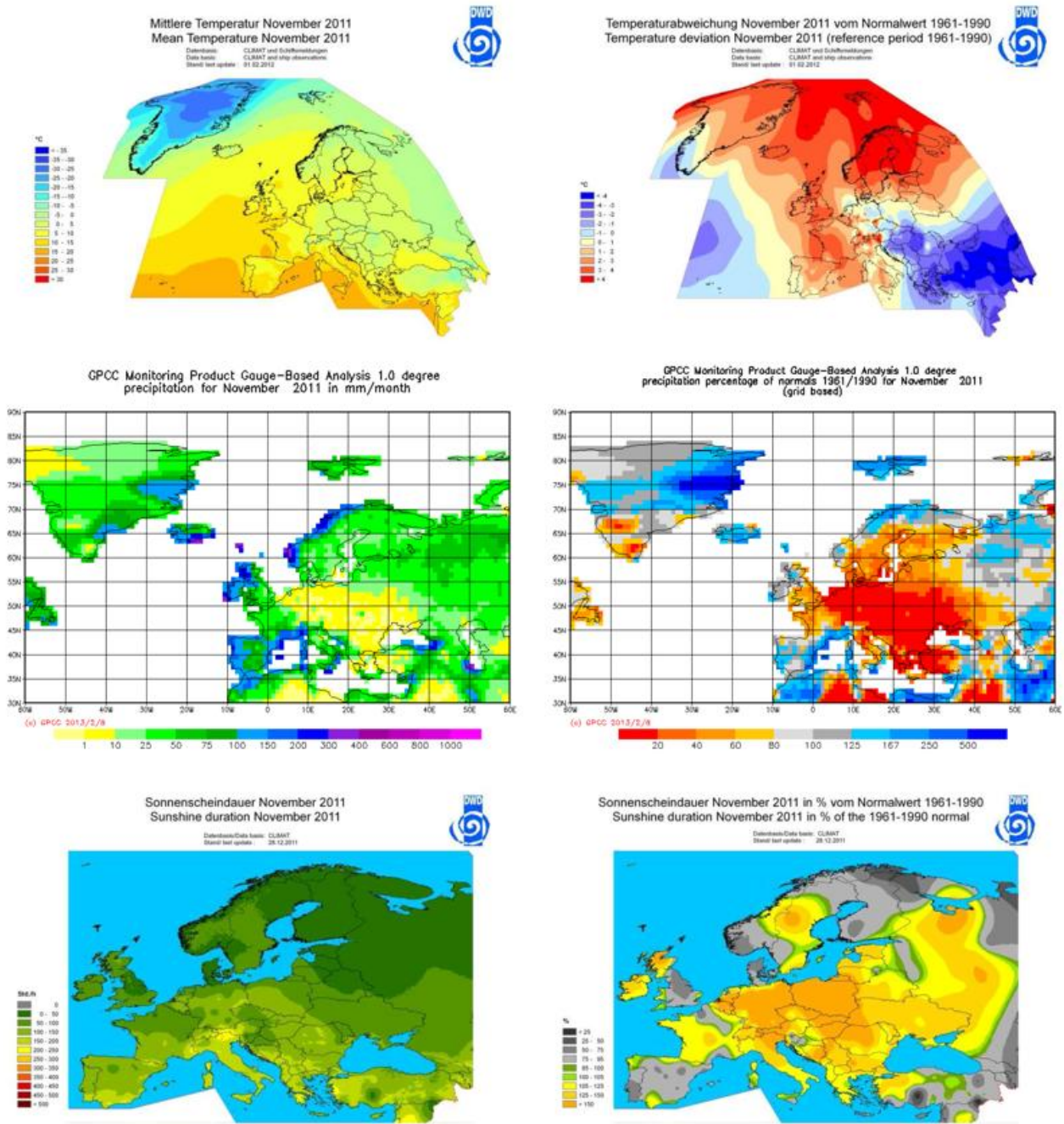


Fig. 3.41: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in November 2011

Monthly Climate Extremes and Events:

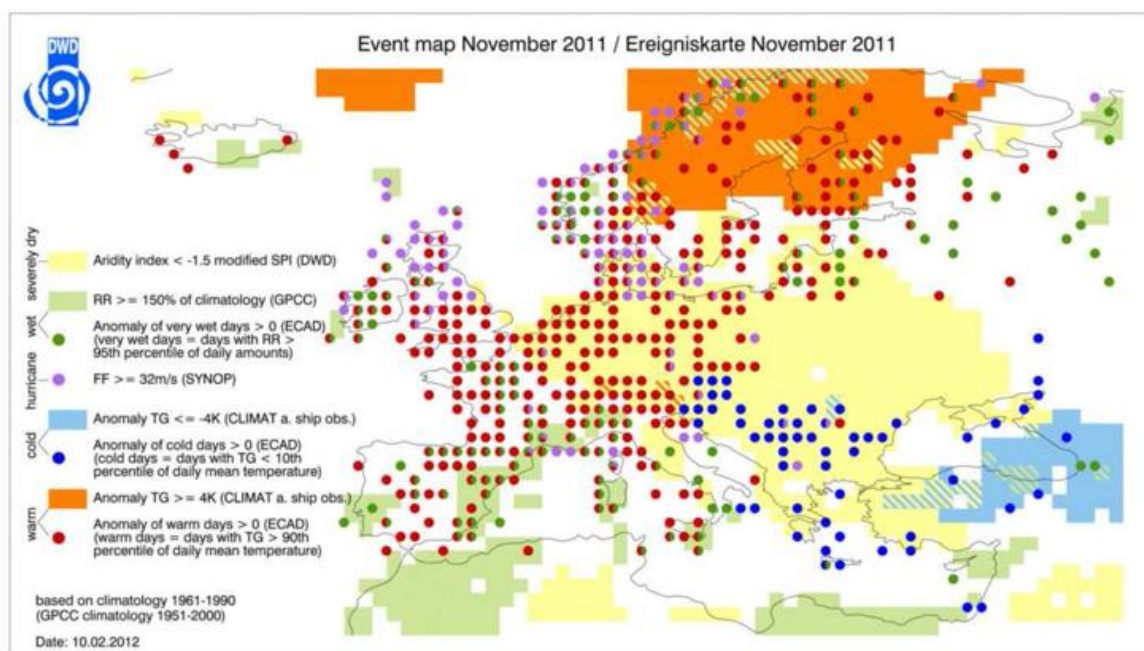


Fig. 3.42 : Monthly Map of Climate Extremes and Events November 2011

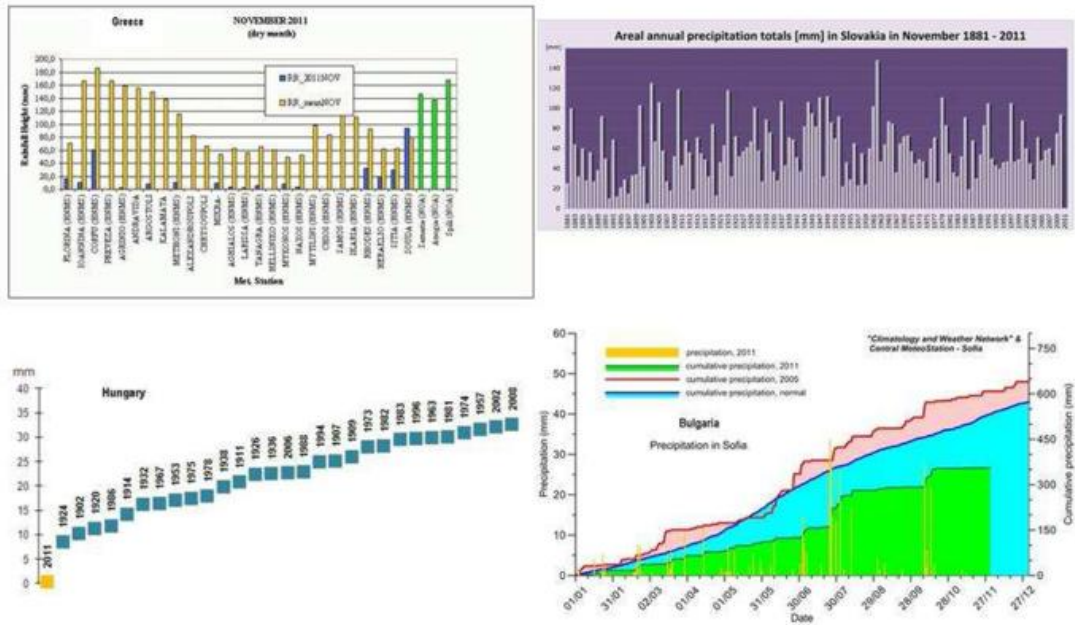


Fig. 3.43 : Graphs illustrating the extreme low precipitation on the Balkan Peninsula and neighbouring Slovakia: November 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

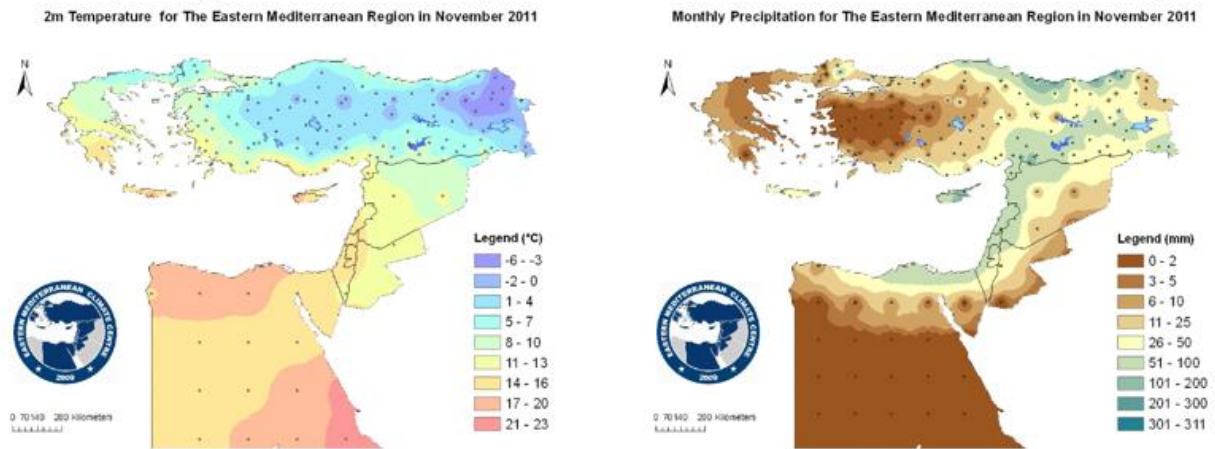


Fig. 3.44 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) November 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

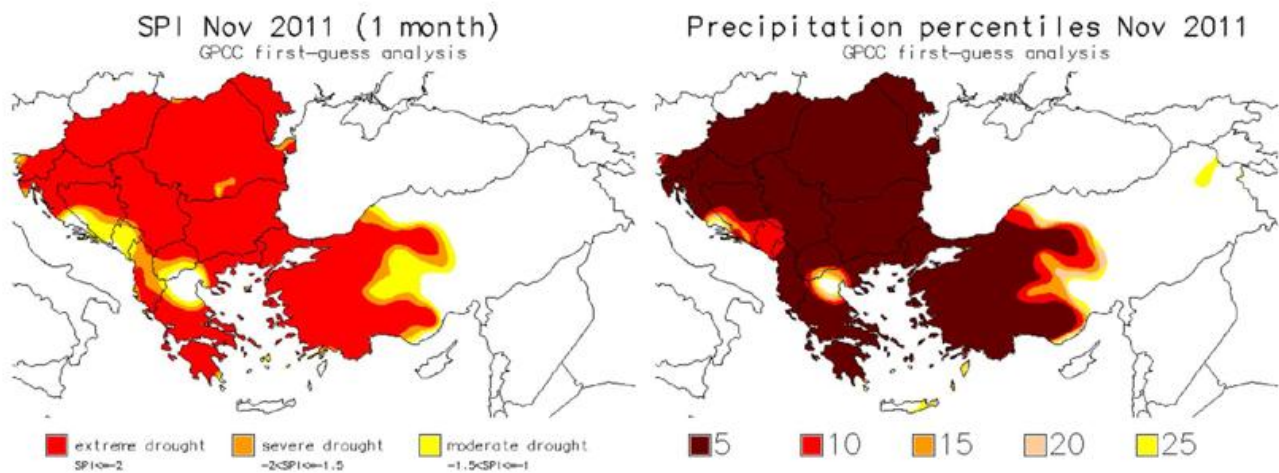


Fig. 3.45 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) November 2011

December

Highlights:

- *Mostly remarkably warmer than normal except in the Atlantic region and the southeast.*
- *Wetter than normal in western, central, northern and eastern Europe, dryer than normal mostly in the Mediterranean region.*
- *Dull in central, northern and eastern Europe, sunny in the Mediterranean Sea region, western Balkan Peninsula and Poland.*

Overview:

Temperature:

December 2011 was warmer than normal in Europe and the Arctic Sea region. Most remarkable is the surplus of more than +4K for eastern and northern Europe. Lithuania for instance had a positive anomaly (reference 1961-1990) of 4.3 K and recorded record-breaking 8 to 12 °C in many places on 26 and 27 December. Russia reported as well an anomaly of 4.2 K and for the Arctic Franz-Joseph Islands an anomaly of +14 K is reported. Fig. 3.48 shows the spatial extent of the warm anomaly in Russia as well as time series of daily temperatures in December and of mean December temperatures over the years for 3 stations. The daily maximum temperatures in Moscow and St. Petersburg in 27 and 28 December were record-breaking. Belarus reported an anomaly of +5 K for December 2011. Armenia reported as well a new record for a December daily maximum temperature in Baku of 22.7 °C. It was colder than normal on the North Atlantic and in the eastern Mediterranean and the Middle East.

December 2011 was the coldest December in over 100 years in United Kingdom and the 2nd coldest since 1659 for 'Central England'.

Precipitation:

December 2011 was wetter than normal in western, central, eastern and most of northern Europe. Heavy precipitation occurred widely spread (see the Map of Climate Extremes below).

In Luxembourg it was the 3rd wettest December since records started in 1947 bringing more than twice the normal total. On 4 December the highest 1 hour precipitation of 15 mm/1 h was observed.

It was on the other hand dry in the western Mediterranean Sea and on the Iberian Peninsula and in the Middle East as well as in the Caucasus region and partly on the Balkan Peninsula and the soil moisture was still below normal in these areas according to the analysis of the Climate prediction Center (http://www.cpc.ncep.noaa.gov/cgi-bin/gl_Soil-Moisture-Monthly.sh). Reykjavik on Iceland reported the longest lasting snow cover since observations started in 1921 with 29 days in December 2012.

Sunshine:

Sunshine duration was well below normal in Ireland, western UK, central Europe as well as eastern and northern Europe. It was very dull in central parts of Germany and in European Russia and northern Scandinavia. It was on the other hand rather sunny on the Iberian Peninsula, parts of Italy, mostly in Poland, in Turkey and the Caucasus area. This patchy pattern corresponds fairly well with the anomaly of the fractional cloud cover (<http://www.dwd.de/rcc->products->clouds>).

Wind:

Storm JOACHIM hit France on 15-16 December. Remarkable was the spatial extent of the area with high wind speeds. It covered about one quarter of France with gusts of 25 m/s or more. The highest gusts occurred on the Puy-de-Dôme (up to 59 m/s in 1465 m asl).

Storm DAGMAR was devastating in Sweden on 26 December. UK reported generally stormy weather across Scotland from late November to mid December.

Other Phenomena:

Belgium reported a record number of thunderstorms for December. Uccle had 11 days compared to normal 3 days. Sweden reported the highest thunder activity ever recorded in December.

Monthly Means or Totals and Anomalies :

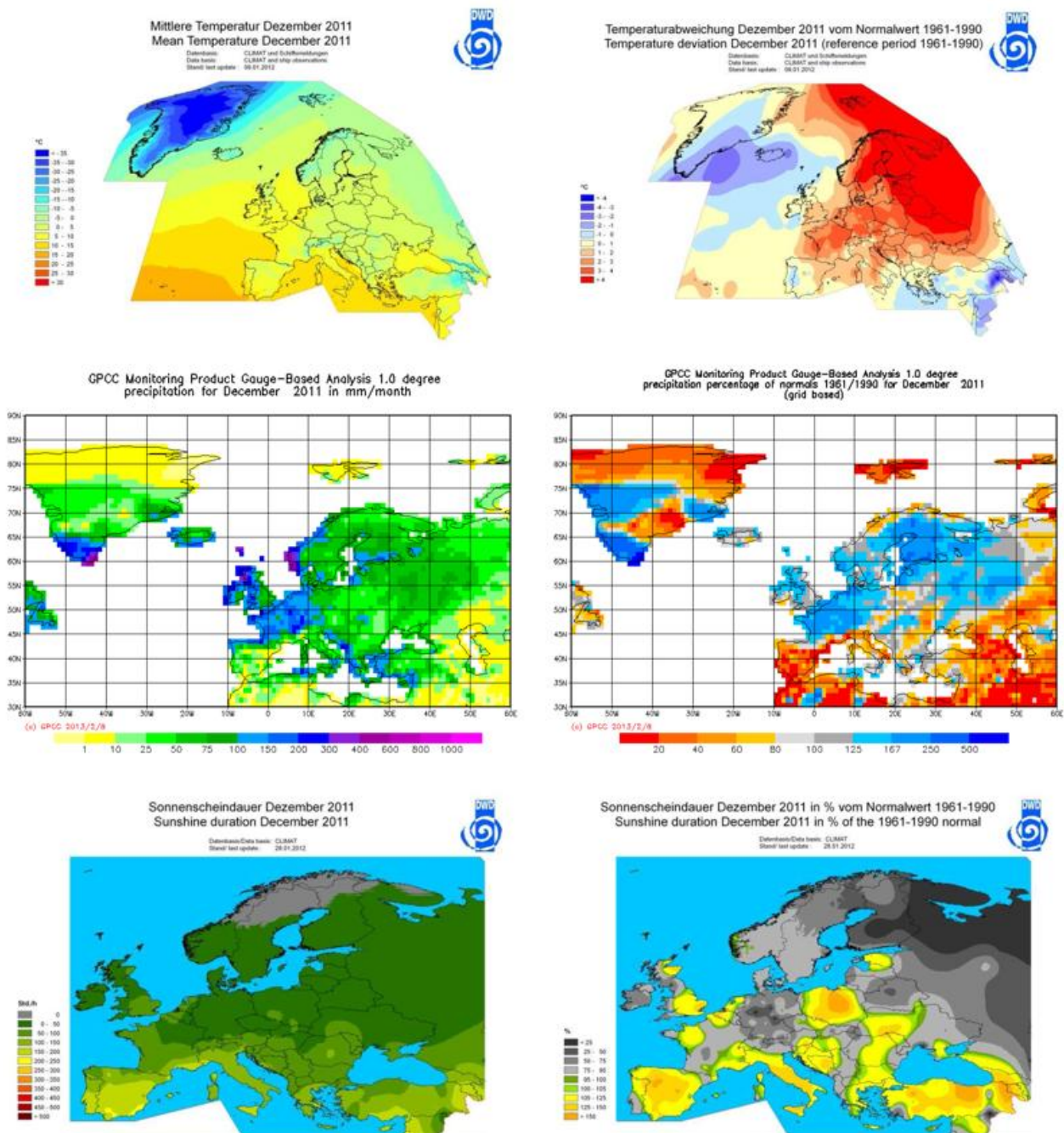


Fig. 3.46: Means and anomalies (reference 1961-1990) of temperature, precipitation and sunshine duration in December 2011

Monthly Climate Extremes and Events:

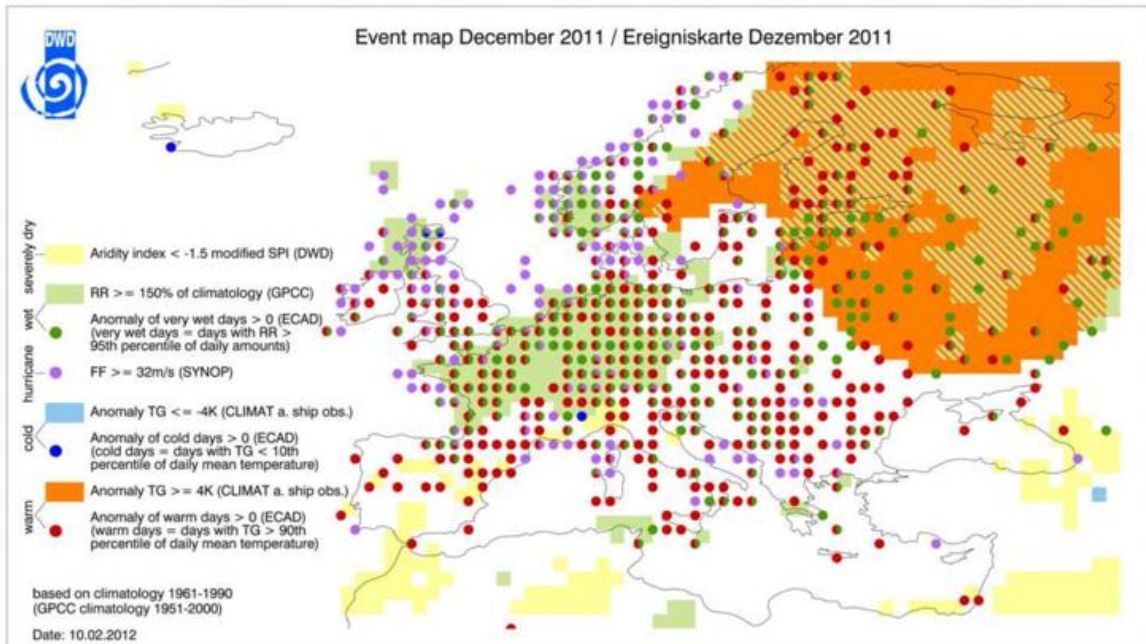


Fig. 3.47 : Monthly Map of Climate Extremes and Events December 2011

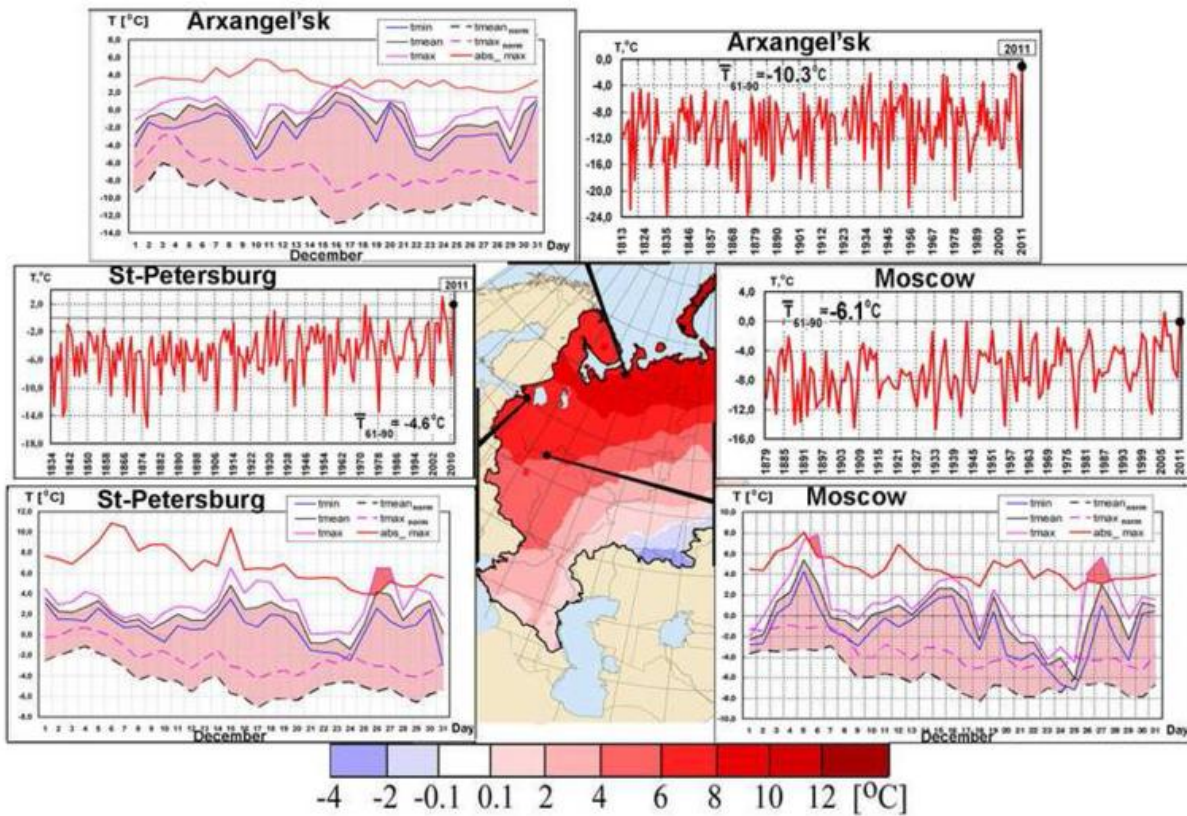


Fig. 3.48 : Illustration of very warm December 2011 in northern Russia December 2011

Monthly Temperature and Precipitation in the Eastern Mediterranean Subregion:

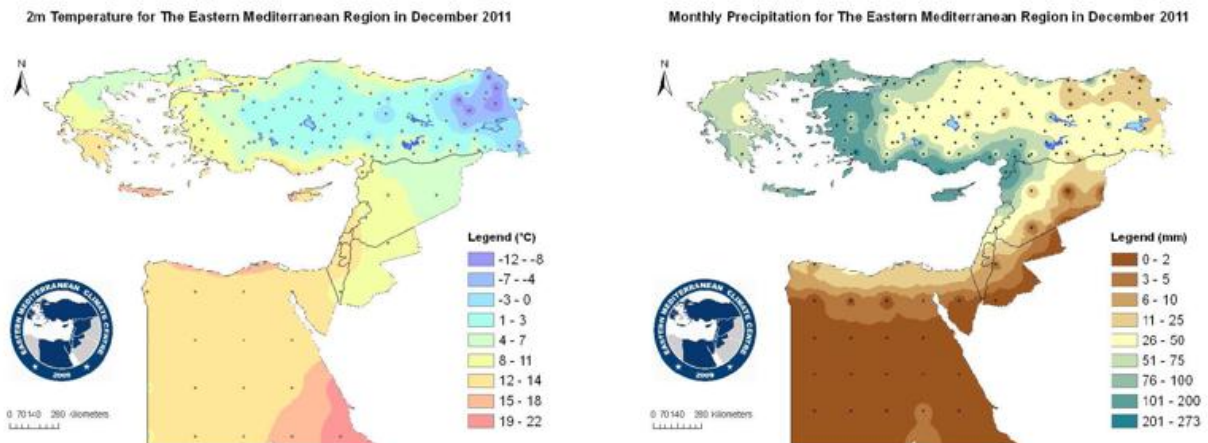


Fig. 3.49 : Monthly mean temperature (°C;) and monthly precipitation totals (mm) December 2011 as provided by the Eastern Mediterranean Climate Center (EMCC)

Drought Indizes for the Southern European Subregion as provided by the Drought Management Centre for Southeastern Europe (DMCSEE):

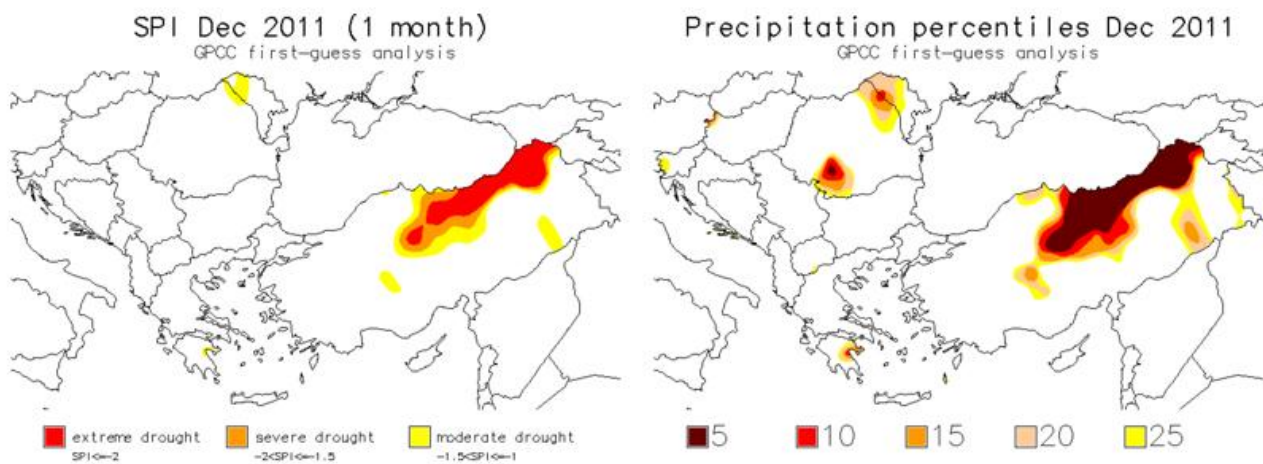


Fig. 3.50 : Monthly Drought Indices (1-month SPI and low precipitation percentiles) as provided by the Drought Management Centre for Southeastern Europe (DMCSEE) December 2011