European
Climate Support
Network

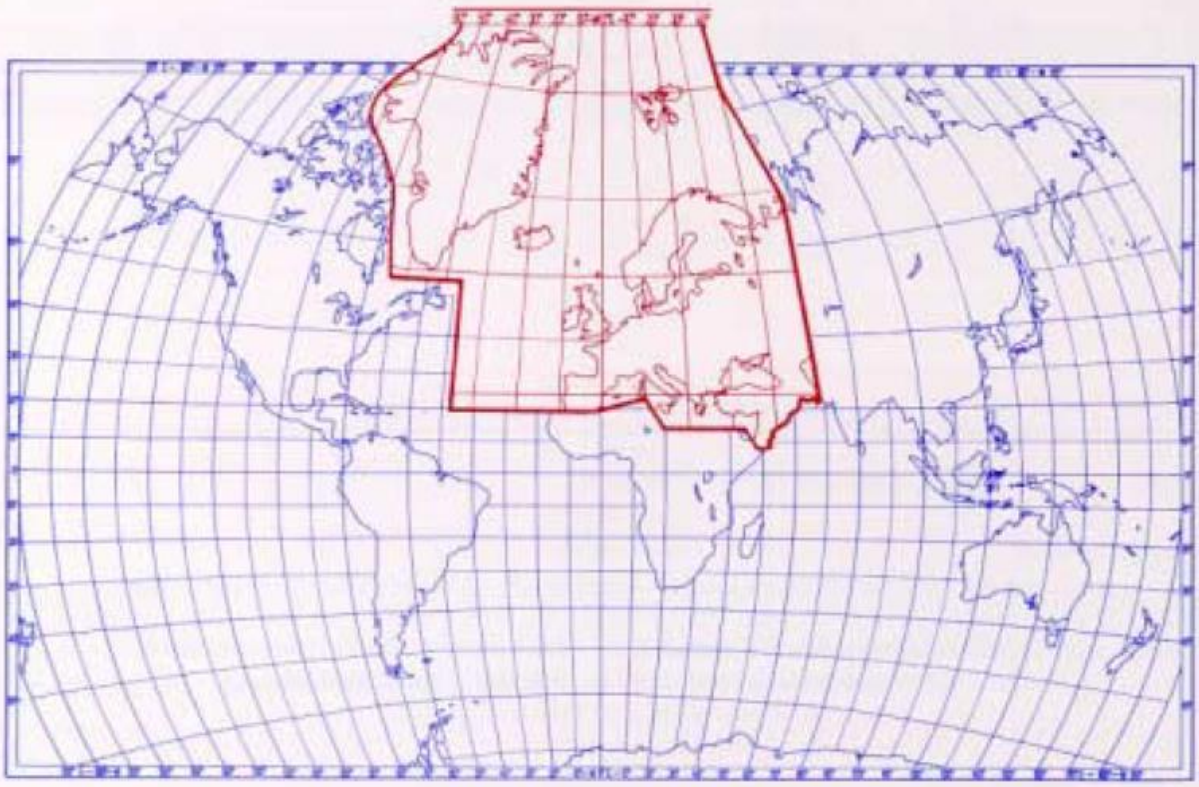
World Meteorological
Organization
World Climate Data
and Monitoring Programme

Deutscher
Wetterdienst

Annual Bulletin on the Climate in WMO Region VI

– Europe and Middle East –

2001



ISSN: 1438 – 7522

Internet version:
http://www.dwd.de/de/FundE/Klima/KLIS/prod/RA-VI-Bulletin/RA-VI-Bulletin.htm

Editor: **Deutscher Wetterdienst**
Postfach 10 04 65, D-63004 Offenbach am Main, Germany
Phone: +49 69 8062 2938
Fax: +49 69 8062 2993

Responsible: Ernst Dittmann
E-mail: ernst.dittmann@dwd.de

Annual Bulletin on the Climate in WMO Region VI
- Europe and Middle East -
2001

The Bulletin is a summary of contributions
of the following national meteorological services
and was co-ordinated by Deutscher Wetterdienst, Germany,

Armenia
Austria
Belarus
Belgium
Bosnia and Herzegovina
Croatia
Cyprus
Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Jordan
Kazakhstan
Latvia
Lithuania
Luxembourg
Moldova
Netherlands
Norway
Poland
Portugal
Russian Federation
Slovakia
Slovenia
Spain
Sweden
Switzerland
The Former Yugoslav Republic of Macedonia
Turkey
Ukraine
United Kingdom
Yugoslavia

Furthermore, contributions to the WMO Bulletin article on consequences of abnormal weather in 2001 were referred from the following countries:
Czech Republic, Tajikistan, Uzbekistan

List of Contents

Foreword

The Annual Bulletin on the Climate in WMO Region VI – Europe and Middle East – for 2001 is now presented as the 8th edition in a sequence since the series started in 1994. All of the 49 national Meteorological and Hydro-Meteorological Services in WMO Region VI have been asked for input to this edition. There were direct responses from 40 member states of the Region. Additionally, WMO Secretariat supported the compilation of the report by providing the contributions to the WMO Bulletin article on consequences of abnormal weather in 2001.

The report from the ECSN manager is also highly appreciated and incorporated to this edition of the Bulletin. The Project 'Generate Climate Monitoring Products' (GCMP) of the ECSN Application Area is closely connected to the objectives of the Bulletin. As for the first time last year, this edition of the Bulletin will be presented again also via Internet.

In 2001, numerous climatic highlights occurred in WMO Region VI on different scales in space and time. Prominent features on the monthly time scale were the record breaking high temperatures in October exceeding those of September in many places, while September had extremely high precipitation rates in large parts of the Region. Devastating floods and long lasting drought affected different and in some cases the same areas at different times.

There were also many reports of extreme short time events on a more local scale. While reports on local whirlwinds and tornadoes have increased compared to earlier years, this may be due in part to enhanced reporting procedures that have been introduced in recent years. A new feature of this edition of the Bulletin is the photographic illustration of some extreme events, that occurred within in the Region.

I would like to thank all those who contributed to this publication. The reader of the Bulletin will find a compilation of selected parts from all national reports with the intention of presenting the characteristic climatic features of the WMO Region VI in 2001.

Last not least I want to thank Germany for the co-ordination, the editorial review, publishing and distribution of the document.

Petras Korkutis
Acting President of WMO RA VI

Outstanding Events and Anomalies in 2001

Temperature

- Overall warmer than normal with highest positive deviations in SE-Europe and the Middle East
- October extremely warm with highest temperatures on record and higher mean values compared to September in many places
- December very cold in nearly all parts of Europe except for the Northwest, with extreme deviations from normal in the Southwest and in eastern Europe
- In contrast to other parts of Europe, absolute records of maximum temperatures were set up on islands in the Norwegian Sea in December
- March extremely warm in the Mediterranean and Middle East
- Extremely mild January in the Volga region

Precipitation

- Overall rainfall slightly above or near normal except some parts of southern Europe and the Middle East
- Intense drought with high temperatures in summer months from central-south to south-eastern Europe, in the Caucasus region and Uzbekistan
- September very wet in Central Europe with extreme rainfall amounts in the Alpine and Balkan regions
- Extreme wintry rainfall in Brittany and the northern part of Portugal, succeeded by abundant flooding at the beginning of the year
- Abundant snowfall in Western Altai leading to frequent avalanches in January and flooding in spring-time

Wind

- Violent storms in November in the mid Baltic area

Annual Survey

Temperature deviations from normal all over the year within the Region were generally positive with maxima above +1°C in south-eastern Europe and the Middle East (e.g. see fig. 0.1), but still below the level of the preceding year.

October temperatures were extremely high in many parts of the region (e.g. fig. 0.2) and exceeded previous all time records at many stations. Monthly mean values lay above September means in many places in Europe (see fig. 0.3).

The Mediterranean and the Middle East were hit by an extraordinary heat wave in March (see fig. 0.4).

On Iceland and Jan Mayen absolute maximum temperature records were broken in December, whereas from the Iberian Peninsula over central to eastern Europe December was very cold with temperatures significantly below normal (see figs. 0.5, 0.6).

Precipitation was generally near to normal or slightly above over the Region (e.g. see fig. 0.7) except for some parts of southern Europe and the Middle East.

September was extremely wet in Central Europe with deviations in some areas up to 300% of the normal precipitation and even more (e.g. see fig 0.8).

In summertime, some parts of southern Europe and the Caucasian region suffered from severe drought, especially at the beginning and the end of the season (see fig. 0.9).

Starting from the second half of November, a growing snow cover affected Latvia and Poland, reaching more than 40 cm in some parts of the area at the end of December (see fig. 0.10).

Sunshine duration was reported to be near normal or slightly above with the exception of central France, where a deficit of sunshine occurred. At the beginning and at the end of the year, the U.K. enjoyed record-breaking sunshine. Ireland gained significantly more sunshine than normal all over the year at nearly all stations (see fig. 0.11).

Extreme **Wind** events occurred all over the Region throughout the year in many localities. In France, the highest gust was recorded on April 8 by 187 km/h at Cap Béar in the eastern Pyrenees near the Mediterranean Sea. A thunderstorm, that developed into a tornado on September 30 hit the county Westmeath in Ireland with impacts illustrated by fig 0.12.

In mid-November, violent storms uprooted millions of trees when crossing Scandinavia to the Baltic States, and caused exceptional sea level rise in the Gulf of Riga.

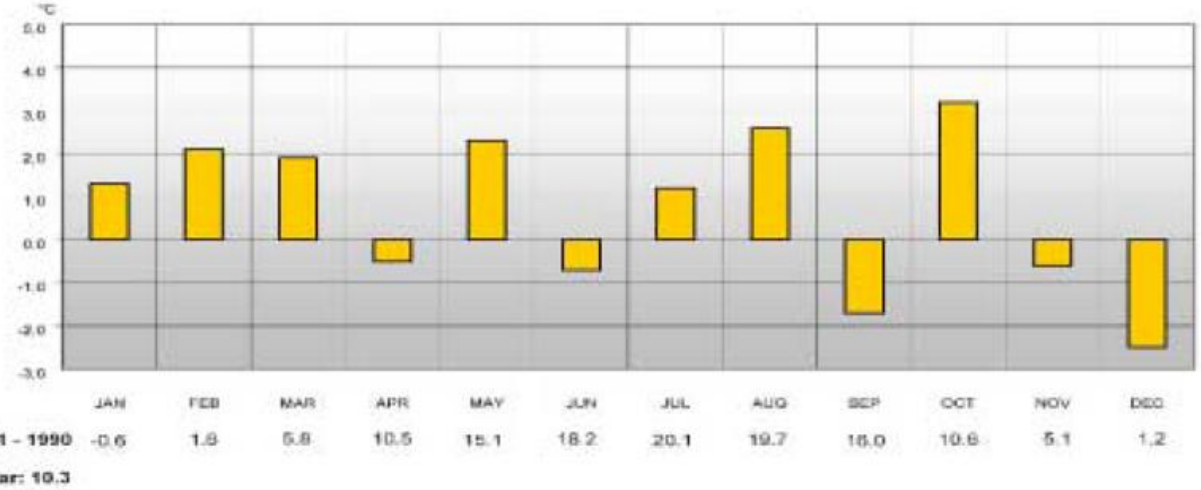


Fig.0.2: *Deviations of monthly mean temperatures from normal, Vienna 2001; long-term average values in °C, reference period 1961-1990*
From: Zentralanstalt für Meteorologie und Geodynamik, Austria

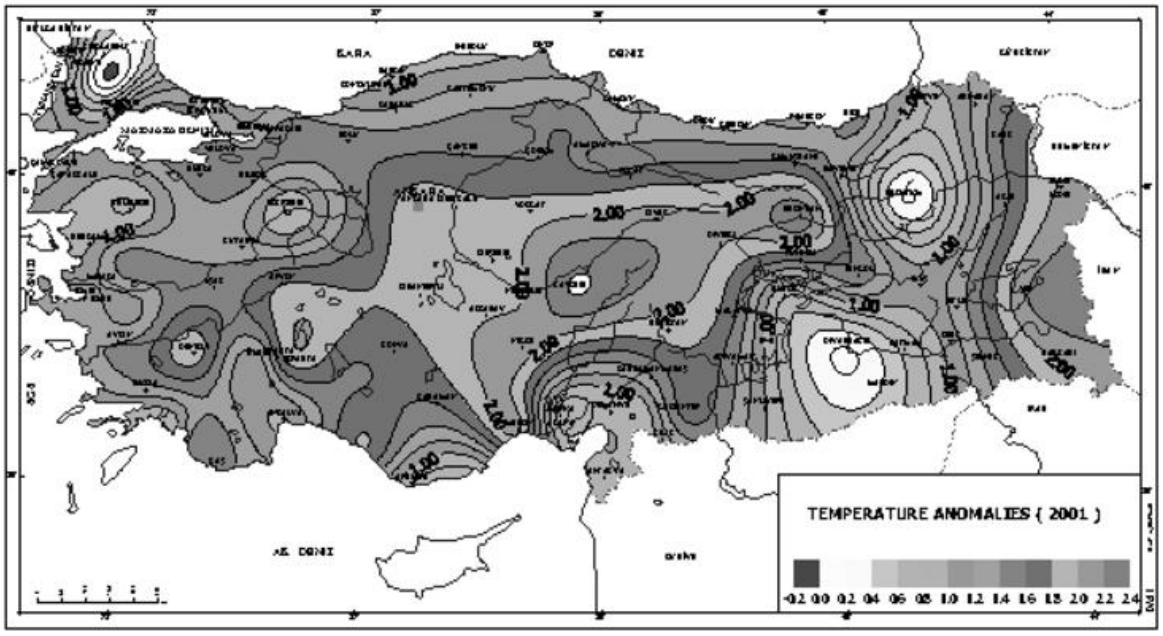


Fig. 0.1: *Temperature anomalies (°C) in Turkey, 2001*
From: Turkish State Meteorological Service

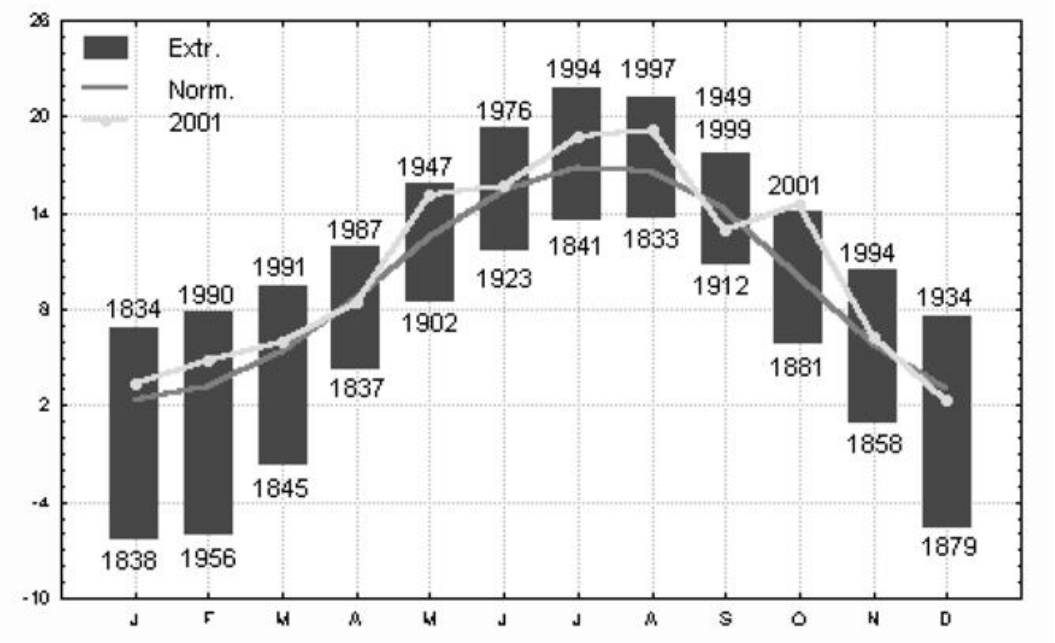


Fig. 0.3: *Monthly mean temperatures in °C for 2001, normal and extreme values since 1833 at Uccle station*
From: Royal Meteorological Institute, Belgium

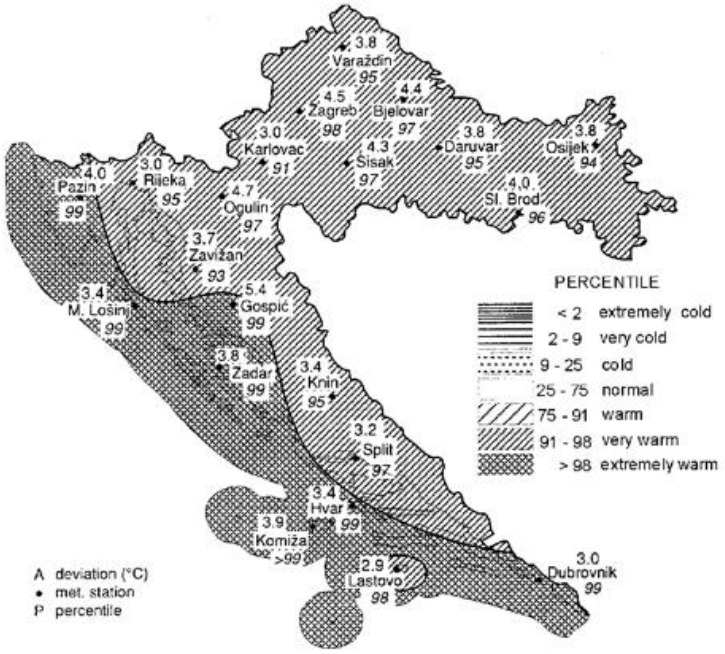


Fig. 0.4: *Percentiles of anomalies of March temperatures in Croatia in 2001, reference period 1961 – 1990*
From: Meteorological and Hydrological Service, Croatia

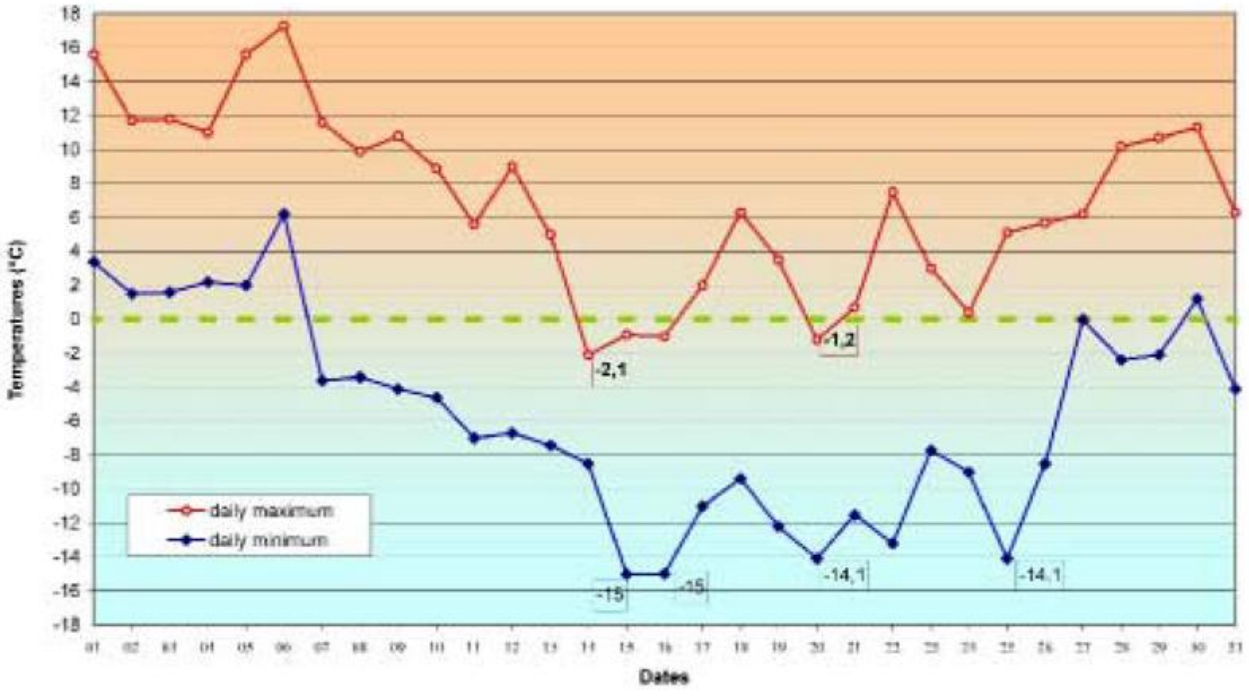


Fig. 0.5: *Daily extreme temperatures in Castellet (Vaucluse), elevation: 288 m, December 2001*
From: Météo France

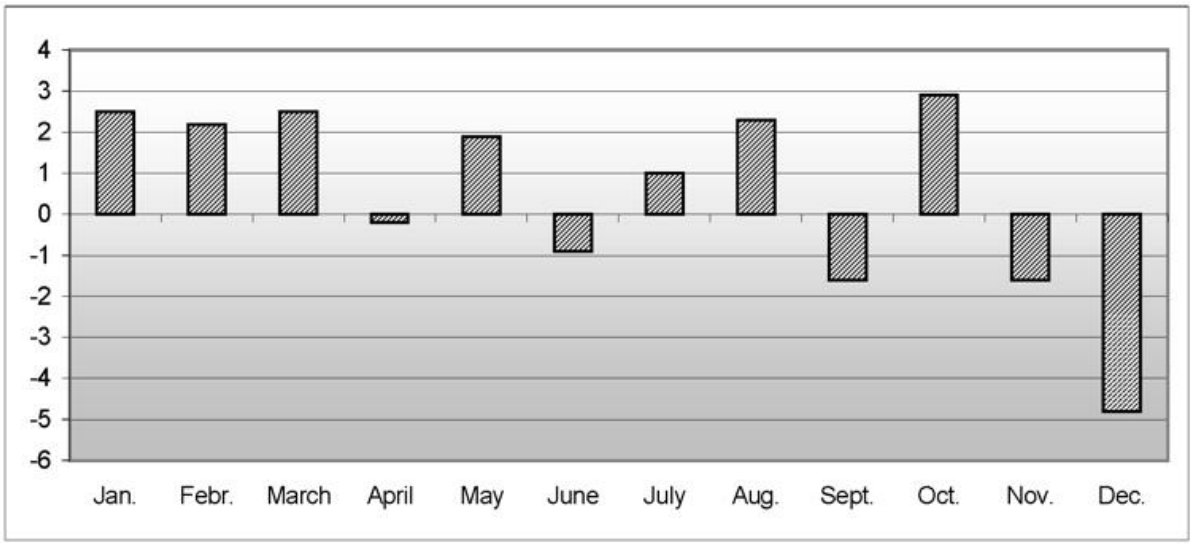


Fig. 0.6: *Variation of the national mean temperature (°C) in Hungary in 2001, related to the average of many years*
From: Hungarian Meteorological Agency

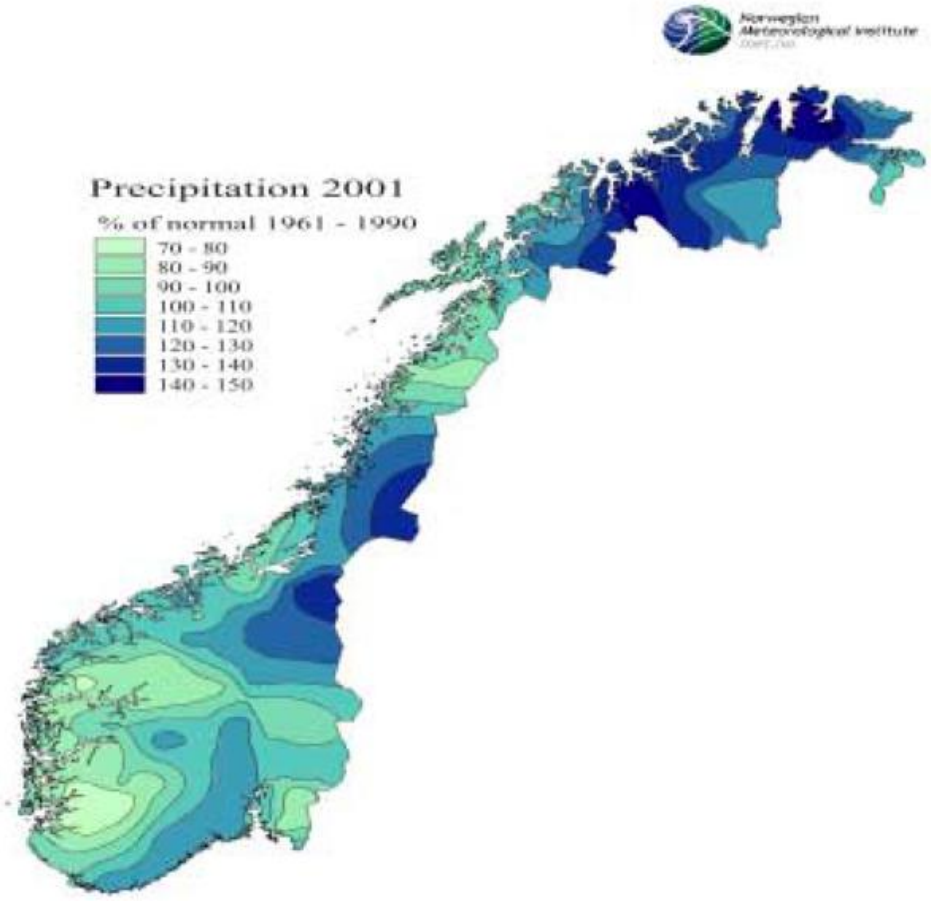


Fig. 0.7: *Spatial distribution of the annual precipitation in % of normal in Norway, 2001*
From: Norwegian Meteorological Institut

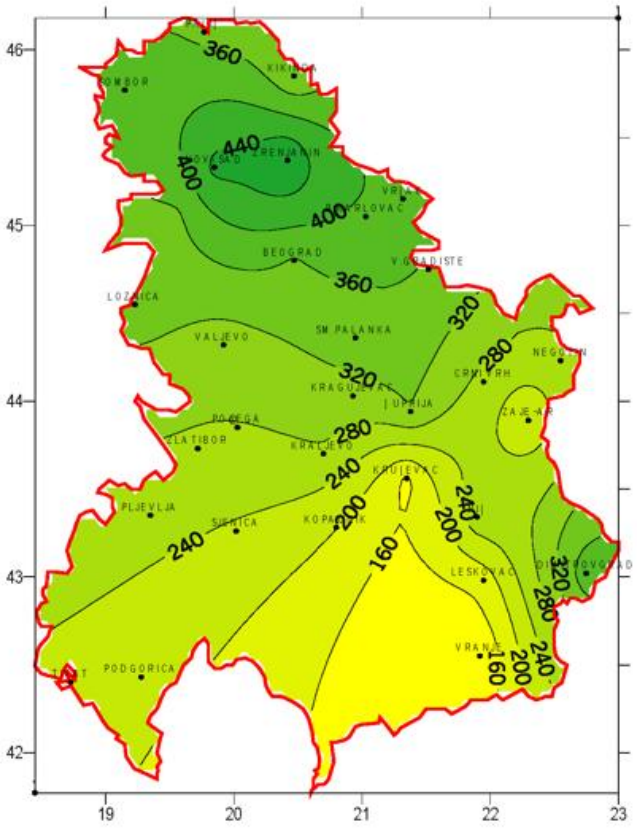


Fig. 0.8:

Precipitation deviations in % from normal in Yugoslavia for September 2001; axes are in geographical coordinates
From: Federal Hydrometeorological Institute of Yugoslavia

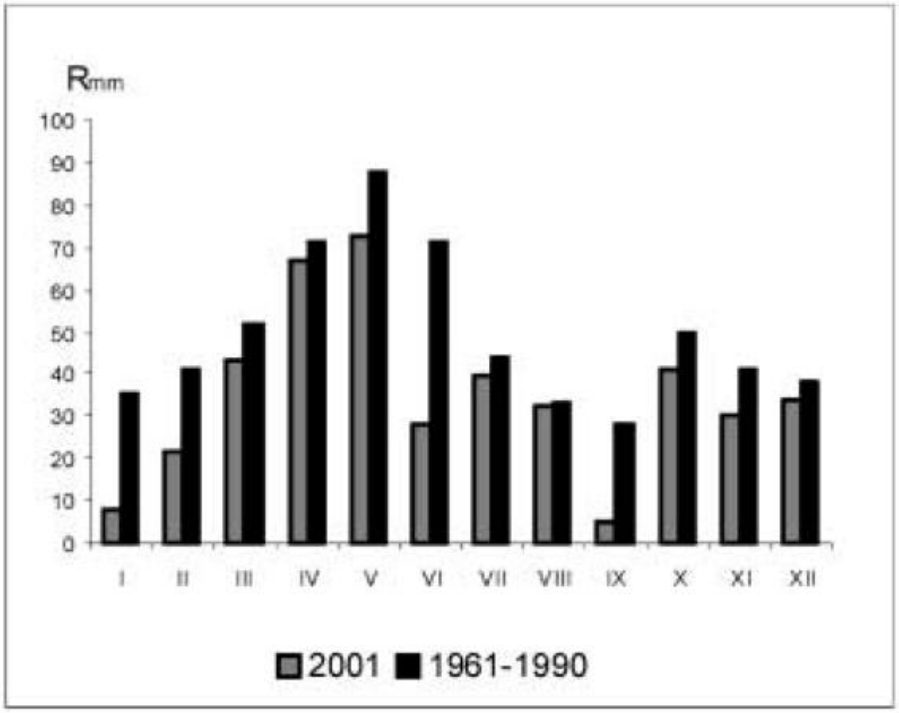


Fig. 0.9: *Monthly percipitation totals in Armenia, 2001*
From: Department of Hydrometeorology of the Republic of Armenia

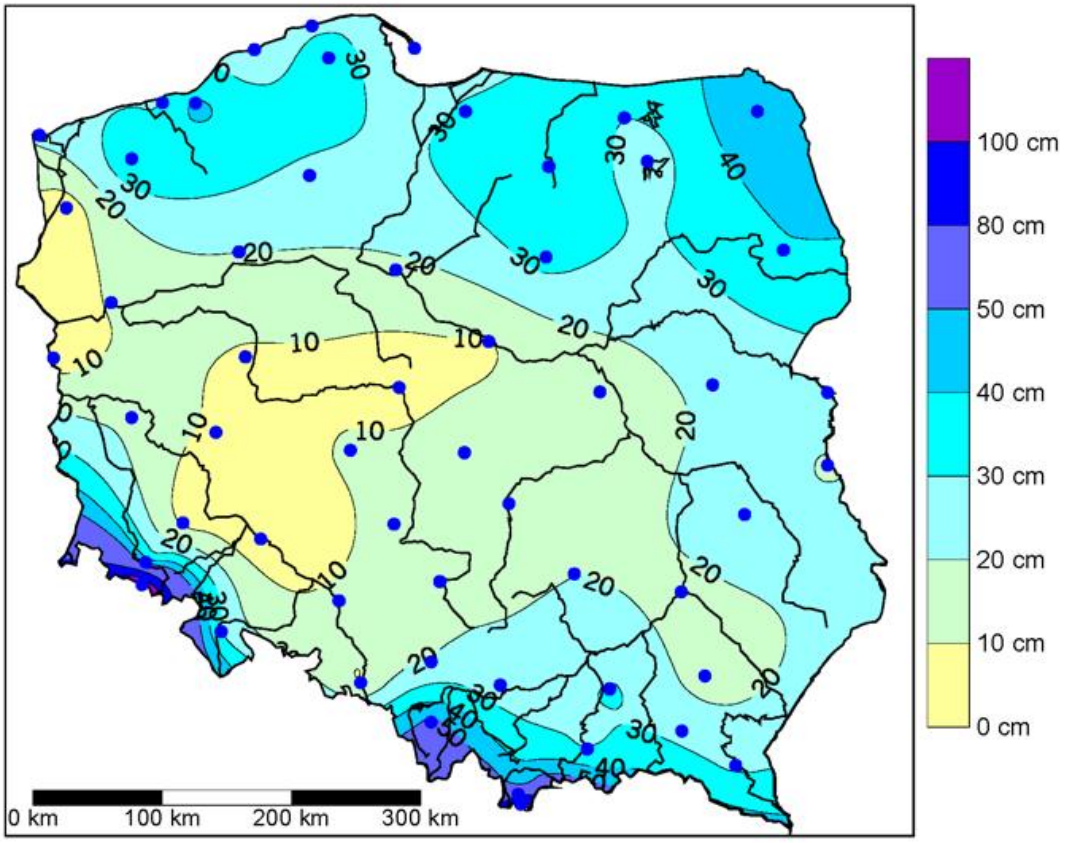


Fig. 0.10: *Depth of snow cover on December 31, in Poland, 2001*
From: Institute of Meteorology and Water Management, Kraków, Poland

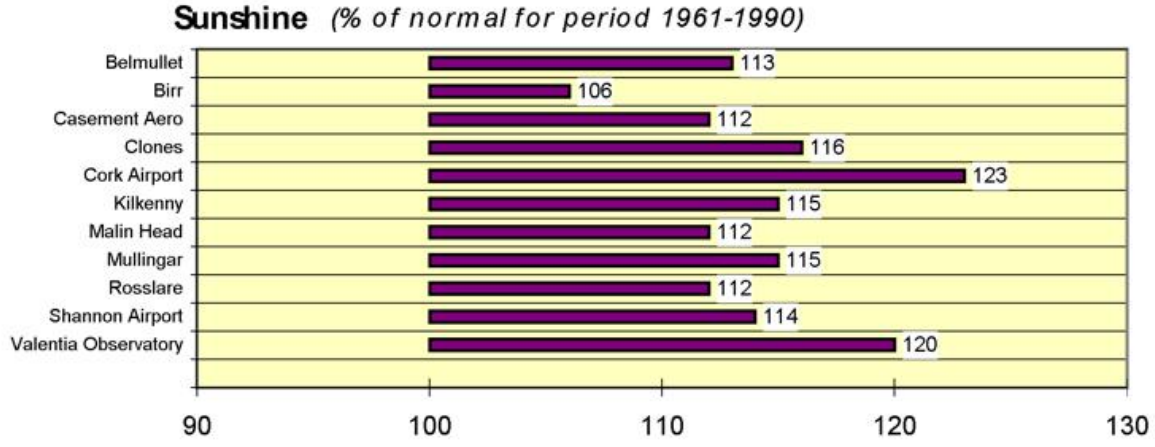


Fig. 0.11: *Sunshine duration in % of normal at stations in Ireland in 2001*
From : Met Eireann, Ireland

Fig. 0.12: *Impact of a tornado on September 30 in the county Westmeath*
From : Met Eireann, Ireland

Fig. 0.13: *Coimbra, January 2001. Photo by: Manuel Correia, reporter from „Jornal de Noticias"*
From: Instituto de Meteorologia, Portugal

Seasonal Survey

Winter 2000/2001 was generally mild except in Ireland with a country-wide slightly negative deviation of 1°C from normal. Positive temperature anomalies occurred elsewhere and increased from the European coastal regions in the West and Southwest into the continental area, where they reached maximum values up to +5°C in eastern Europe. Switzerland had a remarkable relative maximum of positive temperature deviations (see figure page 14 above). The wintry precipitation was distributed in a more complex way over the Region. While some coastal parts of western Europe received enormous amounts of precipitation, other parts like south-central France, the Levante, and areas around the Black Sea had significant deficits (see figure page 18 above). Continuous rainfall over several days around New Year caused large floods on saturated soil in Brittany (France) and in the northern part of Portugal (see fig. 0.13).

Spring 2001 was generally warm with positive temperature anomalies except for northern Scandinavia. Positive deviations from normal occurred up to +3°C, rising from western to eastern Europe and the Middle East (see figure page 15 above). In Tartu, Estonia, the April mean temperature exceeded the normal value by far; the long term linear trend of this parameter shows an increase of +1.9°C since the beginning of observations in 1866 (see fig. 0.14). The spatial distribution of precipitation in springtime has a patchy pattern over the Region. There are areas of up to 200% of the normal precipitation in the north-western part of the Iberian Peninsula, in France, Poland, and north-east of the Black Sea. Significant precipitation deficits occurred in eastern parts of Spain, in several coastal areas of the Mediterranean and the Norwegian Sea, around the central part of the Caspian Sea, and in eastern Europe with centres in Belarus and Moldova (see figure page 18 below). High spring temperatures in western Altai, Kazakhstan, melted large snow reserves and together with abundant rainfall led to extraordinarily high floods in the mountain rivers with destruction of villages, bridges and motorways.

Temperatures in **Summer 2001** were above normal except for the coastal area of middle Norway. The positive deviations from normal increased from the European coastal areas to the centre of the continent up to +2°C and had an even higher maximum around the eastern Black Sea and north of it (see figure page 16 above). The most prominent feature of the precipitation regime in summer was a large deficit of rainfall around the Mediterranean coastline and in the Middle East leading to severe drought in many areas. Central and northern Scandinavia and other, more or less isolated areas in France, eastern Europe, Greece and eastern Turkey had remarkable precipitation amounts exceeding 150% of the normal values (see figure page 19 above).

Autumn 2001 was generally mild with centres of positive temperature deviations from normal in the British Isles, in Scandinavia, and south-eastern Europe (see figure page 17 above). The spatial distribution of precipitation had a more complex structure over the Region (see figure page 19 below). Precipitation amounts up to more than 200% of normal occurred in southern Russia (Volga region) and in some parts of Turkey, especially in the North-East and in the south-western coastal area. Central Europe received precipitation above normal up to 150% as well as the northern Balkans and the Ukraine. The Pyrenees, the Alps, Italy, the southern Balkans, and the eastern Caucasus suffered from precipitation deficits causing severe drought. The special climatic characteristic of autumn 2001 in many European countries was a very wet and cool September followed by a warm October with precipitation significantly below normal. This feature is exemplarily illustrated by fig. 0.15.

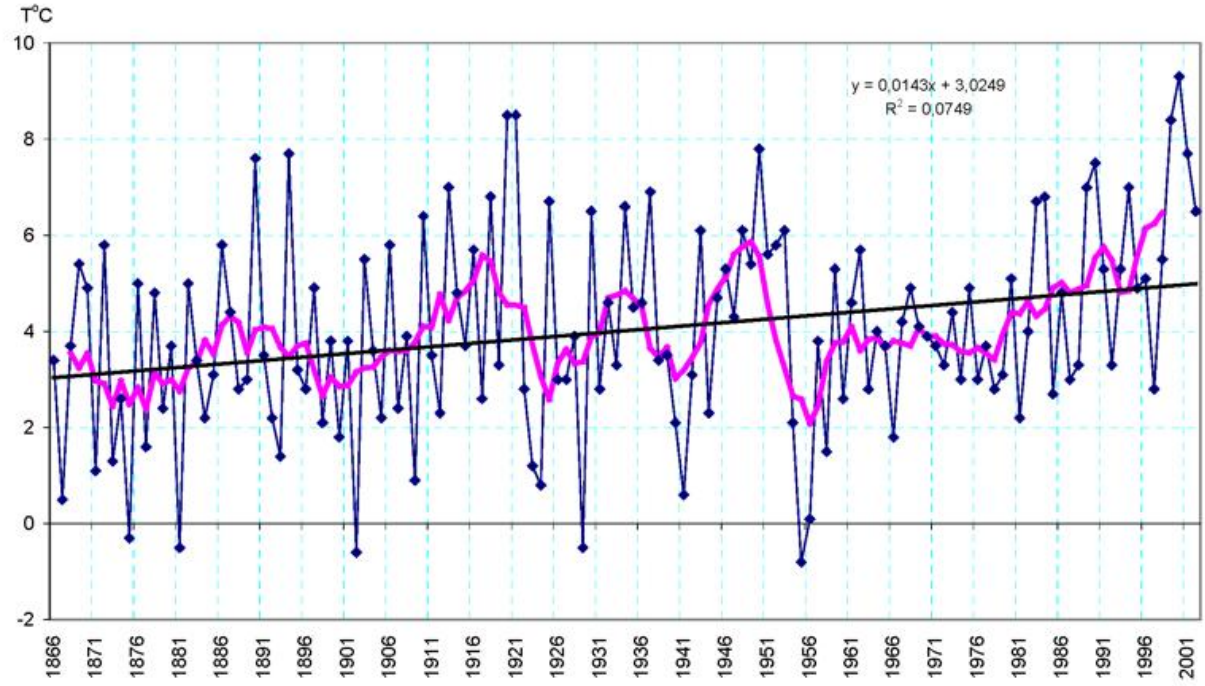


Fig. 0.14 : *April mean air temperatures at station Tartu since 1866*
From : Estonian Meteorological & Hydrological Institute

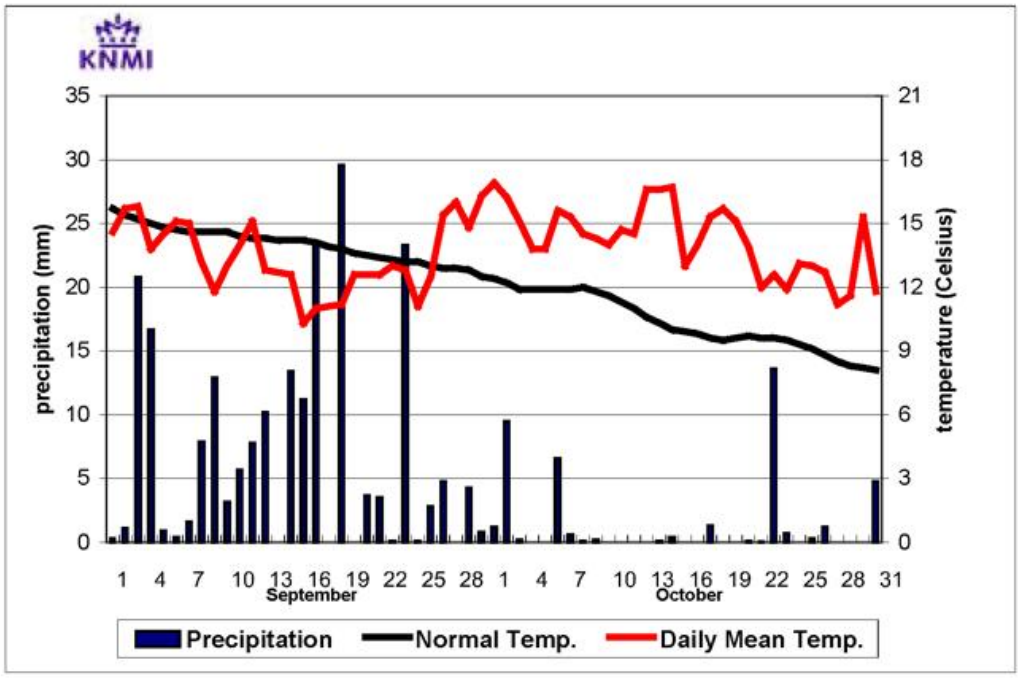
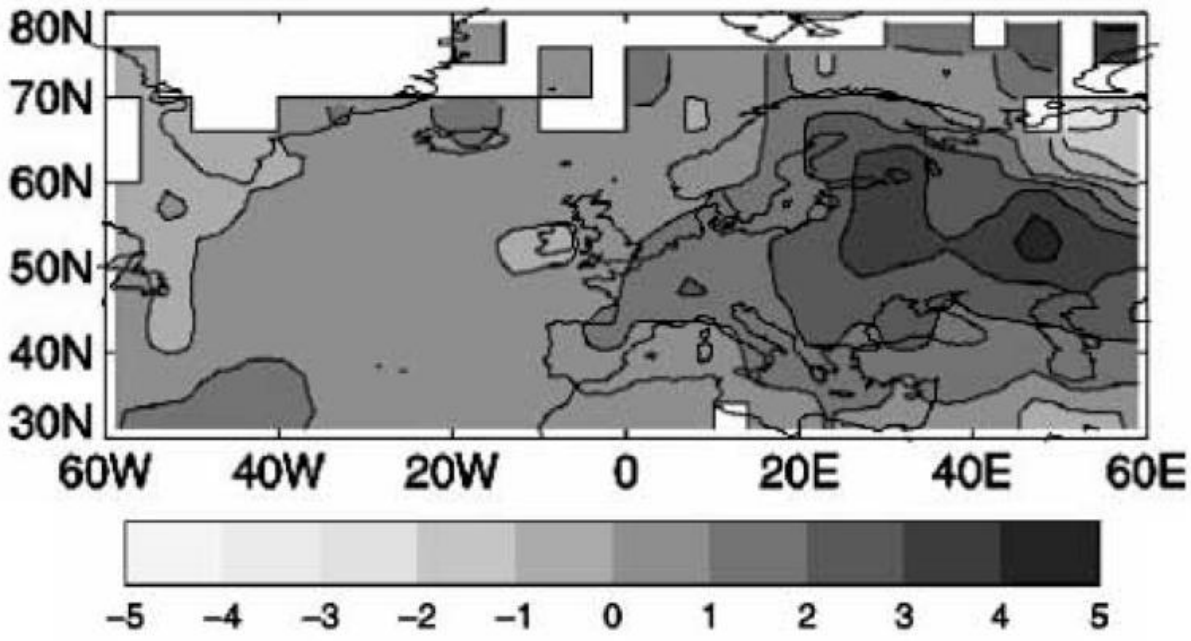


Fig 0.15: *Daily precipitation and daily mean temperature in September and October at the station De Bilt, Netherlands*
From: The Dutch Royal Meteorological Institute

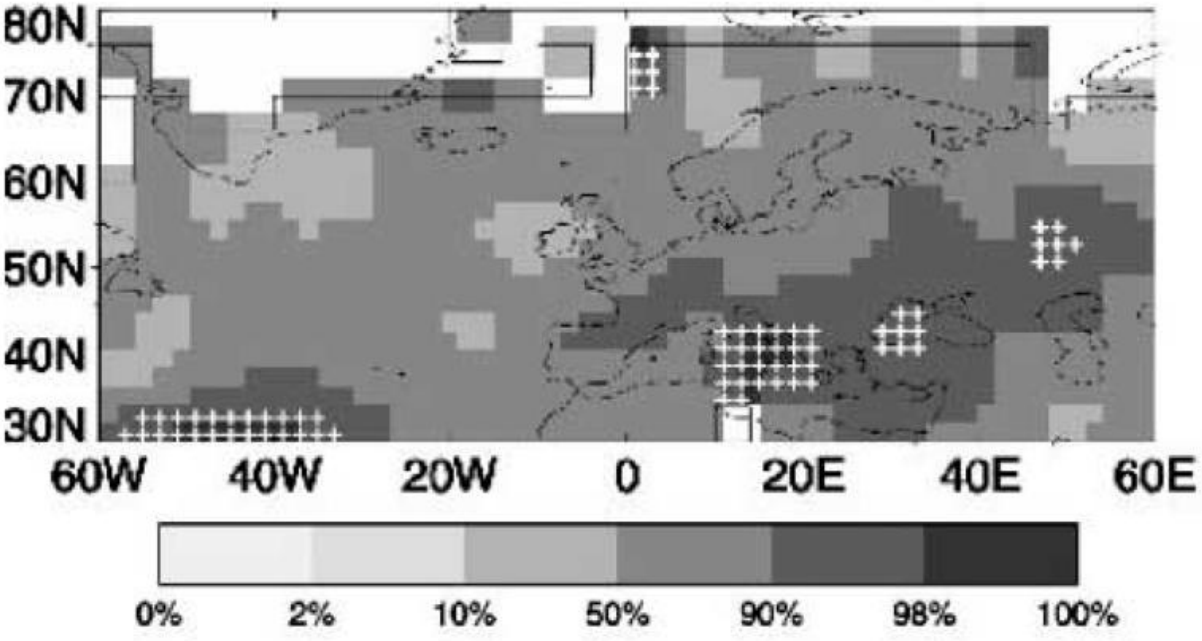
Seasonal Maps

Surface temperature anomalies: December 2000 – February 2001

From: Hadley Centre of Climate Prediction and Research, U.K.



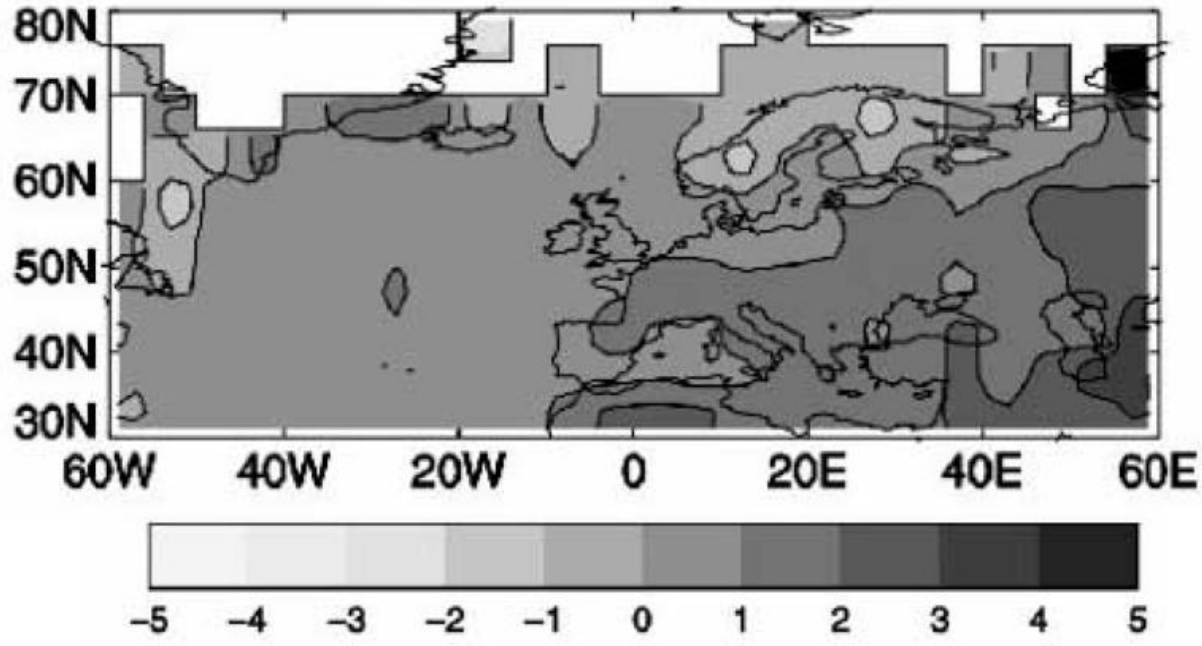
Departures from normal in °C



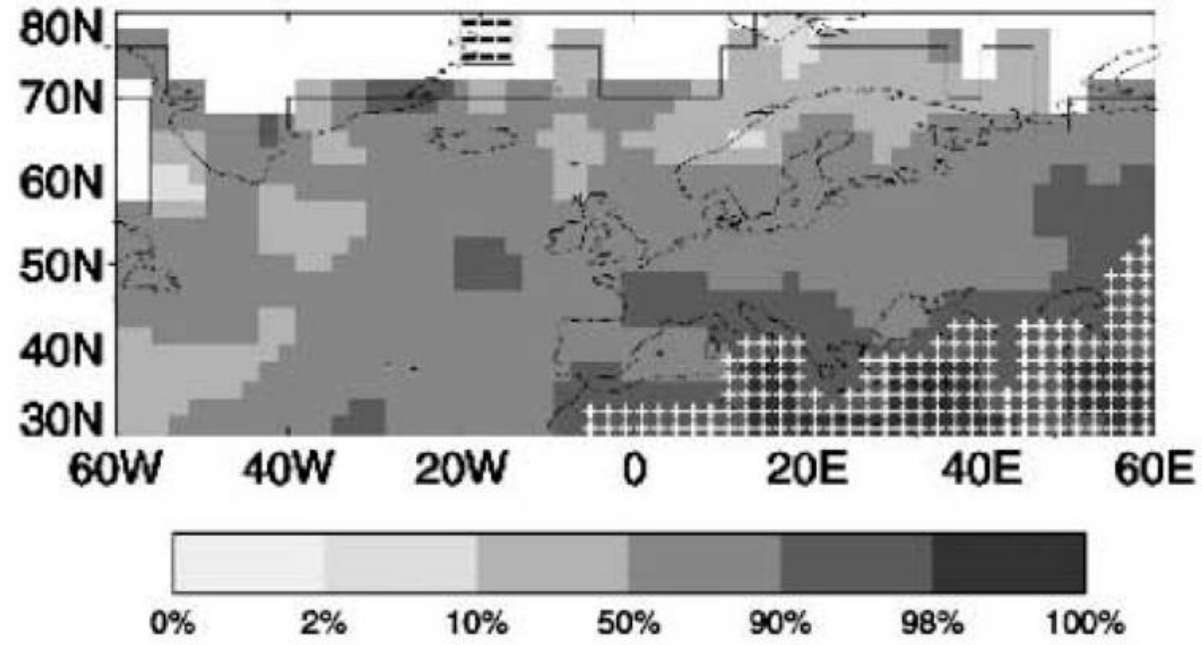
Percentiles (anomalies fitted to gamma distribution)
Reference period: 1961 – 1990

Surface temperature anomalies: March 2001 – May 2001

From: Hadley Centre of Climate Prediction and Research, U.K.



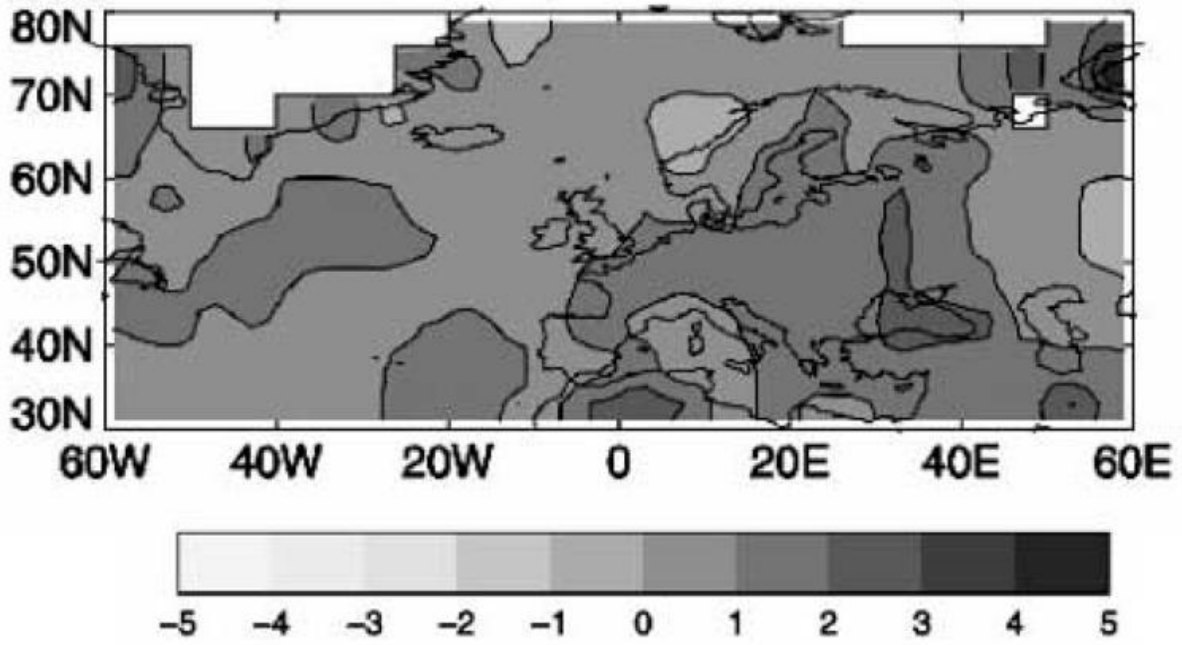
Departures from normal in °C



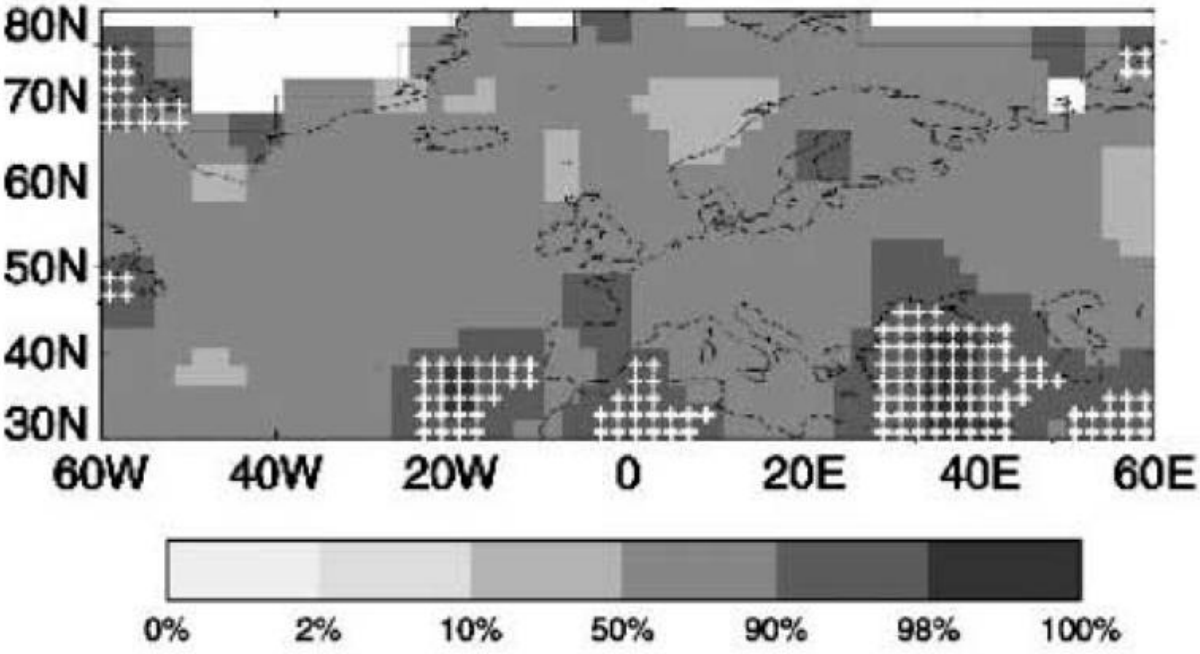
Percentiles (anomalies fitted to gamma distribution)
Reference period: 1961 – 1990

Surface temperature anomalies: June 2001 – August 2001

From: Hadley Centre of Climate Prediction and Research, U.K.



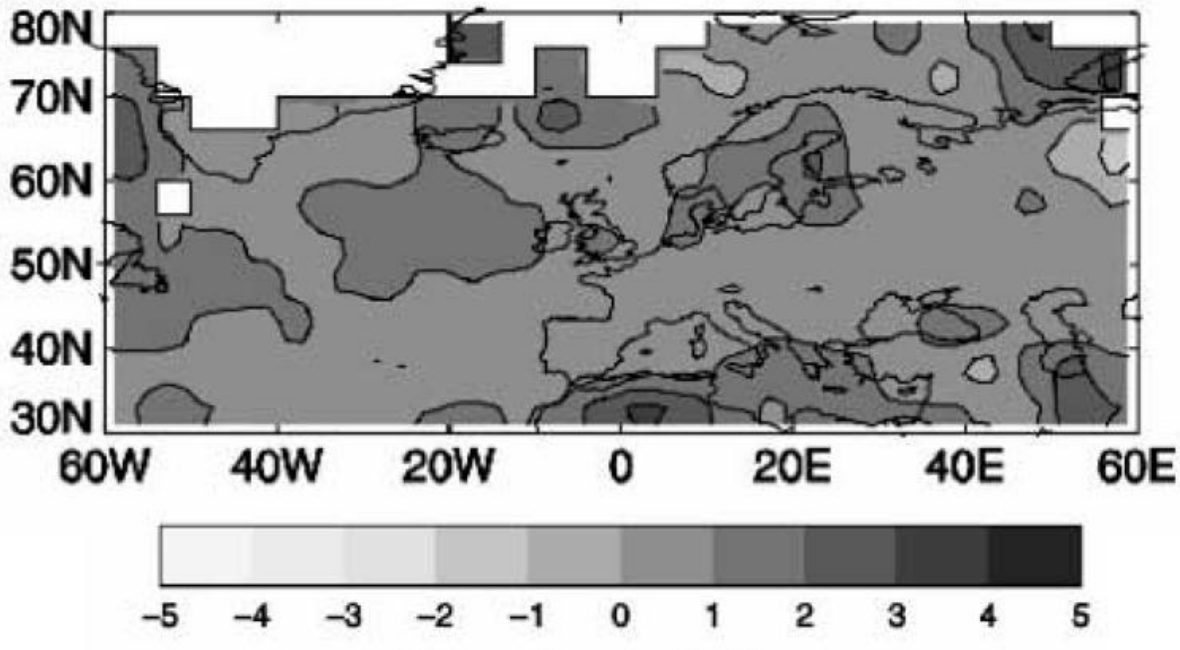
Departures from normal in °C



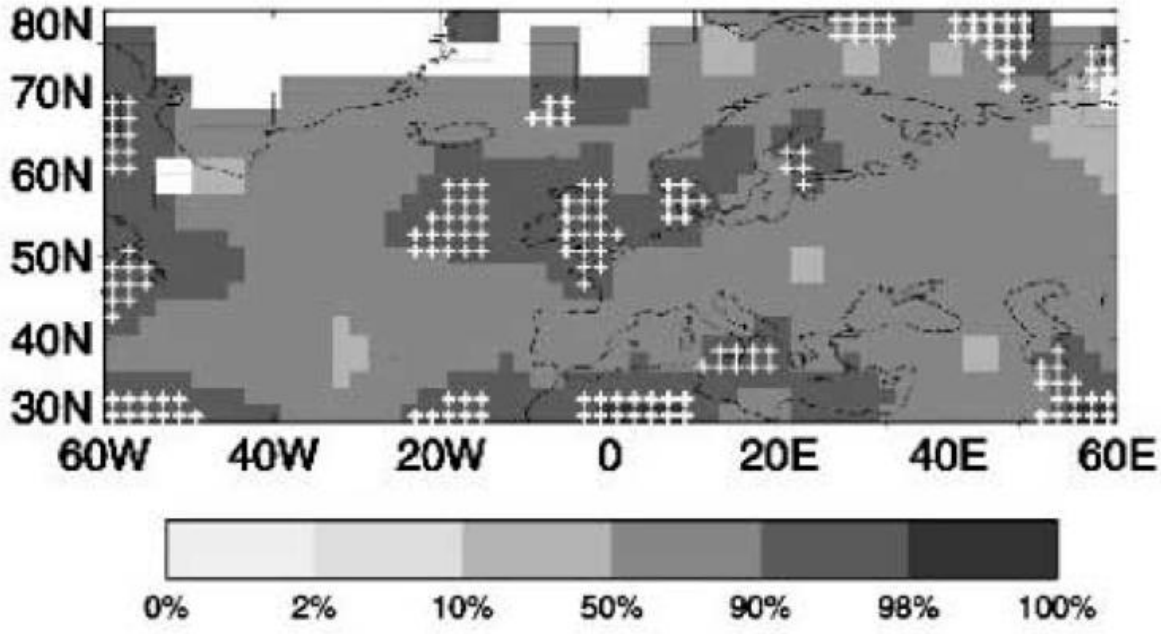
Percentiles (anomalies fitted to gamma distribution)
Reference period: 1961 – 1990

Surface temperature anomalies: September 2001 – November 2001

From: Hadley Centre of Climate Prediction and Research, U.K.



Departures from normal in °C



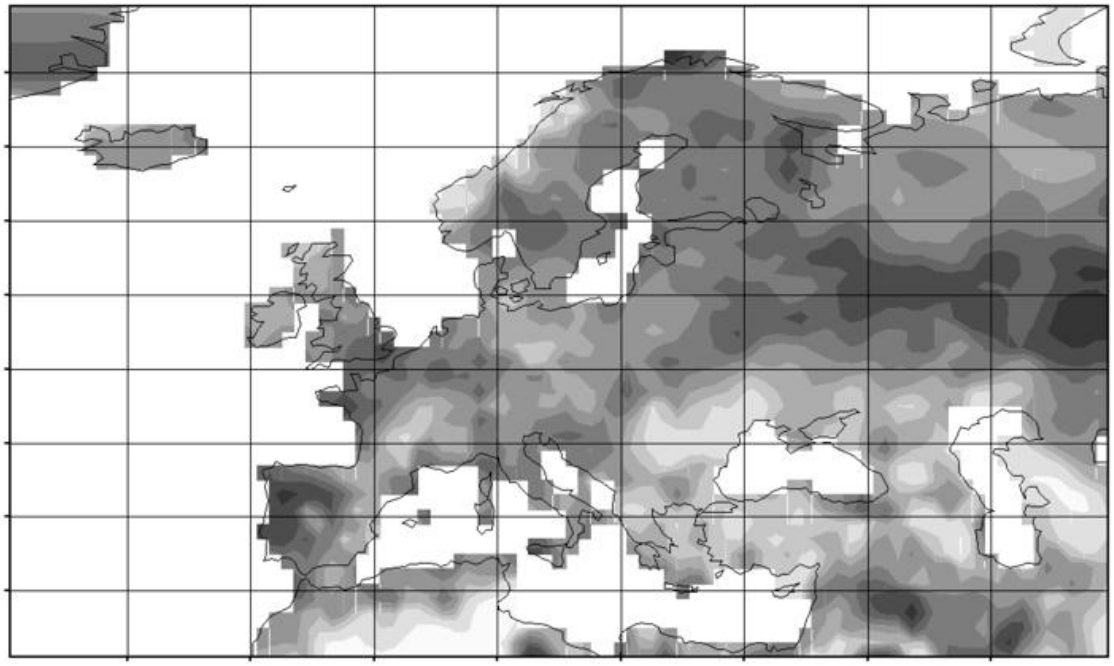
Percentiles (anomalies fitted to gamma distribution)
Reference period: 1961 – 1990

Precipitation in percent of normal

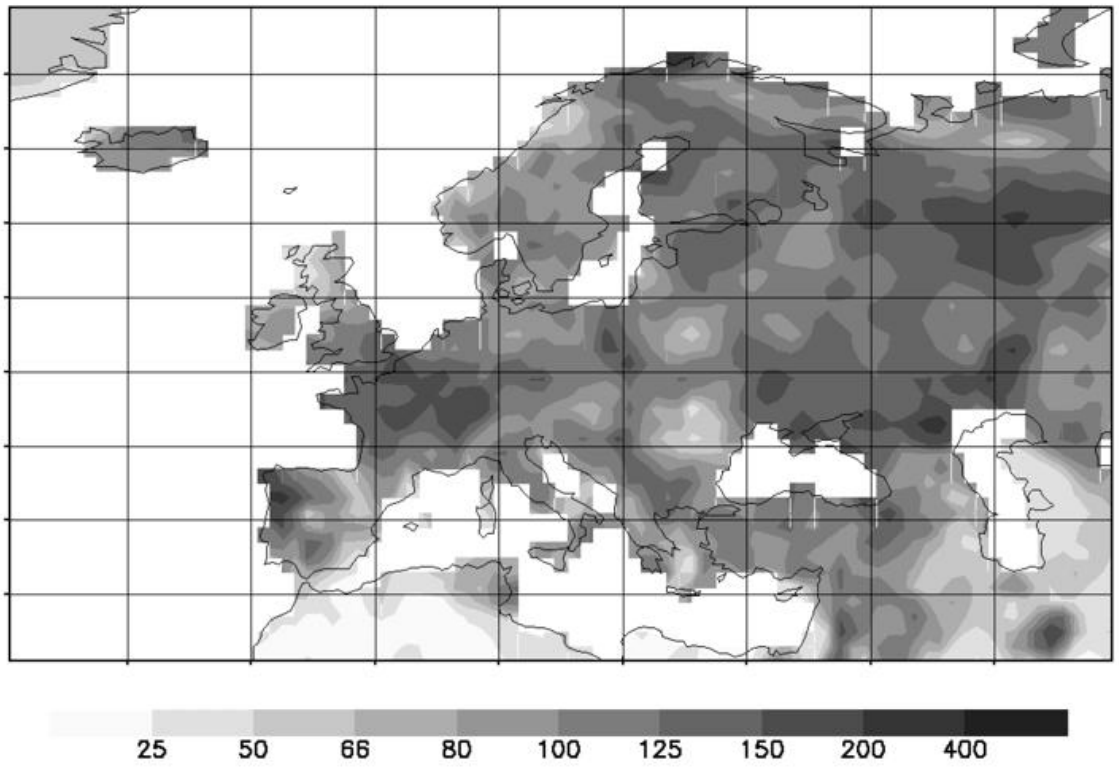
Gauge-Based Analysis 1.0 degree, reference period: 1961 – 1990

From: GPCC / Deutscher Wetterdienst, Germany

December 2000 – February 2001



March 2001 – May 2001

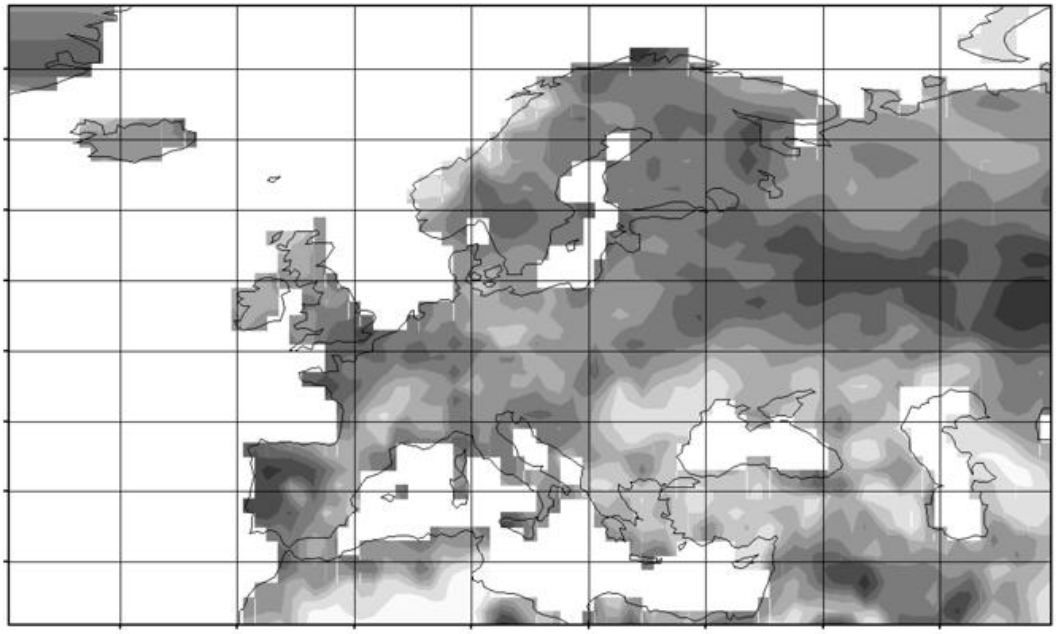


Precipitation in percent of normal

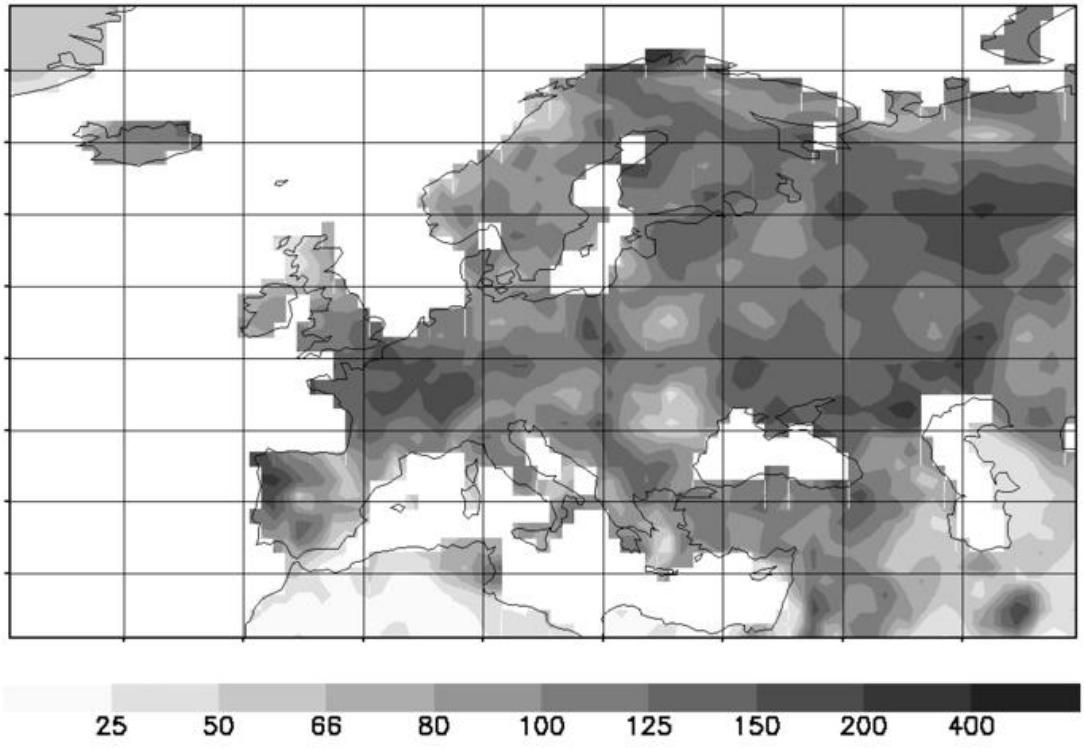
Gauge-Based Analysis 1.0 degree, reference period: 1961 – 1990

From: GPCC / Deutscher Wetterdienst, Germany

June 2001 – August 2001



September 2001 – November 2001



Monthly and Annual Tables

Temperature and precipitation values with departures from 1961-1990 means

WMO No.	Station	January 2001 Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	February 2001 Temp. mean	(°C) dep.	Prec. Sum	(mm) dep.
01008	Svalbard	-8.3	7.1	21	7	-9.2	6.5	11	-8
01025	Tromsø	-1.1	2.9	127	46	-5.4	-1.7	90	4
01492	Oslo-Blindern	-2.9	1.4	72	23	-5.3	-1.3	26	-10
02196	Haparanda	-5.6	6.5	39	-5	-12.2	-0.9	35	3
02485	Stockholm	0.1	2.9	32	-7	-3.4	-0.4	23	-4
02974	Helsinki-Vantaa	-1.9	5.0	50	9	-7.7	-0.9	49	18
03091	Aberdeen	3.1	0.2	63	-17	2.7	-0.4	83	31
03772	London-Heathrow	4.5	0.3	75	23	6.1	1.6	70	35
03967	Dublin (Casement)	4.0	-0.4	28	-38	4.4	0.0	41	-10
04030	Reykjavik	1.0	1.5	78	2	-0.2	-0.6	81	10
04320	Danmarkshaven	-21.9	1.2	14	3	-21.7	2.6	9	-2
04360	Angmagssalik	-5.6	1.9	80	-32	-7.1	0.6	163	72
06186	København-Landb.	2.1	1.6	28	-23	1.0	0.5	29	-2
06260	De Bilt	2.6	0.4	70	4	4.5	2.0	90	41
06447	Uccle	3.4	0.8	84	17	4.8	1.3	84	31
06590	Luxenbourg	1.9	1.7	118	47	3.3	1.9	73	13
06660	Zürich	1.7	1.8	99	29	3.6	2.7	53	-20
06700	Genève	3.4	2.7	146	66	4.8	2.8	44	-37
07510	Bordeaux	8.0	2.2	134	34	7.6	0.5	58	-28
07650	Marseille	9.5	2.8	55	8	8.5	0.6	35	-19
08222	Madrid	7.2	1.2	74	28	8.5	1.1	32	-14
08314	Mahon / Menorca	12.2	1.5	60	-1	11.1	0.4	103	50
08495	Gibraltar	14.0	0.6	107	-14	14.4	0.6	48	-52
08515	St. Maria / Acores	15.2	0.8	59	-41	14.6	0.6	53	-33
08535	Lisboa	12.6	1.2	193	83	13.1	0.8	76	-35
10384	Berlin-Tempelhof	1.2	1.4	37	-6	2.0	1.2	31	-3
11035	Wien-Hohe Warte	0.5	1.2	19	-19	3.1	1.8	20	-22
11518	Praha-Ruzyne	-1.7	0.7	30	7	0.9	1.7	16	-7
11903	Slica	-1.4	2.5	74	30	-0.7	0.4	27	-17
12160	Elblag	-0.2	2.2	40	-7	-0.7	1.5	41	16
12375	Warszawa-Okecie	-0.5	2.8	18	-4	-0.8	1.2	19	-2
12843	Budapest-Lorinc	0.7	2.3	90	58	3.6	2.5	11	-21
13274	Beograd	4.2	3.8	35	-14	5.4	2.7	27	-17
14015	Ljubljana	3.4	4.5	159	77	4.7	3.3	16	-64
14445	Split	9.7	2.3	208	125	9.3	1.2	25	-43
14654	Sarajevo	3.6	4.5	105	34	2.5	1.0	52	-15
15420	Bucuresti	0.6	3.0	17	-23	1.9	2.0	46	10
15614	Sofia	0.8	2.4	40	13	1.8	1.3	31	-2
16158	Pisa	8.4	2.3	61	-14	8.0	0.9	23	-50
16597	Luqa / Malta	14.3	2.1	71	-18	13.2	0.8	38	-23
16716	Athens (Hellinikon)	11.3	1.1	34	-10	11.7	1.1	33	-10
16754	Heraklion / Kreta	13.6	1.6	114	24	12.5	0.4	137	60
17040	Rize	7.9	1.6	94	-123	8.3	1.7	173	0
17062	Istanbul-Goztepe	8.6	3.0	22	-77	8.0	2.1	74	7
17130	Ankara / Central	3.0	2.9	7	-40	4.1	2.2	43	7
17170	Van	-0.6	3.6	17	-18	0.3	3.7	28	-6
17609	Larnaca	13.0	1.5	55	-10	13.4	1.7	36	-21
22113	Murmansk	-5.2	6.5	22	-11	-13	-1.8	17	-5
26038	Tallina	-0.9	4.6	48	3	-4.6	1.1	59	30
26629	Kaunas	-1.0	4.0	33	-4	-3.0	1.3	32	5
26730	Vilnius	-1.6	4.5	26	-15	-3.9	0.9	29	-9
26850	Minsk	-2.5	4.4	57	17	-4.2	1.6	35	1
27199	Wjatka (Kirov)	-7.9	6.3	57	19	-13	-1.2	50	22
27612	Moskva	-4.3	5.0	38	-7	-7.2	0.5	91	54
33345	Kiev	-1.0	4.6	33	-14	-2.5	1.7	54	8
33815	Chisinau	0.2	3.5	20	-20	0.4	2.1	26	-12
34300	Charkov (Kharkiv)	-0.8	6.1	33	-11	-3.4	2.3	45	13
34880	Astrahan'	-1.4	4.0	3	-10	-1.7	3.2	12	2
35188	Akmola	-14.1	1.7	21	4	-14.8	1.1	17	3
37789	Yerevan	-5.2	1.6	8	-27	-2.6	3.2	22	-19
40080	Damascus	6.5	0.3	4	-31	9.0	1.1	38	6
40100	Beyrouth	15.4	1.8	77	-114	15.0	1.5	209	73
40180	Tel Aviv (Airport)	13.3	1.0	119	-30	13.5	0.6	110	12
40270	Amman	9.1	0.0	35	-26	9.3	-0.7	46	-8
60030	Las Palmas / Gr. Can	19.2	1.7	0	-17	19.0	1.4	0	-22

	March 2001				April 2001				May 2001			
WMO No.	Temp mean	(°C) dep.	Prec sum	(mm) Dep.	Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	Temp. mean	(°C) dep.	Prec. Sum	(mm) dep.
01008	-16.6	-1.9	4	-17	12.4	-0.7	5	-7	-2.9	0.8	3	-3
01025	-4.9	-2.7	45	-19	0.4	-0.3	66	6	4.9	0.0	68	20
01492	-1.6	-1.4	6	-40	4.3	-0.3	82	40	11.9	1.1	82	30
02196	-8.3	-1.5	18	-17	0.6	1.1	78	49	6.2	0.1	41	10
02485	-0.4	-0.5	18	-8	5.9	1.3	30	0	11.3	0.6	16	-14
02974	-3.4	-0.5	24	-10	5.7	2.8	54	17	9.9	0.0	18	-17
03091	3.3	-1.3	109	48	6.5	0.1	46	-7	10.7	1.7	21	-38
03772	6.8	0.3	95	48	9.2	0.3	67	22	13.9	1.4	26	-25
03967	5.3	-0.7	49	0	7.3	-0.5	47	0	11.5	1.0	48	-10
04030	0.0	-0.5	24	-59	3.7	0.8	32	-26	6.6	0.3	87	43
04320	-25.9	-2.5	18	1	-20.4	-3.1	1	-9	-7.3	-0.7	1	-3
04360	-7.7	0.5	77	-11	-4.7	-0.6	31	-42	1.8	1.2	42	-15
06186	1.8	-0.8	11	-31	6.4	-0.2	43	1	12.8	0.8	18	-25
06260	4.9	-0.1	74	11	8.3	0.3	87	35	14.1	1.8	29	-32
06447	6.5	1.0	112	58	8.5	-0.3	134	77	15.1	2.2	30	-41
06590	5.7	1.4	138	70	6.9	-0.9	121	61	15.1	3.0	16	-61
06660	6.9	2.5	237	164	7.0	-1.0	130	36	15.5	3.2	116	12
06700	9.0	4.0	282	204	8.5	-0.2	114	49	16.3	3.4	74	0
07510	11.9	3.1	134	58	11.1	-0.2	94	22	16.7	2.1	20	-57
07650	13.3	3.1	36	-8	13.3	0.1	25	-23	18.6	1.5	83	-41
08222	12.2	2.2	72	39	13.7	1.5	21	-33	16.8	0.7	37	-4
08314	15.4	3.6	5	-44	14.4	0.7	18	-27	18.2	1.2	46	13
08495	16.9	1.9	79	4	17.8	1.6	12	-48	18.3	-0.2	18	-17
08515	15.0	0.4	165	86	16.0	0.8	13	-42	17.3	0.6	60	30
08535	14.8	1.1	154	85	15.9	0.8	12	-52	17.9	0.5	30	-9
10384	3.4	-0.8	41	4	8.5	-0.1	34	-7	15.1	1.2	42	-14
11035	7.1	1.8	51	10	9.6	-0.6	31	-19	17.2	2.4	29	-32
11518	3.7	0.7	51	23	7.2	-0.5	57	19	14.2	1.5	40	-37
11903	4.4	1.4	62	20	8.7	0.2	51	4	15.6	1.9	24	-40
12160	1.5	-0.6	54	19	8.0	1.2	64	22	12.3	-0.6	34	-7
12375	2.2	0.2	31	3	8.0	0.2	61	29	14.7	1.3	41	-18
12843	7.4	1.8	66	37	11.0	-0.1	27	-11	18.5	2.5	20	-35
13274	11.8	4.6	66	16	11.9	-0.5	158	99	18.3	1.1	47	-24
14015	8.8	3.4	200	102	10.1	0.2	89	-20	17.2	2.6	134	12
14445	13.7	3.3	111	36	13.8	-0.1	70	4	20.7	2.3	19	-37
14654	9.9	4.8	70	0	8.7	-0.7	130	56	15.5	1.4	75	-7
15420	7.0	2.2	77	39	10.0	-1.3	39	-7	15.7	-1.0	22	-48
15614	9.8	5.2	30	-8	9.5	-0.4	84	34	15.1	0.8	110	37
16158	12.8	3.3	110	34	11.5	-1.0	61	-18	17.9	1.6	40	-19
16597	16.9	3.5	36	-4	16.5	1.0	13	-10	20.6	1.5	31	24
16716	16.0	3.4	6	-35	16.4	0.3	47	22	21.4	0.8	1	-16
16754	17.0	3.6	1	-55	16.6	0.3	68	38	20.4	0.6	8	-8
17040	11.2	3.3	171	24	12.2	0.6	127	26	15.5	-0.3	127	25
17062	12.7	5.2	36	-26	13.6	1.6	53	4	16.8	0.3	31	0
17130	11.5	5.4	33	-3	12.6	1.4	27	-21	14.8	-0.7	110	55
17170	6.3	5.2	46	3	9.6	2.3	33	-21	12.5	-0.2	28	-21
17609	17.0	3.7	2	-47	18.9	1.5	17	6	22.5	1.6	4	-3
22113	-10.1	-3.3	21	1	-1.0	0.9	31	10	3.0	-0.8	14	-18
26038	-2.2	0.0	28	-1	5.9	2.5	95	59	9.6	-0.1	27	-10
26629	-0.2	0.0	51	19	8.1	2.1	32	-11	13.0	0.3	58	2
26730	-0.5	0.1	43	4	8.5	2.8	58	12	12.3	-0.2	60	-2
26850	-0.4	1.0	41	-1	9.4	3.4	61	19	12.8	-0.1	23	-39
27199	-4.0	1.1	62	33	7.9	4.7	9	-27	10.7	-0.4	127	78
27612	-2.1	0.1	48	14	11.0	5.2	29	-11	11.3	-1.6	112	54
33345	2.7	2.0	89	50	11.2	2.5	65	16	14.2	-0.9	33	-20
33815	5.9	3.0	46	11	11.2	1.0	56	14	15.4	-0.7	37	-14
34300	2.1	2.4	63	36	10.7	1.8	48	12	13.8	-1.8	28	-19
34880	5.1	3.8	12	-2	12.7	1.6	47	29	18.0	-0.3	21	-3
35188	-1.9	6.2	5	-9	7.7	2.8	17	-5	18.1	5.0	20	-13
37789	3.8	5.2	43	-9	7.1	2.2	67	-4	8.7	-0.9	73	-15
40080	15.6	4.4	3	-21	18.1	2.4	1	-12	21.4	1.0	7	2
40100	18.7	3.6	34	-86	21.0	3.2	34	-17	22.6	2.2	36	16
40180	18.4	3.5	4	-58	20.3	2.1	5	-18	22.6	1.5	7	4
40270	16.4	3.5	9	-42	17.9	0.1	10	-7	21.0	-0.9	3	0
60030	20.6	2.2	1	-10	20.0	1.3	4	-2	20.8	0.9	0	-2

WMO No.	Station	June 2001 Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	July 2001 Temp. mean	(°C) dep.	Prec. Sum	(mm) dep.
01008	Svalbard	3.4	1.2	11	1	6.4	0.4	20	7
01025	Tromsø	10.7	1.4	23	-30	10.9	-0.8	99	27
01492	Oslo-Blindern	14.6	-0.6	45	-20	17.7	1.3	81	-3
02196	Haparanda	14.4	1.6	49	8	16.4	0.9	72	22
02485	Stockholm	15.4	-0.2	32	-13	20.0	2.8	65	-7
02974	Helsinki-Vantaa	14.3	-0.6	112	68	20.5	3.9	56	-17
03091	Aberdeen	11.8	-0.3	44	-9	14.6	0.8	35	-26
03772	London-Heathrow	16.1	0.4	39	-12	19.4	1.6	35	-11
03967	Dublin (Casement)	12.9	-0.4	41	-7	15.3	0.4	54	0
04030	Reykjavik	8.8	-0.3	32	-19	10.9	0.3	80	29
04320	Danmarkshaven	1.5	0.8	3	-2	4.1	0.4	17	3
04360	Angmagssalik	4.9	0.8	65	13	6.6	0.2	14	-35
06186	København-Landb.	14.2	-1.9	45	-9	19.0	1.8	40	-29
06260	De Bilt	15.2	0.0	54	-14	18.5	1.7	87	12
06447	Uccle	15.7	0.0	45	-34	18.8	1.3	120	45
06590	Luxenbourg	14.9	-0.4	79	10	18.8	1.7	85	18
06660	Zürich	15.2	-0.3	182	55	18.7	1.0	141	23
06700	Genève	17.2	0.8	127	40	20.1	1.1	108	45
07510	Bordeaux	19.6	1.8	30	-26	20.6	0.4	75	29
07650	Marseille	22.1	1.2	1	-27	24.6	0.8	19	5
08222	Madrid	23.4	2.8	4	-23	24.2	-0.2	3	-10
08314	Mahon / Menorca	22.6	1.6	0	-15	24.9	0.6	12	7
08495	Gibraltar	22.1	1.0	1	-11	23.7	0.0	1	-1
08515	St. Maria / Acores	19.7	1.0	59	37	22.5	1.7	11	-14
08535	Lisboa	21.3	1.1	17	-4	21.4	-1.0	3	-2
10384	Berlin-Tempelhof	15.2	-2.2	66	-9	20.4	1.6	50	-2
11035	Wien-Hohe Warte	17.4	-0.6	47	-27	20.9	1.0	78	16
11518	Praha-Ruzyne	14.3	-1.6	72	-1	18.0	0.5	99	33
11903	Slica	16.4	-0.2	55	-30	20.0	1.8	136	77
12160	Elblag	14.1	-1.3	36	-58	19.8	3.0	158	64
12375	Warszawa-Okecie	15.2	-1.4	36	-36	20.7	2.8	139	72
12843	Budapest-Lorinc	18.4	-0.7	58	-5	22.0	1.1	122	70
13274	Beograd	19.0	-1.1	186	96	23.0	1.3	19	-47
14015	Ljubljana	18.3	0.5	147	-8	21.9	2.0	48	-74
14445	Split	22.6	0.4	46	-5	26.6	1.2	12	-16
14654	Sarajevo	16.6	-0.3	120	29	20.1	1.2	65	-14
15420	Bucuresti	18.6	-1.6	140	63	23.2	1.2	35	-29
15614	Sofia	17.6	-0.1	40	-32	21.9	1.9	15	-41
16158	Pisa	20.7	0.9	2	-42	23.8	1.0	27	4
16597	Luqa / Malta	23.9	0.9	1	-3	27.1	1.2	1	1
16716	Athens (Hellinikon)	26.0	0.9	1	-6	29.9	2.1	12	7
16754	Heraklion / Kreta	24.5	1.0	0	-3	27.7	2.0	0	-1
17040	Rize	20.1	0.2	136	8	25.3	3.1	93	-43
17062	Istanbul-Goztepe	21.8	0.7	5	-16	26.1	2.9	14	-5
17130	Ankara / Central	21.9	2.3	1	-37	26.3	3.4	3	-11
17170	Van	19.6	2.0	5	-16	23.1	1.2	7	3
17609	Larnaca	25.7	1.4	0	-1	27.5	0.6	0	0
22113	Murmansk	11.7	2.3	20	-33	14.5	1.7	51	-9
26038	Tallina	13.6	-0.9	109	56	20.0	3.7	86	7
26629	Kaunas	14.4	-1.6	46	-29	20.9	3.8	144	76
26730	Vilnius	14.4	-1.4	39	-38	20.9	4.0	94	16
26850	Minsk	15.4	-0.7	89	6	22.0	4.7	137	49
27199	Wjatka (Kirov)	16.0	0.4	24	-40	20.1	1.9	17	-69
27612	Moskva	16.3	-0.3	72	-4	23.0	4.9	89	-3
33345	Kiev	16.7	-1.5	152	79	24.6	5.3	6	-82
33815	Chisinau	17.9	-1.5	129	54	24.5	3.6	38	-31
34300	Charkov (Kharkiv)	16.9	-2.0	116	58	25.5	5.2	4	-56
34880	Astrahan'	21.9	-1.0	72	50	26.1	0.8	3	-20
35188	Akmola	18.4	-0.6	59	24	18.1	-3.2	69	19
37789	Yerevan	15.3	1.9	28	-43	17.7	0.6	40	-4
40080	Damascus	26.4	1.8	0	-1	28.3	1.7	1	1
40100	Beyrouth	24.3	0.7	0	-1	27.0	1.5	0	0
40180	Tel Aviv (Airport)	25.2	1.2	0	0	27.1	1.4	0	0
40270	Amman	25.2	0.2	0	0	27.0	0.6	0	0
60030	Las Palmas / Gr. Can	22.7	1.3	1	1	23.9	0.6	1	1

WMO	August 2001				September 2001				October 2001			
	Temp	(°C)	Prec	(mm)	Temp.	(°C)	Prec.	(mm)	Temp.	(°C)	Prec.	(mm)
No.	mean	dep.	sum	Dep.	mean	dep.	sum	dep.	mean	dep.	Sum	dep.
01008	6.5	1.7	16	-9	3.2	2.7	45	22	-5.2	0.3	15	0
01025	11.1	0.2	141	59	8.9	2.1	98	4	3.2	0.3	132	7
01492	15.8	0.6	93	3	11.5	0.7	67	-23	8.9	2.5	149	65
02196	13.9	0.6	39	-24	10.1	2.2	76	13	3.2	0.7	73	9
02485	17.4	1.2	87	21	12.7	1.5	108	53	10.2	2.7	77	27
02974	16.4	1.4	70	-10	12.1	2.1	99	26	8.0	2.6	76	3
03091	14.6	1.0	88	13	11.7	0.0	84	16	12.0	2.9	117	39
03772	18.9	1.5	79	28	14.5	-0.5	60	9	14.6	2.9	108	50
03967	15.2	0.6	103	25	12.9	-0.1	31	-38	12.4	2.1	82	14
04030	11.1	0.8	63	1	9.4	2.0	94	27	6.3	1.9	63	-23
04320	4.0	1.6	27	13	-1.8	2.4	9	-2	-10.9	2.7	17	5
04360	6.8	0.8	21	-40	5.0	1.9	101	33	0.5	1.3	27	-55
06186	17.8	0.8	120	57	12.9	-0.7	99	37	12.1	2.2	31	-28
06260	18.5	1.8	116	45	13.4	-0.6	211	144	14.2	3.7	41	-31
06447	19.2	1.9	43	-20	12.9	-1.6	199	140	14.4	3.5	68	-2
06590	18.9	2.2	47	-24	11.3	-2.4	113	46	12.7	3.4	53	-21
06660	19.2	2.3	112	-22	11.7	-2.4	189	95	13.3	3.8	81	9
06700	20.4	2.3	73	-8	13.1	-1.7	97	15	14.1	4.1	80	6
07510	22.1	2.2	39	-15	16.5	-1.4	51	-23	16.8	2.8	82	-6
07650	25.1	1.9	0	-29	18.7	-1.6	33	-14	19.2	3.1	37	-41
08222	25.5	1.6	2	-7	20.4	-0.1	23	-7	16.2	1.4	67	22
08314	26.1	1.6	13	-13	21.5	-0.7	68	13	21.7	3.2	47	-37
08495	25.1	0.9	1	-6	22.6	-0.2	34	19	20.1	0.6	68	4
08515	23.2	1.0	92	52	22.3	0.9	82	25	19.4	0.1	49	-35
08535	22.4	-0.4	1	-6	21.1	-0.6	61	35	18.7	0.2	151	71
10384	19.9	1.5	40	-21	13.1	-1.5	135	90	13.1	3.1	43	7
11035	21.6	2.4	44	-21	13.6	-1.8	99	54	13.2	3.1	9	-32
11518	18.5	1.5	85	15	11.8	-1.5	66	26	11.9	3.6	20	-10
11903	20.1	2.8	66	-3	12.7	-0.7	154	98	11.4	3.1	13	-37
12160	18.5	1.8	100	19	12.3	-0.4	129	59	11.0	2.1	35	-18
12375	19.3	2.0	38	-25	12.1	-1.1	73	30	10.9	2.6	37	-1
12843	22.9	2.6	31	-20	14.6	-1.8	85	45	13.9	3.0	5	-29
13274	24.0	2.7	57	5	16.2	-1.5	185	134	14.8	2.4	17	-23
14015	22.9	3.8	33	-111	13.8	-1.7	305	175	14.0	3.6	68	-47
14445	27.7	2.5	4	-46	19.0	-2.4	166	105	19.2	2.3	47	-32
14654	20.7	2.2	71	0	13.0	-2.1	231	161	12.6	2.2	37	-51
15420	23.3	2.1	27	-31	17.0	0.1	37	-5	11.8	1.0	6	-26
15614	22.3	2.9	44	-8	16.7	0.9	43	4	13.0	2.6	6	-31
16158	25.3	2.8	1	-56	17.9	-1.6	136	47	17.8	2.5	53	-67
16597	27.7	1.4	14	7	25.1	1.0	14	-26	23.3	2.6	11	-79
16716	30.0	2.4	1	-5	25.6	1.4	2	-8	21.2	1.9	1	-51
16754	27.2	1.6	0	-1	25.3	2.2	0	-18	21.3	1.6	3	-73
17040	25.6	3.4	241	58	22.1	2.7	282	61	16.3	0.9	314	42
17062	25.1	2.1	32	6	21.5	1.8	55	14	16.6	1.3	15	-56
17130	24.7	2.1	19	7	20.8	2.5	13	-6	13.2	0.6	1	-26
17170	24.0	2.8	0	-7	18.9	2.1	2	-12	11.4	1.3	56	8
17609	28.3	1.2	0	0	25.9	0.8	1	1	22.3	1.0	19	0
22113	11.2	0.2	65	0	9.0	2.3	48	-4	0.0	-1.0	61	19
26038	16.3	1.0	61	-23	12.3	1.5	67	-15	8.9	2.6	63	-7
26629	17.9	1.6	55	-8	12.2	0.1	75	16	9.0	2.1	40	-11
26730	17.9	1.6	52	-20	11.9	0.3	83	18	8.3	1.7	43	20
26850	18.2	1.7	75	3	12.1	0.4	48	-12	8.0	1.7	54	5
27199	14.2	-1.3	120	55	11.6	2.4	76	5	1.4	-0.3	81	19
27612	17.0	0.6	57	-17	12.2	1.3	38	-26	4.8	-0.2	70	12
33345	21.0	2.4	16	-53	13.8	-0.1	53	6	9.3	1.2	23	-12
33815	23.5	3.0	5	-40	16.0	-0.2	113	65	11.7	1.6	52	25
34300	21.9	2.4	31	-19	14.5	0.4	44	3	7.2	-0.1	39	4
34880	23.9	0.6	6	-13	17.9	0.6	6	-20	8.8	-0.3	10	-7.0
35188	18.0	0.3	39	-1	10.9	-1.1	15	-9	3.5	0.7	70	40
37789	18.6	1.9	33	0	14.7	1.5	5	-23	7.3	0.3	41	-9
40080	28.0	1.8	0	0	24.6	1.3	0	0	20.4	1.8	0	-12
40100	28.4	2.0	0	-1	27.2	2.0	0	-5	24.8	2.2	42	-12
40180	28.0	1.9	0	0	26.4	1.6	0	0	23.5	1.5	25	-1
40270	26.3	-0.1	0	0	23.5	-1.7	0	0	20.3	-1.5	1	-8
60030	24.8	0.7	1	1	24.5	0.7	2	-6	24.1	1.6	3	-7

WMO No.	Station	November 2001 Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	December 2001 Temp. mean	(°C) dep.	Prec. Sum	(mm) dep.
01008	Svalbard	-11.1	-0.6	18	5	-9.0	4.3	26	14
01025	Tromsø	0.0	0.8	143	44	-2.1	0.9	88	-16
01492	Oslo-Blindern	2.1	1.4	37	-38	-3.4	-0.6	33	-23
02196	Haparanda	-4.2	-0.1	65	7	-10.4	-0.9	29	-13
02485	Stockholm	3.2	0.6	30	-23	-1.2	-0.2	53	7
02974	Helsinki-Vantaa	-0.1	-0.2	56	-16	-7.1	-3.0	23	-35
03091	Aberdeen	6.7	1.5	48	-27	3.7	0.0	75	2
03772	London-Heathrow	8.1	0.9	34	-21	4.5	-0.6	18	-39
03967	Dublin (Casement)	7.9	1.2	35	-35	4.4	-0.9	22	-55
04030	Reykjavik	1.8	0.6	80	7	2.5	2.7	76	-2
04320	Danmarkshaven	-18.3	1.6	17	7	-16.5	5.3	22	9
04360	Angmagssalik	-4.2	0.5	213	117	-2.0	5.2	211	108
06186	København-Landb.	5.2	-0.3	40	-22	0.7	-1.5	34	-24
06260	De Bilt	7.1	1.2	85	4	2.9	-0.3	94	15
06447	Uccle	6.2	0.1	100	24	2.4	-1.1	70	-6
06590	Luxenbourg	4.3	0.3	77	-2	0.5	-1.3	60	-25
06660	Zürich	2.9	-1.2	99	14	-0.1	-0.8	43	-34
06700	Genève	4.3	-0.7	35	-57	1.6	-0.3	39	-48
07510	Bordeaux	7.6	-1.5	47	-47	3.9	-2.5	43	-56
07650	Marseille	9.3	-1.4	25	-33	4.2	-3.1	1	-55
08222	Madrid	8.1	-1.3	12	-52	2.3	-3.5	18	-31
08314	Mahon / Menorca	13.9	-0.5	251	174	10.3	-1.5	19	-61
08495	Gibraltar	15.4	-0.7	55	-86	14.6	0.5	306	160
08515	St. Maria / Acores	17.0	-0.4	6	96	15.8	0.4	230	135
08535	Lisboa	13.4	-1.1	8	-106	10.2	-1.6	42	-66
10384	Berlin-Tempelhof	4.5	-0.4	48	-1	0.1	-1.3	48	-5
11035	Wien-Hohe Warte	4.1	-0.7	56	6	-1.6	-2.6	54	10
11518	Praha-Ruzyne	2.4	-0.4	30	-2	-2.1	-1.5	32	6
11903	Slica	1.6	-1.4	50	-19	-7.3	-5.6	52	-5
12160	Elblag	3.3	0.0	68	12	-2.6	-2.9	82	30
12375	Warszawa-Okecie	2.4	-0.8	34	-8	-4.2	-3.3	19	-13
12843	Budapest-Lorinc	3.3	-1.5	30	-22	-4.3	-4.7	15	-25
13274	Beograd	4.7	-2.3	63	9	-1.9	-4.2	29	-29
14015	Ljubljana	3.6	-1.0	82	-53	-2.1	-2.1	49	-52
14445	Split	11.3	-0.9	308	200	5.6	-3.1	27	-73
14654	Sarajevo	2.9	-1.9	154	63	-3.1	-2.9	45	-19
15420	Bucuresti	3.3	-1.9	25	-24	-4.0	-4.2	21	-22
15614	Sofia	4.0	-1.0	25	-22	-5.2	-5.7	50	11
16158	Pisa	10.3	-0.1	110	-14	5.6	-1.2	61	-24
16597	Luqa / Malta	18.0	1.0	39	-41	12.8	-1.2	72	-37
16716	Athens (Hellinikon)	14.7	-0.8	159	109	8.8	-3.4	135	64
16754	Heraklion / Kreta	16.6	0.0	91	32	12.2	-1.6	228	154
17040	Rize	11.9	0.3	508	258	8.9	0.6	344	102
17062	Istanbul-Goztepe	8.2	-0.9	150	61	5.0	-3.1	250	128
17130	Ankara / Central	10.9	-0.7	65	32	2.5	-0.1	117	68
17170	Van	6.9	-0.2	83	41	1.2	2.1	51	18
17609	Larnaca	3.9	-0.1	26	-18	13.8	0.6	154	78
22113	Murmansk	17.4	1.0	23	-17	-9.0	0.3	50	12
26038	Tallina	-5.5	-0.4	87	19	-6.4	-3.5	34	-21
26629	Kaunas	1.1	-0.1	74	21	-5.5	-3.1	31	-13
26730	Vilnius	2.3	0.2	64	7	-7.3	-4.4	35	-20
26850	Minsk	1.2	0.0	55	3	-8.4	-4.6	37	-16
27199	Wjatka (Kirov)	1.1	0.3	69	17	-14.1	-3.8	45	0
27612	Moskva	-3.9	0.8	66	8	-10.6	-4.5	52	0
33345	Kiev	-0.5	0.6	70	19	-7.3	-5.0	39	-13
33815	Chisinau	2.3	0.2	78	39	-5.6	-5.3	18	-20
34300	Charkov (Kharkiv)	3.1	-1.3	58	14	-8.5	-5.1	30	-15
34880	Astrahan'	2.1	0.8	32	13	-3.7	-1.8	43	28
35188	Akmola	5.7	2.4	28	6	-12.4	0.2	10	-7
37789	Yerevan	-2.0	3.9	30	-11	-2.9	1.3	34	-4
40080	Damascus	11.7	-0.6	2	-25	8.7	1.1	9	-37
40100	Beyrouth	19.8	1.1	115	11	16.4	1.6	245	71
40180	Tel Aviv (Airport)	18.8	0.8	69	1	14.6	0.8	184	46
40270	Amman	13.8	-1.9	35	10	10.1	-0.6	64	13
60030	Las Palmas / Gr. Can	21.0	0.6	94	73	20.3	2.0	33	12

Year 2001

WMO No.	Station	Temp. mean	(°C) dep.	Prec. sum	(mm) dep.
01008	Svalbard	-4.6	1.8	195	12
01025	Tromsø	3.1	0.3	1120	152
01492	Oslo-Blindern	6.1	0.4	773	4
02196	Haparanda	2.0	0.9	614	62
02485	Stockholm	7.6	1.0	571	32
02974	Helsinki-Vantaa	5.6	1.1	687	36
03091	Aberdeen	8.5	0.5	813	25
03772	London-Heathrow	11.4	0.8	706	107
03967	Dublin (Casement)	9.5	0.2	581	-154
04030	Reykjavik	5.2	0.8	790	-10
04320	Danmarkshaven	-11.3	1.0	155	23
04360	Angmagssalik	-0.5	1.2	1045	113
06186	København-Landb.	8.8	0.2	538	-98
06260	De Bilt	10.4	1.0	1038	234
06447	Uccle	10.7	0.8	1089	289
06590	Luxenbourg	9.5	0.9	980	132
06660	Zürich	9.6	1.0	1482	361
06700	Genève	11.1	1.5	1219	275
07510	Bordeaux	13.5	0.8	807	-115
07650	Marseille	15.5	0.8	350	-277
08222	Madrid	14.9	0.6	365	-92
08314	Mahon / Menorca	17.7	1.0	642	59
08495	Gibraltar	18.8	0.6	730	-48
08515	St. Maria / Acores	18.2	0.7	879	296
08535	Lisboa	16.9	0.1	748	-6
10384	Berlin-Tempelhof	9.7	0.3	615	33
11035	Wien-Hohe Warte	10.6	0.6	537	-76
11518	Praha-Ruzyne	8.3	0.4	598	72
11903	Slica	8.5	0.5	764	78
12160	Elblag	8.1	0.5	841	151
12375	Warszawa-Okecie	8.3	0.5	546	27
12843	Budapest-Lorinc	11.0	0.6	560	42
13274	Beograd	12.6	0.8	889	205
14015	Ljubljana	11.4	1.6	1330	-63
14445	Split	16.6	0.8	1043	218
14654	Sarajevo	10.3	0.8	1155	237
15420	Bucuresti	10.7	0.1	492	-103
15614	Sofia	10.6	0.9	518	-45
16158	Pisa	15.0	1.0	685	-219
16597	Luqa / Malta	20.0	1.3	341	-209
16716	Athens (Hellinikon)	19.4	0.9	432	61
16754	Heraklion / Kreta	19.6	1.1	650	149
17040	Rize	15.4	1.5	2610	438
17062	Istanbul-Goztepe	15.3	1.4	737	40
17130	Ankara / Central	13.9	1.8	439	25
17170	Van	11.1	2.2	356	-28
17609	Larnaca	19.4	1.3	314	-15
22113	Murmansk	2.4	0.7	423	-55
26038	Tallina	5.6	1.0	764	97
26629	Kaunas	7.2	0.9	671	63
26730	Vilnius	6.9	0.8	626	-27
26850	Minsk	7.0	1.1	712	35
27199	Wjatka (Kirov)	3.7	0.8	737	112
27612	Moskva	5.6	1.0	762	74
33345	Kiev	8.5	1.1	633	-16
33815	Chisinau	10.3	0.9	618	71
34300	Charkov (Kharkiv)	8.6	0.9	539	20
34880	Astrahan'	10.8	1.0	267	54
35188	Akmola	4.8	1.3	370	52
37789	Yerevan	6.7	1.9	424	-168
40080	Damascus	18.2	1.5	65	-130
40100	Beyrouth	21.7	2.0	792	-96
40180	Tel Aviv (Airport)	21.0	1.5	523	-44
40270	Amman	18.3	-0.3	203	-68
60030	Las Palmas / Gr. Can	21.7	1.3	140	23

Monthly Surveys

January 2001

- **Extremely mild in the East, additionally dry in the Southeast**
- **Catastrophic floods in Brittany and northern Portugal**
- **Sunny and cold in the British Isles**

Temperature anomalies were positive in northern and central Europe by +1...+3°C and increasing significantly eastwards. As an example, the monthly mean temperature anomalies at the station Ljubljana, Slovenia, show, that January was the month with the highest positive deviation from normal by +4.5°C throughout the year (see fig. 1.1). In the Volga region, Russian Federation, the monthly mean temperature exceeded the normal value extraordinarily by +8.6° C.

During the second pentade of the month, a south westerly airflow transported warm and dry air from Africa to south-eastern Europe. As a consequence, record-breaking maximum temperatures were observed in several places: in Greece, on January 6-7 by 18-19°C; at the station Kiskunmajca, Hungary, by 17.6°C on January 7; one day later at Loznica, Yugoslavia, by 21.6°C.

In the Southeast, the relatively high temperatures were combined with deficits of precipitation, especially in Turkey, Cyprus, parts of Israel, and the Caucasus region, where the percentages of normal precipitation ranged from 60% down to 30%.

In contrast to this, some western parts of Europe received unusually high amounts of precipitation. In north-western France, continuous heavy rainfall during the first 5 days of the year (especially 50-90 mm on January 3-4) on already saturated soil caused flooding with catastrophic damage in the southern basins of Brittany.

In the northern part of Portugal rainfall rates near to 300% of normal occurred (see fig. 1.2). In Coimbra, Viana do Castelo and Vila Real, the actual monthly precipitation sums exceeded the previous maxima of cumulated amounts for the 5-month period of September to January, which were 1040 mm, 1511 mm and 1163 mm respectively. Due to these extraordinary precipitation amounts, the dams reached their maximum storage capacities. Their discharges led to floods in north and central areas, causing submerged roads, insulated villages and evacuation of people, landslides and closure of some railways.

Ireland and the U.K. had sunny and cold weather. In England and Wales, it was the sunniest January since 1959; but despite of the sun, January was also the coldest in four years.

In southern Sweden, heavy snowfall on January 2 caused problems to power lines. As a consequence, 80,000 families stayed up to one week without electricity supply. Also in Estonia, wet snow wrecked power lines and caused damage to forests. Although Germany had a small deficit of precipitation and a temperature anomaly of slightly above +1°C, there were a lot of events with heavy snowfall and freezing rain during the month and located all over the country, leading to mass accidents on motorways.

From January 14-16 heavy rains and thunderstorms affected the central and southern parts of Greece, leading to floods in Attiki and the north eastern Peloponnisos with significant destruction. Due to bad weather conditions, a first aid helicopter crashed over the South Agean with the loss of 5 people.

In Kazakhstan, snow depths in the western Altai mountains exceeded normal by 2-3 times, giving cause to frequent avalanches and consequently to the blocking of railways and a 1500 km stretch of the main road.

In Tajikistan, temperatures fell below -50°C in some places, at Bulunkul station down to –56°C.

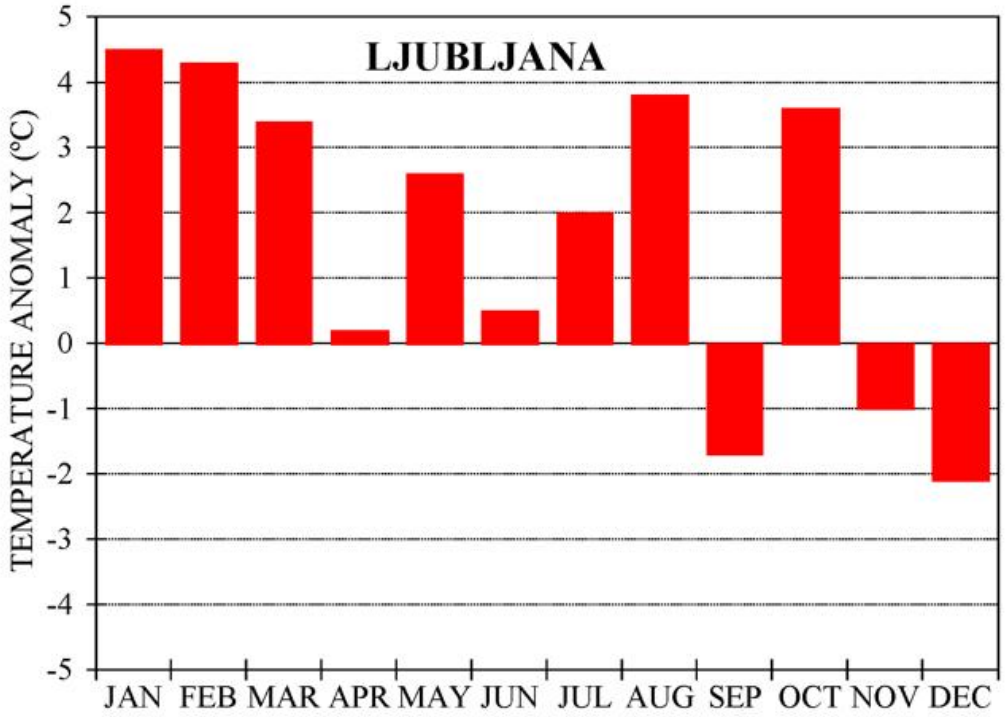


Fig. 1.1: *Monthly temperature deviations from normal 1961 – 1990 at station Ljubljana in 2001*
From: Environmental Agency of the Republic of Slovenia

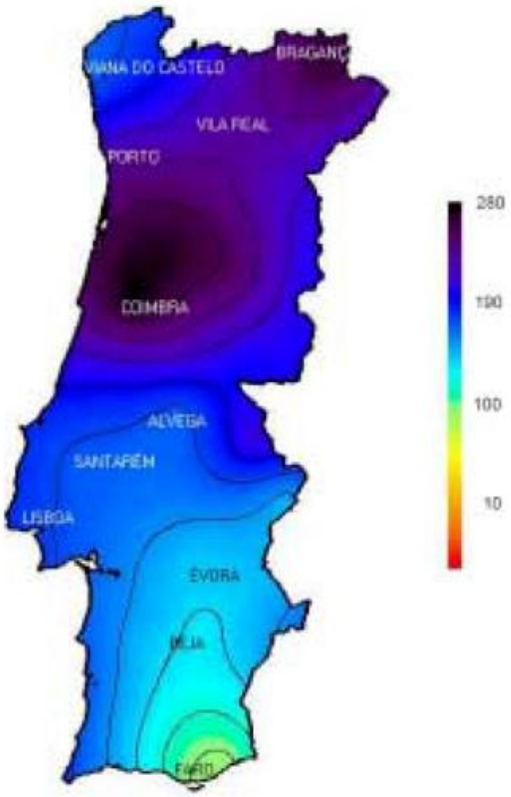


Fig. 1.2:

Precipitation rate for January in % referred to 1961 – 1990 in Portugal
From: Instituto de Meteorologia, Portugal

February 2001

- **Warmer than normal in central, eastern, and south-eastern Europe**
- **Very wet in some parts of western Europe**
- **Very dry on the Balkans and in the Caucasus**

Temperature anomalies in central Europe were above +1°C and up to more than +2°C in the northern Balkan region. In the Caucasus area, positive temperature deviations from normal were up to +4°C.

Precipitation amounts in central Europe were near to normal except for Belgium, where the station Uccle received 158% of the average in 1961-1990.

Heavy snow and widespread floods affected the U.K. in the first week of the month. Snow and ice closed areas of north-eastern England and Scotland, while at the same time parts of southern England were under water. In Kent, more rain fell in one day than normally would fall in a month.

In Portugal some daily maximum records of precipitation were broken (with 71 mm in Porto, 70 mm in Évora and 50 mm in Beja).

On February 21, heavy snowfall, thunderstorms, and icing led to severe calamities on roads in many districts of the Czech Rebublic. On the same day in Austria, gusts up to 100 km/h caused damage of greenhouses, roofs, and trees in the area of Vienna; additionally, traffic was blocked on highways by a lot of accidents.

At station Freiburg, a maximum temperature of +19.5°C was measured on February 6, the highest temperature in Germany for the first decade of the month since more than 100 years.

In France, heavy snowfall in the Southeast led to the closing of roads and motorways. Damage to power lines and trees occurred due to the weight of the snow.

A spell of warm air occurred in Hungary in the second pentade of the month. The country-wide average temperature was +15.5°C on February 9. On the same day, the maximum temperature at the station Baja was +18.6°C.

In the Netherlands, the month was very wet by 168% of the normal rainfall. The first decade of the month was the second wettest on row since 1901 with 70 mm. On February 1, heavy snowfall and icing disrupted public life in the northern half of the country.

At station Svenningdal, Norway, the largest precipitation amount of the country for 24h was observed by 144.5 mm.

In the Russian Federation avalanches blocked transport on the main Transcaucasian routes and broke power lines.

A cold episode early in the month brought a new February record to the province Dalarne, Sweden, with –44°C.

In Switzerland, the weather was very mild in the lowlands during an episode of several days at the beginning of the month; Vaduz/Liechtenstein had an extraordinarily high mean daily temperature of +16.4°C on February 7.

In Turkey, whirlwinds, frosts, and storms caused damage to agricultural areas; telephone and power lines. In Izmir, the seaport was closed on February 26 because of bad weather conditions.

March 2001

- **Extremely warm in the Alps, around the Mediterranean, and in the Middle East**
- **Cold in Scandinavia**
- **Very wet from the South-West over central to eastern Europe**

In Cyprus, it was the warmest and driest March in the last 100 years. The temperature anomaly was +4.4°C combined with a precipitation rate of 14% from normal.

Exceptionally heavy rainfall in France engendered flooding in Franche-Comté, Paris, Lyon, and the whole centre of the country.

In Luxembourg, the highest monthly precipitation amount since 1947 was recorded with 138 mm.

At the end of the month, very cold air came into Germany, producing a snow cover of 25 cm in the North. In Berlin, the coldest March 25 since 1919 was observed by a maximum temperature of –0.1°C.

In Greece, unusually high temperatures were recorded, exceeding normal by +6°C up to +15°C. Daily maximum temperatures varied from 28°C to 35°C within the period March 22-27.

Extreme floods were triggered by intensive precipitation in north-east Hungary from March 3-5. The highest amount of a 3-day accumulation was recorded at the station Tiszabes with 80.2 mm, which has a 20 years' return period.

In Ireland, the highest gust of the year was observed with 122 km/h at station Malin Head on March 6.

Israel experienced the hottest March since the beginning of measurements 40-50 years ago (see fig. 3.1). Several hot and dry spells (called sharav) throughout the month led to temperatures above 30°C. A significant sharav event occurred in the end of the month with temperatures up to 38°C in the Coastal Plain and the northern Negev.

Also in Jordan very warm air invaded the country at the end of the month and caused maximum temperatures exceeding the normal of the daily maximum by +6.3...+13.8°C.

In the first half of the month, frequent fog obstructed aviation in Lithuania. The station at airport Vilnius recorded visibility below 100 m for 15 hours on March 11, delaying all flights. Temperature in Lithuania had an abnormal course during the month. Up to March 20 it was rather mild. In the last decade of the month, temperatures fell to -1.5...-5.5°C below normal and were lower than in the first half of January.

In Belgium (see fig. 5.1) and in the Netherlands, March was rather dull. The station De Bilt received only 55% of the normal sunshine, which is the 4th lowest record since 1901.

At station Sihcajavri in Norway, the lowest monthly mean temperature (except for mountain stations) was measured with -17.0°C, which is –5.7°C below normal.

Heavy snowfall in northern Poland caused much trouble to transport. In the Russian Federation, heavy snowfall on March 16 interrupted transport and damaged power lines in the Moscow area.

In the high mountains of Slovenia, an abundant snow cover had accumulated at the end of the month, combined with country-wide relatively high temperatures and a sunshine deficit. On Kredarica (2514 m), a snow cover of nearly 6 m was observed, the highest ever recorded in March.

South-westerly winds prevailed during the month over the Iberian Peninsula. The result was an extremely warm month in most parts of continental Spain, especially in the East. Historical records for mean monthly values were beaten at many observatories.The greatest anomalies are to be found in the Levante with values around +3ºC. The prevailing winds of Atlantic origin were responsible not only for high temperatures but also for intense precipitation. In almost all Galicia and the Duero Basin new records were registered of monthly precipitation sums. In La Coruña, the monthly total of 262 mm exceeded the previous record over a 124-year long series. In sharp contrast to this, the month was very dry in the Southeast and the Balearic Islands.

In Portugal, daily maximum precipitation amounts were exceeded in some places in the North, e.g. in Porto with 108 mm. Monthly maximum precipitation records were exceeded in places distributed all over the country, e.g. with 629 mm in Viano do Castelo, 327 mm in Bragança, 432 mm in Vila Real, 570 mm in Porto, 177 mm in Alvega and

110 mm in Faro. The fall of a bridge crossing the Douro River, due to the increase of river flow and eventually to the local extraction of sand, caused 59 deaths. The material losses to the whole country were estimated to € 500 million.

In Switzerland, March was extremely mild, wet and dull. Temperature anomalies were up to +4°C. Highest rainfall rates reached 400% of normal and there were up to 26 days with precipitation of at least 1 mm, the maximum number recorded since the beginning of observations in 1864. The snow depth on Bernina pass (2256 m asl) was highest with 641 cm on March 14. It was the most alarming avalanche situation since winter 1950/51. Water levels in rivers and lakes were extremely high, but no major flooding occurred. Sunshine duration was unusually low with 40% to 60% of the average. At the mountain station Säntis, it was the March with the lowest rate of sunshine since records started in 1901.

Hail and heavy rainfall caused large damage to agriculture, roads, and houses on March 8 in the Sanliurfa district, Turkey; 3 people died.

A drought situation affected The Former Yugoslav Republic of Macedonia, caused by decreasing precipitation rates since the beginning of the year (see fig. 3.2) and accompanied by extraordinarily positive temperature anomalies (see fig. 3.3).

During March 3-5, intense rainfall in western Ukraine led to catastrophic floods on the rivers of Zakarpattya in the Carpathian Mountains.

In the U.K., March was rather cold and accompanied by blizzards, high winds and a snow cover of up to 25 cm in Scotland, England and Wales.

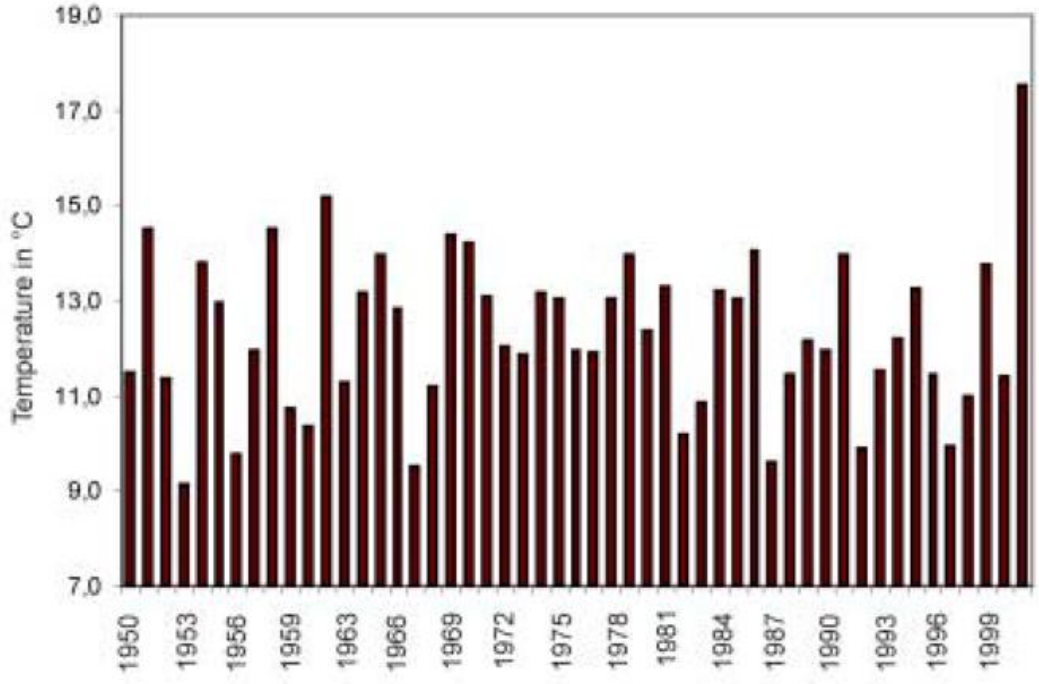


Fig. 3.1: *Mean daily temperature in March, Jerusalem 1950 – 2000*
From: Israel Meteorological Service

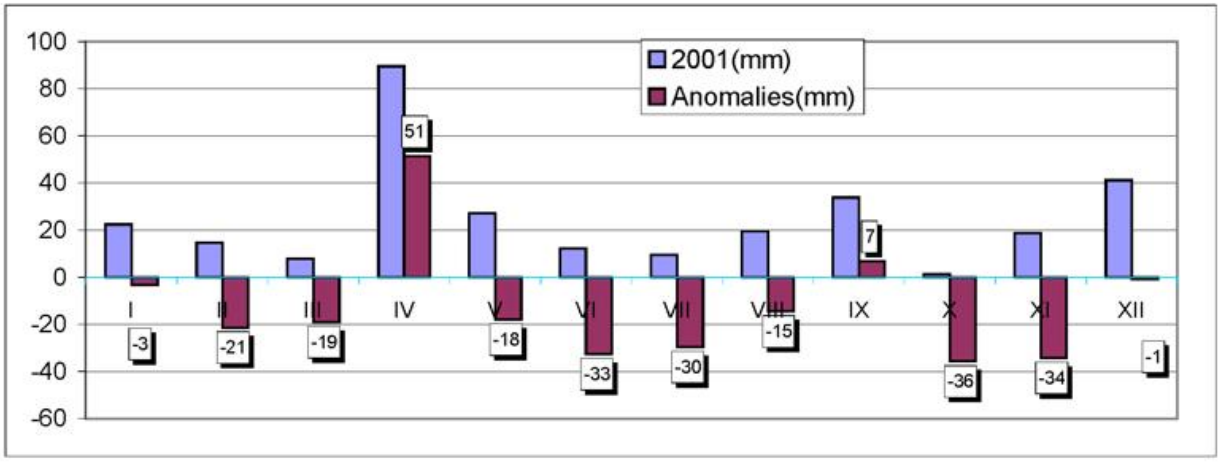


Fig. 3.2: *Monthly precipitation totals and anomalies in SkopjeZajev Rid, in 2001, reference period: 1961 – 1990*
From: Hydrometeorological Institute of Republic Macedonia

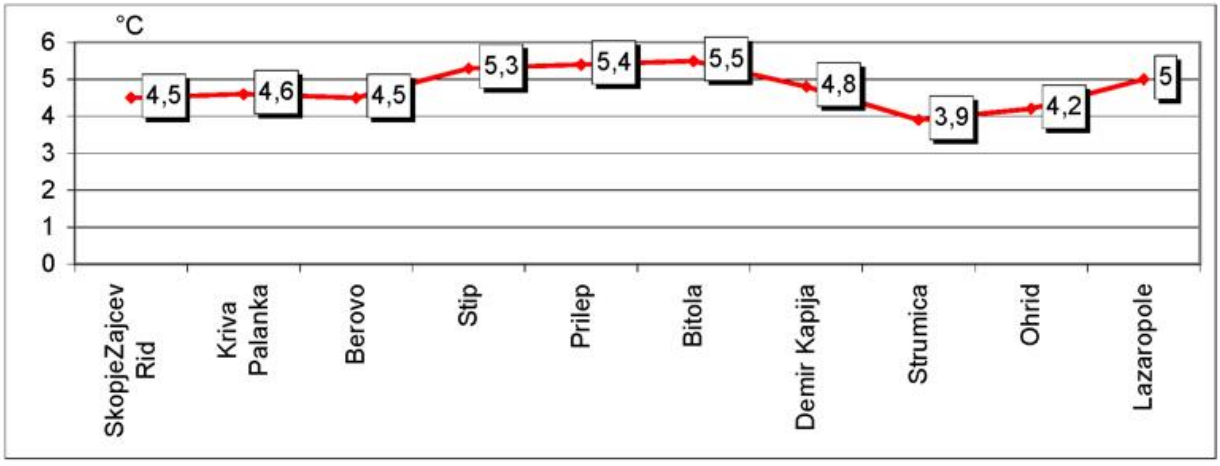


Fig. 3.3: *Monthly temperature anomalies in March 2001, Macedonia, reference period is March 1961 – 1990*
From: Hydrometeorological Institute of Republic Macedonia

April 2001

- **Very wet in a broad strip from the British Isles and northern France over central Europe to the Baltic States, Belarus and parts of the Ukraine as well as on the Balkans**
- **Return of wintry weather in the second decade of the month in central and eastern Europe**
- **Dry on the Iberian Peninsula and in the Caucasus**
- **Very warm in eastern Europe and the Middle East**

At station Uccle, Belgium, a precipitation amount of 134.2 mm was measured, which is 253% of normal and thus as absolute record since observations started in 1833.

A long lasting rainy period in northern France, starting from October 2000 (see fig. 4.1) led to disastrous floods in Brittany and the Somme area. In Lille, the monthly precipitation amount was 112.2 mm and thereby the highest ever recorded in April.

From April 13 to 15, snow and ice lead to chaos on motorways all over Germany. It was the coldest Easter time since more than 20 years. On April 20-21, fresh fallen snow covered S-Germany up to more than 50 cm and increased the avalanche danger in the Alps.

In Hungary, the month started with temperatures around normal. From April 13 on, a very cold period brought enormous damage to flowering fruits and trees.

After a start with warm weather, Latvia was hit by snowstorms from the middle of the month on. After a 24h lasting snowfall, Riga had a fresh snow cover of 20-24 cm accompanied by frost down to –6°C; such an increment of fresh fallen snow has never been observed before in Riga in April. Traffic was paralysed by long lasting snowfalls, -storms and –drifts.

In Lithuania, temperatures in the first decade of the month were above normal up to +5°C. In the second decade, it became cool with temperatures below the average by –1...-2°C. Snowfall led to a snow cover up to 16 cm. During the third decade, mean daily temperatures rose significantly above normal by +3...+5.5°C.

The characteristic climatic feature of the month in Poland was an overall abundant precipitation rate of nearly 150%, compared to normal. Station Kielce received even 400%.

In Portugal, maximum temperatures at the end of the month were +12°C above the normal maximum temperatures. The return period of this event is estimated to more than 500 years.

Cyprus was hit by tornadoes, partly connected with hailstorms, before and at the end of a hazy period in the second half of the month.

In Israel, several sharav events occurred in the second half of the month, leading to sandstorms with severe haze in a warm and dry atmosphere. In the coastal area and northern Negev, maximum temperatures up to 39°C were observed at the end of the month.

A heat wave affected Georgia in the second decade of the month. Daily maximum temperatures up to 40°C were measured.

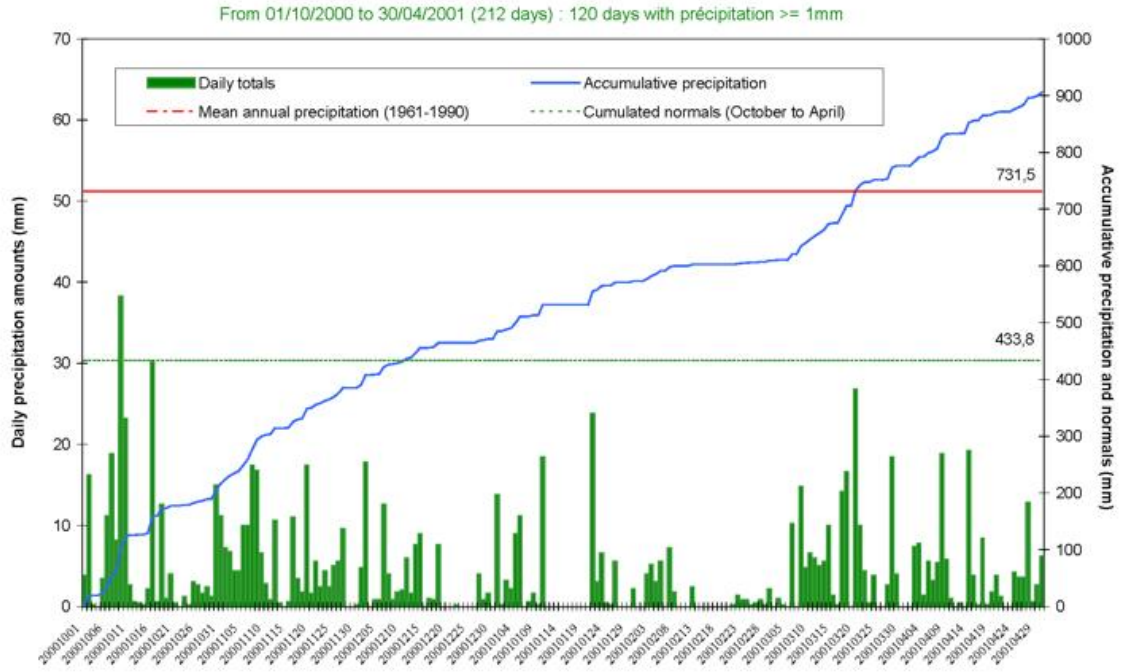


Fig. 4.1: *Daily and accumulated precipitation from October 2000 to April 2001 in Abberville, northern France*
From: Metéo France

May 2001

- **Much warmer than normal except in eastern Europe and the Middle East**
- **Very dry except in France and some parts of the Middle East**

Switzerland experienced the warmest May since 1868. The monthly mean temperature was above normal by +2.5...+4°C.

In the U.K., the month had a very warm start in Southampton (27.3°C).

In the Netherlands, the month was very sunny. Station De Bilt received 277 hours of sunshine, which is 136% of the normal value. This corresponds to the measurements at station Uccle in the neighbour country Belgium, where 130% of the average sunshine duration was observed (see fig. 5.1).

In Lithuania, the month started warm and dry. On May 1, maximum temperatures were up to 27°C. In the second half of the month, daily maxima of temperature fell below 10°C locally, and there were 17 nights with morning frost and minimum temperatures down to −6°C.

New records of the month were set in northern and southern Portugal for daily maximum temperatures by 35.6°C in Viana do Castelo and 37,0°C in Beja.

At the end of the month in Greece, maximum temperatures were up to 37°C and thus +5..+6°C above the long term average maxima of May.

In Slovakia, only 10 mm of precipitation fell during the month. So, it was the third driest May since 1901.

In Italy, especially in the northern and central parts, a long lasting period of very dry weather started in May.

France again suffered from continuous rainfall over several days causing floods in the Paris area and in the Atlantic Pyrenees.

On May 2-3, thunderstorms with hailstones of diameters up to 2 cm affected northern and western Germany. Precipitation amounts up to 110 mm caused floods and the interruption of transportation lines. On May 31, a tornado over Saxony damaged 26 houses and some forest areas, causing the material losses of several million Euro.

On May 8, hailstorms and heavy rains caused local flooding of houses and the destruction of dams in the Czech Republic; 62 mm of rain were measured on that occasion. On the last day of the month, a tornado was observed during the passage of a cold front, damaging houses and woods.

On May 29, a tornado over southern Poland damaged about 140 buildings in Morawczyna.

In the first half of the month, Cyprus was affected by severe hailstorms and heavy rains, leading to floods.

On May 2 in Israel, an unusually heavy rainfall occurred at station Jerusalem. 70 mm of precipitation fell within 4 hours (see fig. 5.2) and caused the flooding of 200 homes. This rainfall intensity was the highest since the beginning of measurements in 1950.

In Turkey, several hail events affected crops in different parts of the country.

On May 28, strong winds with gusts up to 122 km/h broke communication and power lines in Armenia.

In the second half of the month, numerous frosts ruined a lot of agricultural crops in Belarus.

Throughout 24 days of the month, intense frosts in the air and at the soil surface damaged agricultural crops in the Russian Federation. On May 14, torrential rains and hailstones of diameters up to 4 cm caused the damage of about 4500 homes and the death of 34 people in Stavropolsky Kray on the northern slope of the Caucasus mountains.

On May 7-8, landslides and mudflow interrupted traffic on roads and motorways in Kazakhstan.

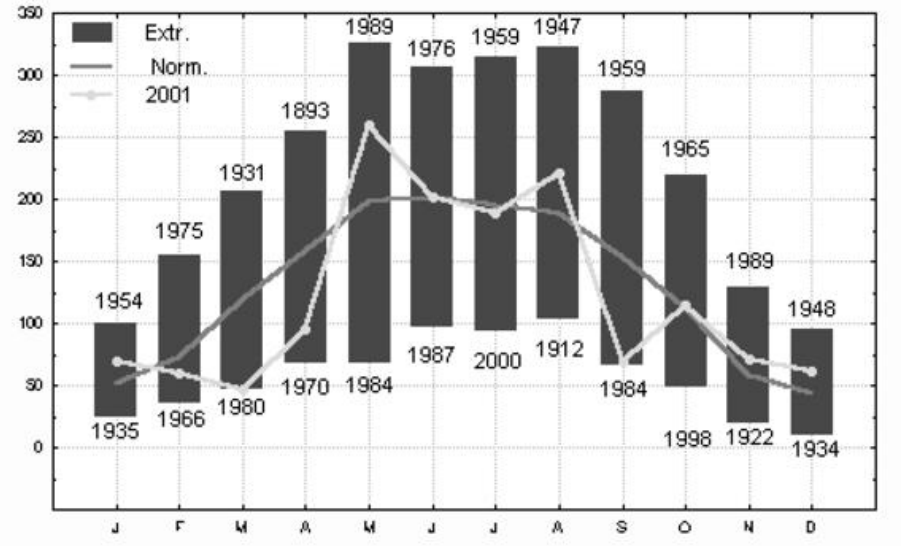


Fig. 5.1: *Monthly Sunshine duration at station Uccle (hours)*
From: Royal Meteorological Institute, Belgium

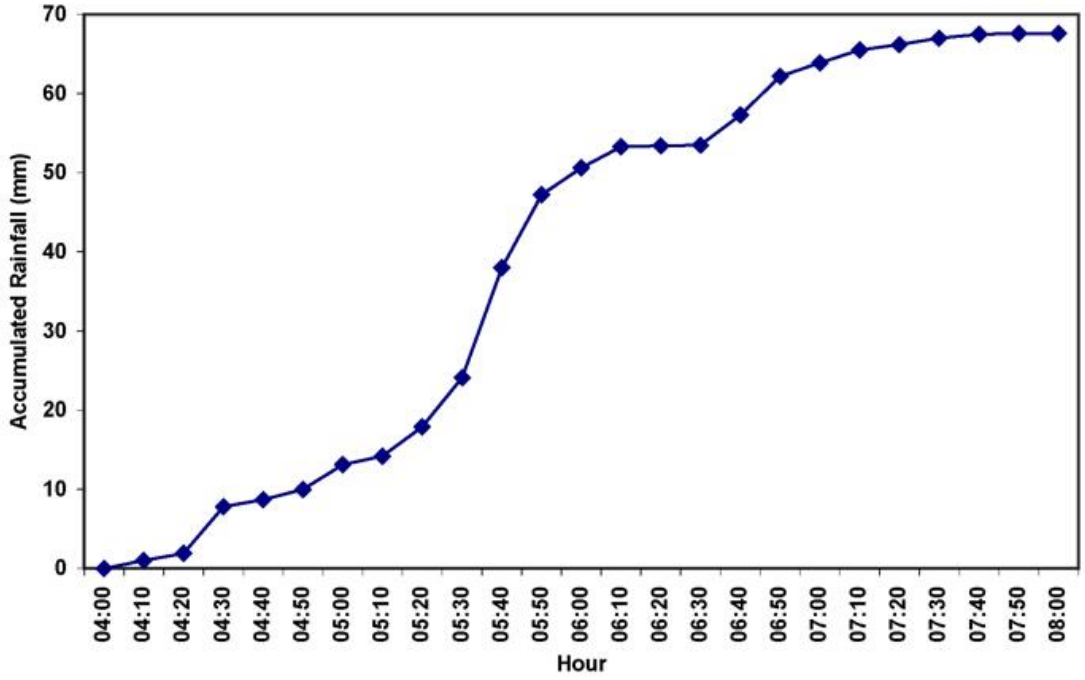


Fig. 5.2: *Accumulated rainfall in Jerusalem on May 2nd, 2001*
From: Israel Meteorological Service

June 2001

- **Cool in Central and East Europe**
- **Wet in some eastern European countries**
- **Very warm and extremely dry in southern Europe and the Middle East**

In Iceland, the month started with snowstorms over the northern lowlands. In the U.K. also, it was chilly during the first days of the month: on June 9, a minimum temperature of –1.8°C was recorded from Redhill station. Later on, it became very warm: the absolute maximum temperature of the year was observed on June 26 in Barbourne with 32.6°C.

The North of France suffered again from heavy rainstorms causing floods. In the north-eastern part of the Netherlands heavy showers accumulating to 60 mm of rainfall on June 15.

Gusts up to Beaufort 8 on Lake Constance (Austria, Switzerland, Germany) capsized several boats during a yacht race on June 15. Two ships were lost and 10 people injured.

On June 8-10, precipitation amounts of up to 230 mm were measured on the southern slopes of the Swiss Alps. This corresponds to a local percentage between 100 and 150 of the normal monthly precipitation.

A heat wave struck the Iberian Peninsula from June 22-24. Maximum temperatures were above 40°C (see fig. 6.1) and temperature anomalies up to +4°C in the central and south-eastern parts of Spain. The mainland of Greece was affected by a heat wave during the period of June 10-13: maximum temperatures reached values up to 39°C. Cyprus recorded a heat wave from June 12-15.

Germany experienced 2 major episodes of heavy rains, strong winds and thunderstorms: the first one from June 15-17 with flooding of houses, uprooting of trees, lightning damage to communication lines and traffic lights in the North. The second one from June 27-30 was even worse and affected areas all over the country; e.g. the airport of Stuttgart received 100 mm rainfall in 2 days leading to

flooding of buildings, streets and subways; in Castrop-Rauxel 42,8 mm precipitation fell within 1 hour including hailstones of a size up to tennis balls, which caused catastrophic damage to public and private property and injured a lot of people.

A violent thunderstorm with cloudbursts in Czerwinsk on June 28, was the most remarkable extreme weather event of the month in Poland. Hungary had a chilly June.

In Estonia, power lines and forests were damaged by thunderstorms and tornadoes. Latvia received abundant rainfall in the third decade of the month. On June 23, new daily precipitation records were set up in the East and the South of the country by rainfall amounts up to 72 mm. Wind induced surges and heavy rain made water levels of rivers rise up to 3 m and led to flooding of some localities for 10 days.

June was the coolest summer month in Lithuania with soil surface temperatures down to –5°C on the first two days and morning frost reaching –1°C in some places until the middle of the month. There were only 6 days without rain. On June 18, station Širvintos recorded 63 mm rainfall in 3 hours. On June 22-23, intense rainfall at stations Nida and Vėžaičiai amounted to more than the monthly normal precipitation. River levels rose enormously and caused the flooding of houses, streets and crop fields.

The month was also very rainy in the Ukraine, especially in the northern parts; up to 235 mm and 4 times the average precipitation were observed. On June 11-12, whirlwinds of destructive force caused catastrophic damage with the loss of human lives in the western and central parts of the country. On June 20-22, intense rainfall in Prykarrpattya caused landslides and the interruption of communication and power lines.

Moldova was affected by heavy rainstorms in the period from June 4-6. Precipitation amounts accumulated locally to 173 mm, which is twice the normal monthly precipitation. On June 5, an absolute record of 147 mm was measured; it exceeds the previously observed daily maximum by 30 mm in a 110 years' series. Agricultural lands were flooded and many buildings destroyed. The material losses are estimated to 1.5 Mill. Euro.

In the Russian Federation, torrential rains poured down on June 21-22 in Krasnodarsky Kray and in Karachevo-Cherkesiya. The rain was mixed with hail up to 30 mm in diameter, accompanied by strong squally winds and caused floods on the mountain rivers of the northern Caucasus with damage to economic facilities, homes, and more than 20,000 ha of agricultural crops.

In Tajikistan, the weather was hazy throughout the month. Maximum temperatures exceeded 40°C in Dushanbe and reached 47°C in the Isanbaya region. At Khumraga station, a maximum wind speed of 122 km/h was observed.

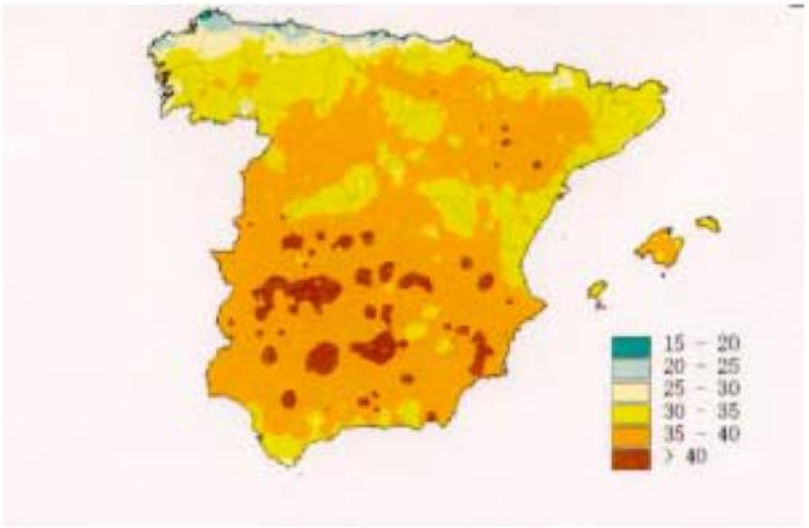


Fig. 6.1: *Maximum Temperatures (°C) in Spain from June 22-24, 2001*
From: Instituto Nacional de Meteorologia Spain

July 2001

- **Very warm in Central Europe and the Middle East, hot in eastern Europe**
- **Rainy in several eastern and some western European countries**
- **Extreme number of thunderstorms in Poland and the Baltic States**
- **Drought in the Mediterranean and in south-eastern Europe**

The month was very warm in southern Norway. The absolute maximum temperature of the year was 31.5°C, measured at Nesbyen station on July 5. The highest monthly mean temperature was observed at the Ferder Lighthouse by 17.8°C, which is +1.3°C above the long term average.

In Denmark, July was the sunniest month of the year; the spatial averaged sunshine duration was 309 hours. In Iceland, unlike in other parts of the Region, the month was rather cool with many afternoon showers.

Thunderstorms and Tornadoes in Estonia damaged houses and 7,000 ha of forests, 2 people were killed. Station Tartu recorded a mean monthly temperature of +4.1°C above normal, which is the third highest value since 1866.

In Latvia, it was the second warmest July since 1914. Subtropical air masses caused the rise of daily maximum temperatures above 30°C for 7 consecutive days. The sun duration was about 100 hours above normal. During the hot weather, the water temperature in rivers rose up to 27°C, exceeding the long term averages by up to +5°C. Thunderstorm events occurred more than twice as normal. On July 1, a thunderstorm accompanied by a spout caused the damage of hundreds of trees, a lot of cars, power lines and obstruction on roads in Riga; one woman was killed. On July 16, another thunderstorm combined with a whirlwind devastated forests in a 20 km long and 5 km wide zone.

In Lithuania, the mean monthly temperature was +4°C above the average. On July 16, the mean daily temperature was 28°C. This value was exceeded only twice in July during the last 50 years. The month was also very wet. There were 24 days with thunderstorms at various places and locally intensive downpour of rain, e.g. station Buivydžiai received 56 mm in 2 hours on July 9, and at Jovana hydrological station 55 mm were measured in 1 hour on July 26.

In Poland, the month was very warm and rainy. The country-wide monthly mean temperature was +2.5°C above normal. On July 9, a downpour of exceptional intensity combined with thunderstorms caused a local splash flood in Gdansk with disastrous consequences to the city. High rainfall rates were observed also in other places, e.g. a daily total of 127.7 mm at Rebiechowo airport. From July 15-17, severe thunderstorms with hail and intense downpours affected many areas all over the country. In Upper Silesia, a thunderstorm with rotor wall was observed on July 16; gusts exceeded 130 km/h and caused large damage to forests near Katowice. During this thunderstorm rapid and frequent pressure variations were measured. In the last decade, more extremely intense rainfall events were observed throughout the country; the most remarkable was on July 25, when station Makow Podhalanski received 190.8 mm within 4 hours.

At many stations in Ireland, the heaviest daily precipitation rates of the year were measured. Johnstown Castle in county Wexford recorded 84,5 mm rain on July 13-14, including a 2-hour fall of 65 mm. July 28 was the hottest day for most stations, e.g. Dublin airport recorded 26.9°C. In the U.K. localised flooding occurred in Nottingham as a consequence of 95 mm rainfall within 15 hours.

Exceptional rainstorms affected France in different areas. Frequent floods occurred in many watersheds, and again in the Somme area. Strong winds associated to a squall line caused 14 casualties to people attending a side-show in Strasbourg, due to tree fall.

In the Netherlands, severe thunderstorms with hail caused extensive damage in South Holland on July 5. On the Frisian island of Terschelling, a downpour of 70 mm rain in 2 hours caused local looding on July 19. Tilburg in the South of the country recorded 69 mm preciptation from heavy showers on July 23.

In southern Germany, heavy rains and storms with gusts up to 130 km/h hit the Black Forest on July 6; a lot of people were injured and 6 died from falling trees. Cars, railways and power lines were broken. Locally, 90 mm

rain fell within 4 hours leading to floods on roads and the interruption of transportation. On July 31, a tornado over Saxony cut thousands of trees, removed roofs from houses and hurt dozens of people.

On July 7, a cold front passage with gusts up to 120 km/h caused heavy damage to forest areas in Austria on a line from Salzburg to Vienna, 12 persons were injured from broken trees. On the lakes of the region, some sailing ships overturned, 1 man was killed.

Slovakia experienced the third rainiest July since 1871. Extreme precipitation totals were recorded from the Tatras region: 582 mm at station Zuberec, 521 mm in Javorina. The highest daily precipitation amount was 142 mm, measured at station Hronec on July 16, including a downpour of 40 mm in 45 minutes within the hour starting at 10 pm. Hundreds of villages were hit by floods, the total amount of material losses is estimated up to 50 Million Euro.

In Belarus, the monthly mean temperature was 22.1°C and thus +5°C above normal (see fig. 7.1). This is the highest value since the beginning of observations 120 years ago.

The Ukraine suffered from an intense drought. In Moldova also, the month was hot and dry. The monthly mean temperatures were up to +4°C above long term averages and the precipitation rate was only 20% of normal.

In the Russian Federation, torrential rain with hail and strong squally winds affected the city of St. Petersburg on July 16-17. On July 24, a thunderstorm with intense rainfall up to 50 mm in 2 hours, hail and strong winds damaged power lines and thousands of trees in Moscow. During a hot weather situation on July 21, photochemical smog formed in Moscow with extremely high values of surface ozone concentration in the afternoon. In the more southern areas like the Volga region and the northern Caucasus, it was not only hot but also very dry with the consequence of a high risk of fire.

In Turkey, the monthly mean temperature surpassed the averages by +3°C. The highest temperature was measured in Cizre by 46.7°C on July 25.

Cyprus experienced a heat wave.

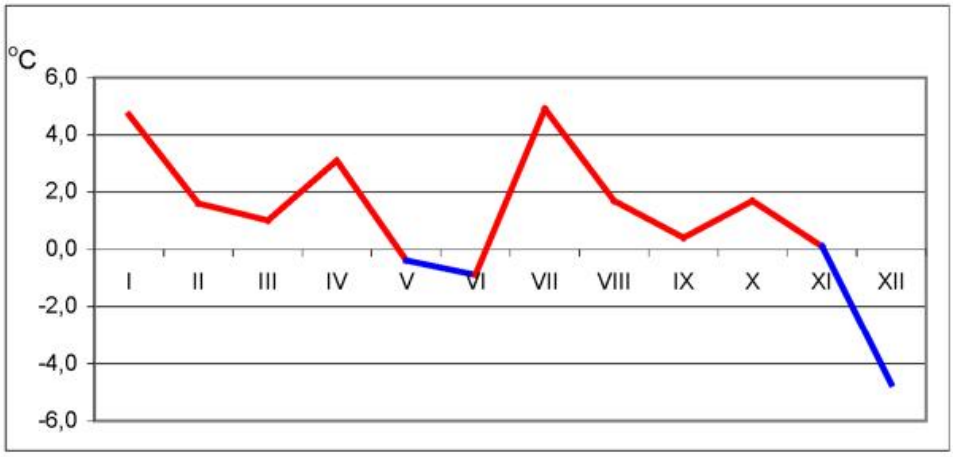


Fig. 7.1: *Deviation of monthly mean temperatures in Belarus from the norm 1961 – 1990*
From: Hydrometeorological Centre of the Republic of Belarus

August 2001

- **Warmer than normal nearly all over the Region, very warm in Central Europe and South East Europe**
- **Wet in the Netherlands, the British Isles, Scandinavia except the Northeast, and Turkey**
- **Dry in the Alpine region, extremely dry around the Mediterranean and north of the Black Sea**

In the Netherlands, the highest temperature of the year was recorded on August 26 in Maastricht with 34.2 °C. The period August 22-26 was marked by a heat wave with temperatures of 25°C or more and three days with maxima ≥30° C. The month was very wet:: Averaged over the country, 108 mm of precipitation was observed compared to 62 mm normally. Hoek van Holland recorded 216 mm. On 5 days at least 50 mm of rain was recorded at one of the Dutch stations. On August 5, 86 mm fell at Honselerdijk in the western part of the country. On August 2, severe gusts caused damage to trees in the province of Limburg. A tornado caused extensive damage to buildings, trees and crops on August 7 near the city of Nijmegen.

In contrast to the nothern neighbouring country, Belgium experienced a very dry August (see table on page 23).

A emarkable rain event in the U.K. was the fall of 56 mm within 12 hours in Northolt.

In Ireland, August was wetter than normal throughout the country. In Iceland, the weather during August was generally mild and fair.

In Austria, a lot of farm houses caught fire by lightning strokes throughout the month. An extreme hail event around Innsbruck caused heavy damage to buildings and agricultural areas on August 2. On August 20, a holiday camp and a reed area of 1 square km at Lake Neusiedl burnt down after lightning strokes. Station Graz airport registered a monthly precipitation of only 28 mm, which is only 24% of the normal and thus the lowest amount since 1951.

From August 3-4, heavy property damage caused by thunderstorms, hailstones and gales was reported from České Budějovice and Holešov, Czech Republic. The maximum wind velocities were up to 126 km/h.

In Bavaria, southern Germany, hurricane like winds with gusts up to 161 km/h devastated forests, homes and power lines on August 3; hailstones injured more than 50 people and accumulated to a layer of several cm on the ground, transportation was blocked on roads and railways. On August 6, a whirlwind near Osnabrück in northern Germany cut a 1 km long break into an inhabited area, causing severe damage to houses, cars and trees. On August 15, maximum temperatures of about 37°C were recorded from western Germany. On August 26, the country-wide mean of daily maximum temperatures was up to 35°C.

In Italy, the month was very dry with temperatures above normal by about two standard deviations.

Heat waves affected several areas of Greece, mostly mainland areas, during the period August 8-9. Maximum daily temperatures exceeded 40 °C.

In Slovenia, the monthly mean temperature all over the country was significantly above normal. Sunshine duration exceeded the long term averages everywhere in the country by at least 10 %, in some parts the normal was exceeded by more than 30 %. Precipitation was rare; in the South and Northeast of the country less than one fifth of the 1961–1990 normal fell with the consequence of a severe drought. On the coast and at station Kočevje, only 5 mm fell, which is 4 % of the norm.

In Poland, August was significantly warmer than the long term average with a precipitation rate near to normal. The highest temperature anomaly was recorded from Cracow by +2.9°C. On August 3, severe thunderstorms with strong winds were observed near Pila. Within the period of August 17-27, several thunderstorms and tornadoes caused a lot of damage to houses, forests and power lines in different parts of the country. On August 22, several fires were caused by lightning strokes in the vicinity of Cracow.

In Hungary, it was the warmest month of the year and the country-wide monthly

mean temperature was +2.3° above normal; in combination with a precipitation rate of only 60% from normal, there were nearly drought conditions.

On August 16, the Swedish capital of Stockholm was seriously hit by an extremely heavy thunderstorm: Three persons were killed and several more injured. On August 27, a powerful rainstorm first hit Uppsala and then even more seriously Sundsvall, two cities in the eastern part of Sweden. Around Sundsvall several roads and also the railway were disrupted due to erosion. Close to Sundsvall 134 mm of rainfall was registered within 24 hours, and a bit further to the north at station Rössjö, a new official Swedish record for daily rainfall in August was set by 160 mm.

An exceptional local rain event occurred in south-western Finland at Merimasku and Rymattyla on August 28: In a convergence zone, precipitation accumulated to 97 mm and 90 mm, respectively. The rain lasted for some six hours and the recurrence period of this event exceeds 100 years.

In Lithuania, the month was moderately warm and moist in the first half, but warmer and drier in the second half. It was raining frequently in the first and the second ten-day period. The heaviest rain occurred around the town of Ukmergė on August 18, amounting to 57 mm in 2 hours. Lowlands were flooded and mechanised harvesting was brought to a standstill, due to over-saturated soil. The third ten-day period was less wet; the monthly amount of precipitation was 69 mm and thus below those of June and July.

The hot weather in Moldova continued in August with an overall precipitation rate of less than 15% of normal. The number of days with a maximum temperature $\geq 30^{0}$C was twice of the normal value. Such an extreme drought event occurred for the first time during the last 50 years in this country.

Drought conditions in the Ukraine lasted throughout the month, especially in the steppe and forest- steppe zones. Dry wind events occurred up to twice the normal number. The heat wave was occasionally interrupted by showers from squall-lines, sometimes including hail.

In southern parts of the Russian Federation, especially the Lower Volga region, the month was very warm and dry. These drought conditions caused the loss of more than half of the crops. Additionally, an extremely high risk of forest fires continued throughout the month in the Volga region and the Northern Caucasus.

The drought in Georgia, which started in June, ended in the third decade of the month. Then, within 4 days the normal monthly precipitation amount was nearly reached or even exceeded at most stations.

In northern and western areas of Turkey, hailstorms damaged houses and agricultural areas, and caused the death of two children in the period from August 21-23.

In Armenia, 80 mm of rain poured down during 6 hours at the station Ashotsk on August 23. This amount of rain equals twice the normal monthly precipitation. The consecutive floods caused considerable material losses.

In Israel, August was very warm with temperatures up to +2.0°C above normal. Nights in the Coastal Plain were especially warm. On August 10-11 the daily minimum temperature in Tel Aviv was 27.5°C.

September 2001:

- **Extremely wet and rather cool in Central Europe and the northern Balkans**
- **Very warm in Greece and Turkey, drought in the Caucasus region**

In the northern Balkan states, the month was extremely wet (e.g. see fig. 9.1). Cloudy and rainy weather was prevailing in Slovenia and the month turned out to be very wet (see fig. 9.2). The Julian Alps were the rainiest region; more than 500 mm fell on some measuring sites. The 1961–1990 normal values were exceeded everywhere, in the south of Slovenia precipitation rates were between 250% and 300% of normal. In the Julian Alps, where abundant rain in autumn is frequent, there fell more than 150 % but less than 200 % of the normal precipitation. The mean air temperature was well below the 1961–1990 average, the largest anomaly was in the high mountains by around -3°C. Sunshine duration was well below normal everywhere in the country, only 55% to 80% of the average sunshine duration of the period 1961–1990 was observed.

Extraordinarily high precipitation rates were recorded from Yugoslavia with maxima in Zrenjanin and Novi Sad (see fig. 0.8).

In the Federation of Bosnia and Herzegovina the overall rainfall rate was more than 300% of normal and especially at station Tuzla the monthly precipitation amounted to 304 mm, which is 475% of the normal value.

Hungary experienced also a very wet September. The country-wide precipitation rate was about 250% of normal (see fig. 9.3). In several places rates up to 400% were observed. The maximum of the 24-hours precipitation total was measured at station Bakonyszücs in 704 m by 132 mm on September 5. The return period of such an extreme event is more than a hundred years.

In Poland, similar to some neighbouring countries, the weather was dominated by a cyclonic circulation pattern. As a consequence, the precipitation rate was country-wide near to double of the long term average. At stations Zielona Gora and Czestochowa the monthly totals of precipitation exceeded even 300% of normal. The monthly mean temperature was moderately below normal by –0.5°C. A severe storm was observed over the Baltic Sea on September 8; lots of trees were uprooted at the seashore near Slupsk and Koszalin.

Lithuania had a rainy, but not too cold month. There were 22–26 days with rain in the western parts of the country while only 14–18 in the eastern regions. Thus, the amount of precipitation was very uneven varying from 47 to 191 mm (70–170 percent of normal). By the end of the month the weather cooled down to morning frosts from 0 to –4°C, at some places to –8°C.

In Sweden, two major precipitation episodes occurred in the first decade of the month. First, the area around Sundsvall was flooded after heavy rains on September 6. Two days later, 108 mm rain was measured within 24 hours in the southern part of the generally dry island of Öland.

Within the last week of the month, tornadoes affected different parts of Ireland. On September 25, a funnel cloud was observed in County Galway accompanied by some localised heavy thundery showers. On September 30, a frontal trough moved eastwards across the country and brought a spell of heavy rain to most areas. Embedded within the front were a number of thunderstorms, at least two of which developed into tornadoes over the midlands. One of these followed a track through County Westmeath for approximately 5 miles. Winds associated with the tornado broke large branches from mature trees along its length (see fig. 0.12), while a 40 m² section of roof from a farm building was lifted over a road and fell almost intact in a field over 100 m away.

September was extremely wet in the Netherlands with a country-wide average of 177 mm rainfall (normal: 75 mm). The month ended in De Bilt as the second wettest on record since 1901 with 211 mm (213 mm was measured in 1953). Hoek van Holland again recorded the highest amount of precipitation: 289 mm, approximately 35% of the normal annual amount. 107 mm fell in 21 hours on September 19. On that day, more than 50 mm fell in a large part of the province Zuid-Holland resulting in flooding in the Westland area.

Precipitation all over Germany was more than twice the normal value, while temperatures were significantly below the long term averages. In northern Germany near Hamburg, heavy rains of more than 30 mm

together with hail caused flooding of streets, subways and houses on September 26. In Austria, a monthly rainfall amount of 159 mm was recorded from station Eisenstadt, which is 350% of the normal precipitation.

In Switzerland, September was wet and cool with very little sunshine in the Alps and north of the Alps. In higher mountain areas the month was 3.5 to 4.5°C colder than normal – the coldest since 1972. From September 9 to 17 occasional snowfalls occurred down to terrain of 1500 m–1200 m asl. On the northern slopes of the Alps and in the neighbouring regions of the Mittelland and the Jura this was the September with the least sunshine since records started in 1901. The rate of sunshine reached 30-60% of the normal monthly total.

Italy experienced an intense cold period throughout the month, characterized by temperatures lower than normal by more than a standard deviation at about 50% of the stations and with precipitation much above normal in the Po valley and over the Alps.

In central and southern parts of Ukraine, intense rains of 90-110 mm during 4-12 hours caused the flooding of a great number of homes on September 26.

In the Russian Federation, 1 man was killed and 37 people injured, when a tornado hit the north-eastern coast of the Black Sea near Sochi at the beginning of the month. Additionally, many houses and power lines were damaged and energy and water supplies were cut off.

In Greece, unusual high temperatures by +5...+10°C above normal were recorded from almost all over the country. The daily maximum temperature varied between 34°C and 37°C. In Turkey also, the overall average temperature was significantly above normal by +1.5°C.

The monthly precipitation amount in Armenia was much below normal (fig. 0.9) and caused, together with positive temperature anomalies, severe drought conditions throughout the country. In Georgia, the weather was also generally hot and dry. Nevertheless, a hailstone event on September 18 caused heavy damage to vineyards in the Gurjaani and Telavi regions on September 18.

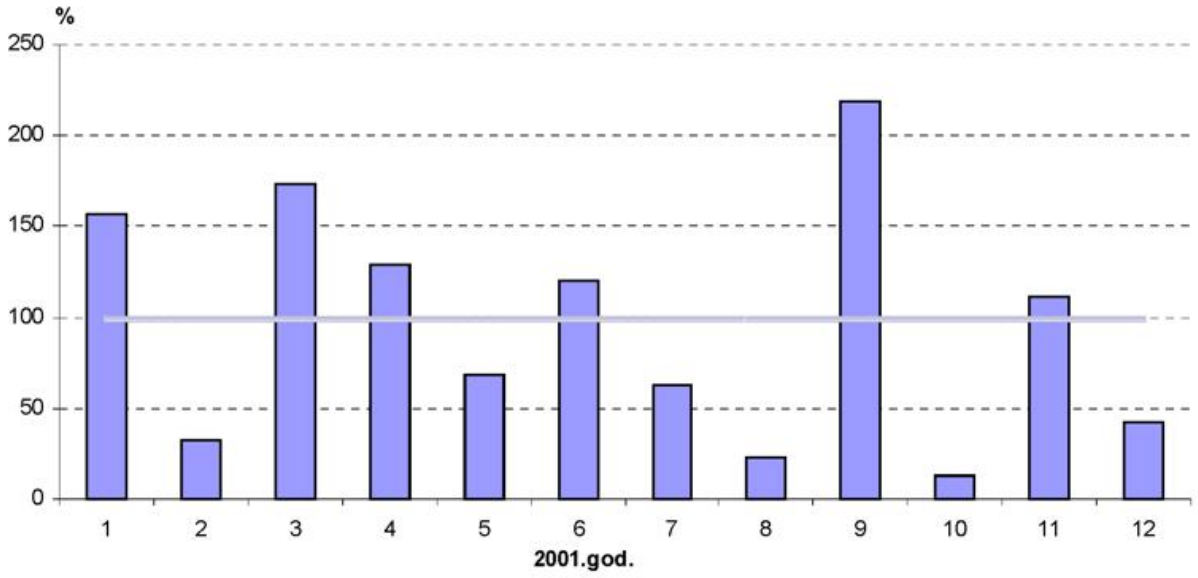


Fig 9.1: *Monthly precipitation totals in % of normal (1961 – 1990) in Zagreb Gric, in 2001*
From: Meteorological and Hydrological Service of Croatia

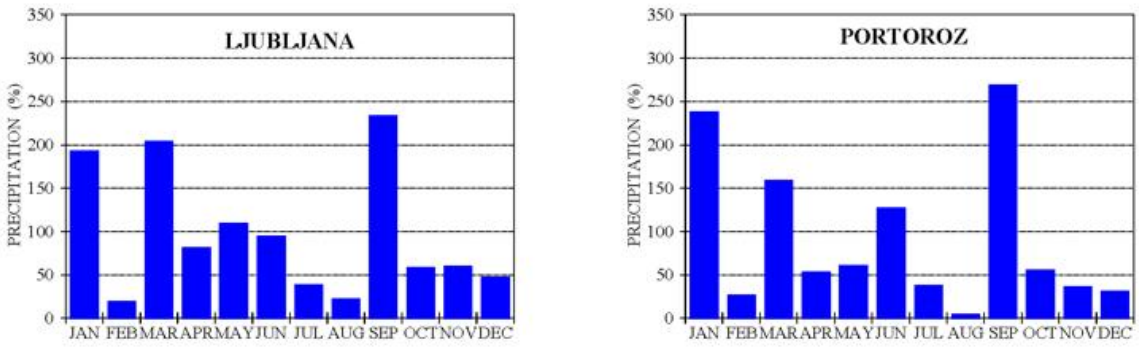


Fig 9.2: *Precipitation rates from normal at 2 stations in Slovenia*
From: Environmental Agency of Slovenia

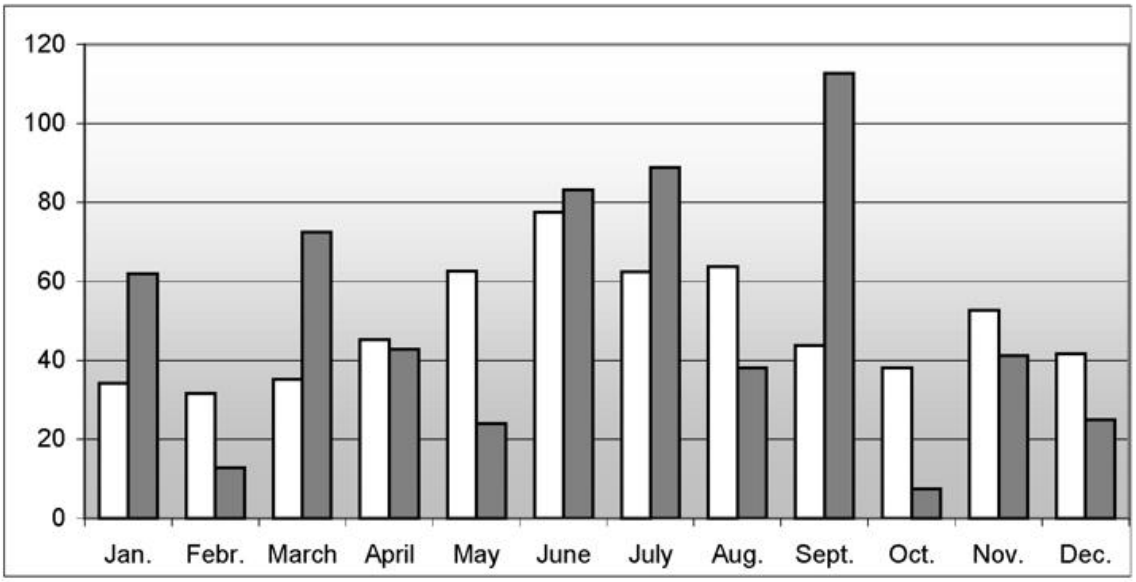


Fig. 9.3: *Monthly precipitation (mm) in 2001 (filled boxes) and between 1961 – 1990 (empty boxes) in Hungary*
From: Hungarian Meteorological Service

October 2001

- **Record breaking warm in Central Europe**
- **Extremely dry in south-eastern Europe**

Nearly all over the Region, the monthly mean air temperatures were above normal (see figs. 0.1, 0.2, 0.3, 0.6, 0.15). In Central Europe, they were extremely high and exceeded September means at many places (see tables on page 23). For example, at the Dutch station De Bilt, this had happened never before since the beginning of observations in 1706. Additionally, the month was very dry in the middle of Europe and extremely dry in the Mediterranean and in a broad strip from Poland southwards over the Balkans to Turkey.

In Norway, the overall monthly mean temperature was +1.7°C above normal. The most southern coastal areas experienced the warmest October since the measurements started in 1874, and they are the northern border of the area with warmest October on

record in Denmark and further south in Europe.

In Denmark, October was record breaking warm and without any frost. With a mean temperature of 12.0°C, the month was 2,9°C above the normal of 1961-1990 and 0,6°C warmer than the earlier record from October 1995 and thus the warmest since the start of observations in 1873.

In the U.K., the rain of the preceding month continued. Cambridge had 90 mm of rain on October 21 causing severe flooding in the adjacent county. But October was also a record-breaking month, being the warmest on record since 1659, with a mean Central England temperature of 13.3°C, which is +2.7°C above the 1961-1990 average. The continuity of high temperatures during the month is shown by fig. 10.1.

October mean temperature was 13.4°C and had never been so warm since the start of regular temperature measurements in the Netherlands in 1706, and for the first time since then, October was warmer than September.

In Belgium at station Uccle, the monthly mean temperature was 14.4°C and thus +0.4°C higher than the preceding record from 1921 and the highest since the beginning of observations in 1833. On October 6, a tornado caused severe damage in areas around Brussels.

In Luxembourg, the monthly mean air temperature was the highest since 1947 with 12.7°C and thus +1.4°C higher than for the preceding September.

In France also, October was an exceptionally warm month with record breaking temperatures. For a large portion of the country, it was the warmest October since 1949, after October 1995, with temperatures as much as 3°C or 4°C above average (see fig. 10.2). On October 29-30, daily temperature maxima up to 30°C were measured at several stations, exceeding records of earlier years since the beginning of observations between 1947 and 1959. Some exceptional rainy and stormy events took place in the Southeast leading to floods in the periods of October 6-9 and 17-20. On these last days, two tornadoes caused much damage close to Montpellier and Perpignan.

The country-wide monthly mean temperature in Germany was 12.5°C and thereby the highest since more than 100 years. On October 2, a daily minimum temperature of 14.9°C was measured at station Potsdam, which is the mildest night since the start of records in 1893. On the same day, a maximum temperature of 29.5°C was observed in Altenstadt and of 27.8°C in Munich, which was the second warmest day of October since 1923 (28.2°C). On October 1, a whirlwind with gusts up to 100 km/h damaged the roofs of 50 houses in a row of 1.5 km in Lower Saxony. On October 31, a stormy depression affected the area north of Berlin with wind speeds up to 115 km/h, uprooting a lot of trees near the coast of the Baltic Sea; 1 man was missed from a capsized sailing boat.

In most places in Switzerland, it was the warmest October since records started in 1864. The month was +2.5°C...+5°C warmer than normal. In the highest regions of the mountains, October was 4°C to 5°C warmer than the preceding September. On October 2, station Chur registered 29.4°C and the mountain station Jungfraujoch +3.9°C in 3580 m above sea level.

In Italy, October was quite dry and warm, particularly on the coastal region in the central and southern part.

The general temperature anomaly in Poland was +3.1°C with a maximum of +3.8°C at station Cracow. The country-wide precipitation rate was 73 % of normal and in S-Poland below 50%.

The relatively warm October weather in Lithuania was predominantly determined by southern edges of Atlantic cyclones, except a steady cold spell of the fifth five-day period caused by a sudden southward move of a northern anticyclone. The monthly mean air temperature was 9.1ºC (+1.9ºC above normal). The monthly amount of precipitation (64 mm) was close to normal at most places, whereas the heaviest rainfalls occurred in the beginning and in the end of the month.

An intense cyclone caused large problems for transportation lines in southern Sweden on October 31, e.g. the bridge over Öresund had to be closed. Additionally, electricity supply was interrupted for about 15,000 families. The highest wind gusts reported were 133 km/h in the Stockholm archipelago.

At Hurbanovo observatory in Slovakia, the mean monthly temperature was + 3.3°C above the average of the normal period 1961-1990, which is the fourth highest record since 1871.

In Slovenia, the mean air temperature in October was well above the 1961–1990 norm, the anomaly was mostly between +2°C and +4°C and statistically significant. In some regions the monthly mean air temperature was even slightly higher than that of September. Sunshine duration exceeded the 1961–1990 average everywhere in the country. There was even more sunshine than in September this year. As mostly sunny weather was prevailing, October turned out to be quite dry. Precipitation was well below normal everywhere in the country.

In Hungary, the country-wide precipitation rate was only 15% (see fig. 9.3) and the overall monthly mean of the temperature +3°C above normal (see fig. 0.6).

In Greece, unusual high seasonal temperatures, significantly +5°C...+8^{0}C above normal, were reported from most parts of the country during the period October 4–24. The daily maximum temperatures varied between 29°C and 33°C.

In Iceland, the weather was generally mild and good. The eastern districts experienced a few days of heavy rain with landslides blocking roads for short periods. On October 18, the temperature in Reykjavik reached 15.6°C, which is the highest ever so late in the year.

In Ireland, mean temperatures for October were well above normal. A localised downpour in county Waterford produced 124 mm of rain in the 2-day period of October 19-20.

The mean monthly air temperature was near to normal in Georgia. The first half of October was warm and dry for the territory of East Georgia. On October 17-19, precipitation amounts of 25 mm-45 mm were very welcome to replenish the soil surface water content. From October 20 to the end of the month, there was not more than 5-10 mm of additional precipitation over most of the territory.

Rainfall amounts in Israel were not homogeneous. They were above normal in the Coastal Plain and below normal in the inner parts of the country.

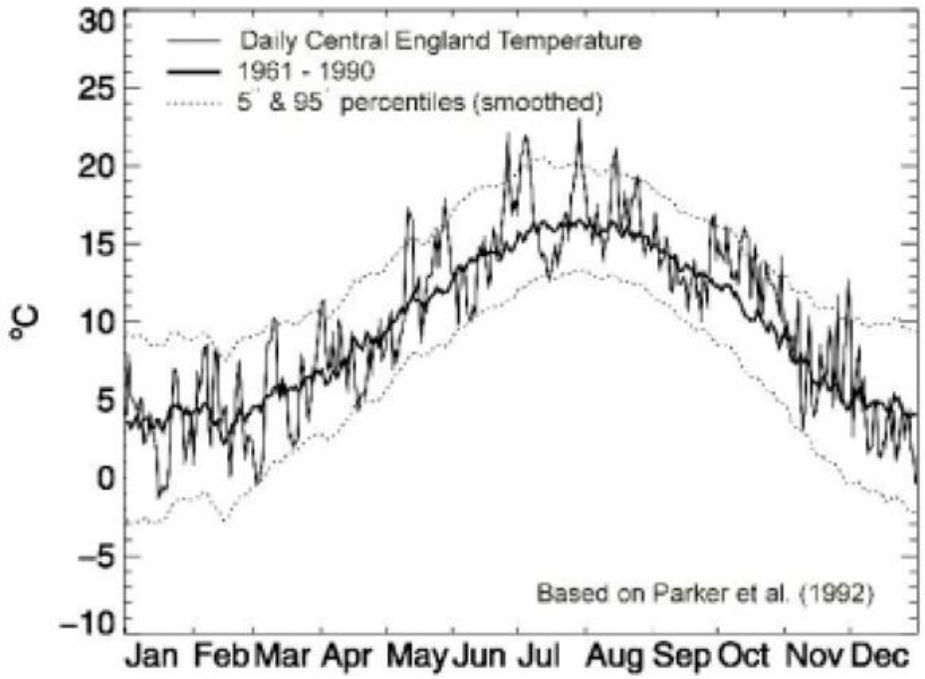


Fig. 10.1: *Central England temperature, daily values 2001*
From: U.K. Met Office, Hadley Centre for Climate Prediction and Research

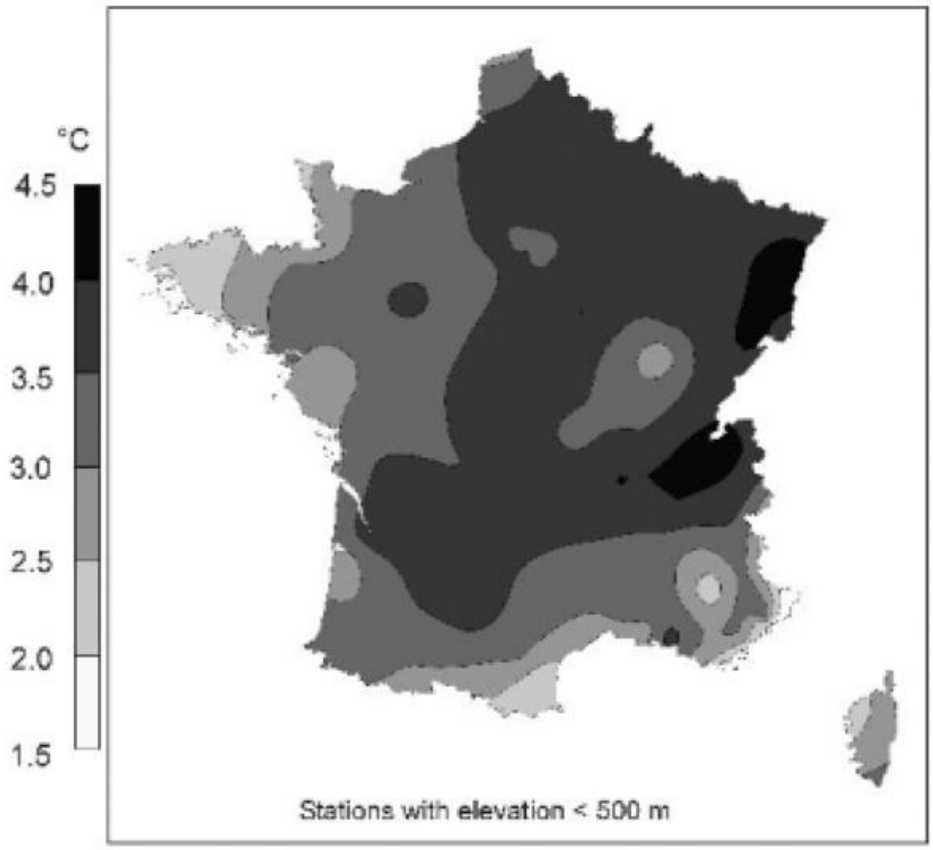


Fig. 10.2: *Mean monthly temperature anomalies, October 2001, Reference periode 1961 – 1990*
From: Météo France

November 2001

- **Violent Storms in many places of the Region**
- **Very wet in Greece and Turkey**

In Iceland, a very dry westerly storm caused some material damage and local disruption of electrical power because of unusually heavy sea-salt deposition on electrical transformers on November 10. The last week of the month brought unusually heavy snowfall to the south-western part of the country.

In Ireland, the highest gust of the year was measured at Malin Head by 122 km/h on November 8 (same record as on March 6).

On November 15, a severe storm affected the middle part of Sweden. Lots of trees were uprooted, constituting a volume of 2 million cubic metres of wood.

Finland was hit by two violent storms at the beginning and in the middle of the month. The first event, in western Finland, started with sleet and freezing rain. Considerable amounts of ice were accumulated on trees and caused, together with upcoming gale force winds, the fall of lots of trees. The second violent storm occurred in south-western Finland on November 15-16 and caused also severe damage to forests. The clearing of this devastation took more than half a year and the economic losses of the forest owners were large in both cases.

Latvia experienced two major storm events. The first one occurred on November 1:

Westerly winds drove enormous water masses from the Baltic Sea into the Gulf of Riga; then, even stronger winds up to 112 km/h from the Northwest caused the rise of the water level in the estuary of the Dauga River up to 1,60 m above normal. The second extreme wind event was a thunderstorm on November 15-16. This time, the water level of the Dauga River exceeded the critical mark of 1,70 m, which is observed only once in ten years. The wind caused damage to the electric power supply of many districts. Latvian ports were non-operational. Traffic on land was made difficult or paralysed because of fallen trees on roads and railways. The roofs of buildings in Riga, some of them of public interest, were damaged or blown away. About 20 people were injured, and one woman was killed. A stable snow cover was formed in the eastern part of the country since November 13 and in central Latvia one week later.

November was the windiest month of the decade in Lithuania. The strongest winds with gusts up to 115 km/h were observed at the Lithuanian seaside on November 1, 11 and 15. These strong winds caused significant damage to the infrastructure in western Lithuania and impeded marine operations. There were 20 days with bad fishing conditions in the Baltic Sea. In the north-eastern region a steady snow cover of 3–9 cm formed since November 13.

On November 1, very strong winds caused lot of damage in N- and NE-Poland. On November 29 the international airport of Warsaw was closed for half a day, due to exceptionally dense fog. A lasting snow cover appeared in Poland at the end of the month.

Although the monthly mean wind speed in Belgium was significantly below normal, the strongest storms of the year were recorded from the Belgian coastline with more than 100 km/h on November 8.

Strong winds crossed Germany under a westerly upper air stream on November 8. Gusts up to 137 km/h were recorded at station Feldberg in the Black Forest. In Frankfurt/Main scaffolding broke down and smashed parking cars. In a place near Osnabrück in Lower Saxony, a whirlwind uprooted trees and damaged cars and the roofs of 40 houses. Starting at the same day, snow fell in many parts of the country in several episodes until November 22. Five people were killed and many more injured by more than a hundred accidents on slippery roads, and numerous trees fell down under the weight of fresh fallen snow.

In the Czech Republic, local damage caused by strong winds was recorded on November 11.

In the middle of the month, snow and ice disrupted traffic on roads in south-eastern France. In Switzerland, a long lasting drought period started in this month.

In Hungary, Croatia, and Bosnia and Herzegovina, the national monthly mean temperature was significantly below normal.

In Slovenia, anomalies exceeded –2°C at several places. On November 9, snow fell over most of the country. The monthly mean sunshine duration exceeded normal everywhere in Slovenia, in most places by 40% up to 60%.

Although dry on a monthly time scale, Spain recorded torrential downpours on the occasion of some extreme local events. E.g., 125.7 mm of rain fell within 24 hours in an episode on the island of La Palma (Canary Islands), leading to several mortal casualties. On November 9, a tornado was observed in the town of Motril near Granada (see fig. 11.1); a nearby camping area suffered from material losses.

Heavy rains and thunderstorms affected central and southern parts of Greece on November 2-5. These extreme conditions led to floods in East Sterea and Attiki with destructive consequences to the infrastructure of the region and the loss of three people. Again, during the period November 28-30, heavy rains and thunderstorms occurred almost all over the country, mainly in the western part and in the East Aegean islands, where the island of Samos was extremely hit by devastating floods.The monthly precipitation amount in several areas of the country (Peloponnisos, East Sterea, Attiki, Cyclades, Crete, Dodecanisa, Islands of East Aegean) was twice to three times greater than normal and thus higher than ever recorded before.

Fig 11.1 : *Funnel cloud of a tornado near Granada on November 9 From: Instituto Nacional de Meteorologia Spain*

In Turkey, the national monthly mean precipitation rate was about 200% (see fig. 11.2). Several extreme rainfall events, some of them combined with storm, caused severe damage to buildings, bridges and agricultural areas, at least 6 people died. Such events were recorded from Rize on November 10, Izmir on November 14, Anamur on November 21 and 24, and Alanya on November 24.

In Cyprus, heavy rains, severe hailstorms with gale force winds and flooding occurred on November 29. Stormy weather was also recorded on November 17.

In Belarus, a positive temperature anomaly continued from the preceding month until November 20. Then, cold weather in the last decade lead to a balanced monthly mean of the country-wide temperature compared to the long term average.

In Israel, rainfall was distributed non homogeneously over the country. Rainfall amounts were above normal in the Coastal Plain and in the Judean Mountains (120%-140% of normal), but in the Galilee and in the Northern Negev they were below normal (60%-80% of normal).

In Jordan, the national monthly rainfall amount was above normal.

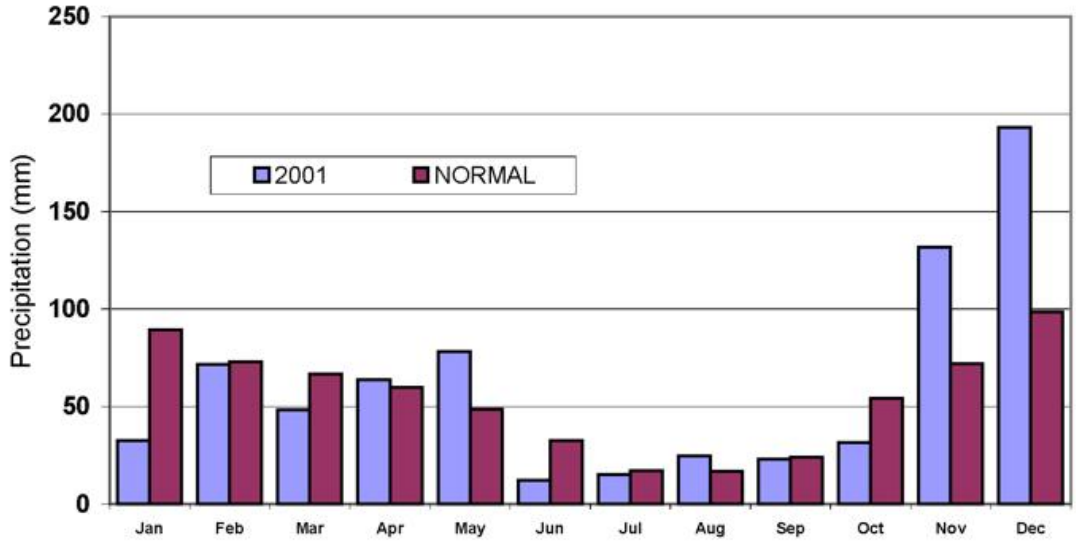


Fig. 11.2 : *Monthly precipitation in Turkey*
From: Turkish State Meteorological Service

December 2001

- **Extremely cold in southern and eastern Europe**
- **Record breaking daily maximum temperatures on islands in the Norwegian Sea**
- **Very dry in the Alps, Italy, the northern Balkans and eastern Europe**
- **Wet and cold in the Middle East**

In France, December was very cold, especially in southern parts (see fig. 0.5.), where the temperature average during 14 days (December 14-27) was the coldest since 1949. Snowfall affected large areas of the country. Nevertheless, dry conditions prevailed in the Southeast.

December was very cold in most parts of the Iberian peninsular except for the southernmost areas. Monthly mean temperatures in the centre and the northern half of Spain were down to 4°C below normal. All-time records of low monthly mean temperatures were set in the observatories of Cataluña and Aragon for series, that started more than 60 years ago. Station Zamora in the Duero Basin recorded -10.6ºC, which is the lowest value of its 90-year long series. On December 13, an easterly circulation pattern initiated a very cold phase, that culminated on December 16 and 25.

December was extremely cold in Portugal. Rivers froze and water pipes broke down due to negative temperatures that are unusual in the north-eastern part of Portugal. The record of daily minimum temperature was exceeded in Viana do Castelo, where -5.0 °C was observed. Heavy rains and strong south-easterly winds in the southern mainland areas caused floods and road obstruction. The weather conditions in Terceira Island, Azores, caused damage to the breakwaters, located at the northern and eastern coast of the island. Heavy rains in S. Miguel Island caused floods and road obstructions.

In Greece, heavy rains and thunderstorms occurred during the period December 15–17, affecting the areas of western Greece, Peloponnisos, Aegean, Crete and Dodekanisa. Severe snowfalls occurred almost all over the country, mainly in the northern and central part. The snow depth reached 1.5 to 2 m in many areas. Due to these snowfalls, several aerodromes in the North of the country remained closed for 3 to 4 days. Also many roads in several areas were closed. Floods were recorded on December 16 in the north-western Peloponnisos, which resulted in catastrophic damage to the infrastructure and the loss of two lives. Unusual low daily temperatures and frost were recorded in most areas of the country on December 19-20. Particularly the minimum daily temperatures recorded were the absolute lowest temperatures ever measured since the beginning of observations.

The monthly mean temperature in Poland was significantly below normal by -2.5°C. The anomalies were smaller in the Northwest and larger in the Southeast, where the station Lesko recorded the largest deviation from normal by –4.8°C. A snow cover existed during the whole month. Sometimes, snowdrift caused trouble on roads. Only in W-Poland the snow depth was less than 10 cm (see fig. 0.10). The highest snow cover in the lowlands of Poland increased up to 50 cm at station Suwalki. In the mountains, the snow cover exceeded 50 cm at the end of the month, engendering most dangerous avalanche situations. Four persons died in the Tatra Mountains and one tourist in the Sudety Mountains in avalanches on December 31.

December was the coldest month of the year in Lithuania with a country-wide mean air temperature of –5.6°C, which is 3.2°C below normal. It was one of the ten coldest months of December on record in the past century. In the first half of December snowfall was mostly insignificant, but then became steady and formed a snow cover of 18–41 cm at the end of the month in many places. At station Nida, the snow cover accumulated up to 60 cm. The monthly amount of precipitation was close to normal in most parts of the country, except at the seaside, where it was up to 140% of normal.

In Latvia, the already existing snow cover was replenished during December and increased up to 40-50 cm at the end of the month. Maximum snow depths were recorded from stations near the Baltic Sea. Heavy snowfall and snowdrift made roads impassable at times in many parts of the country. In Estonia, a minimum temperature of –34.6°C was measured on December 25. The month

brought a new record of sunshine duration by 53 hours.

December was the coldest month of the year in Belarus (see fig. 7.1). Generally, the coldest month in Belarus shifted from January to December during the last decades. This is evident from table 12.1.

In Ukraine, the monthly mean temperature was 4°C-5°C below normal, which is extremely low for the whole period of observations.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1881 - 1990	-6,7	-5,9	-1,6	5,8	13	16,2	17,8	16,5	11,9	6,2	0,7	-4,0
1989 - 2001	-3	-2,6	0,8	7,8	12,8	16,5	18,2	17,1	11,7	6,6	0,2	-3,8

Table12.1 : *Monthly mean temperatures in Belarus in °C for two differents reference periods*
From: Hydrometeorological Centre of the Republic of Belarus

At station Brezová pod Bradlom in Slovakia, a maximum snow cover of 39 cm was measured in December. This was the highest value observed in the Slovakian lowlands since 1921.

After the first week of the month, December turned out to become extraordinarily cold in Hungary (see fig. 0.6). The absolute monthly minimum temperature was below -15°C at all stations of the country except for Sopron, while in most parts of western Hungary this value was even below -20°C. The lowest daily minimum temperature was measured in Orosháza by –26.1°C on December 25.

Cold arctic air masses also affected Yugoslavia in December. Consequently, mean monthly temperatures dropped below normal by deviations of –2.3°C...-5.7°C. As an example, fig. 12.1 shows the daily mean temperatures of the month at station Sombor compared to normal. The coldest part of the country was the North with minimum temperatures below –22.0°C. This December was one of the seven coldest in Belgrade since the beginning of observations 113 years ago.

In The Former Yugoslav Republic of Macedonia, the national monthly mean temperature was extremely below normal by -5.8 °C.

The weather station on the island of Jan Mayen, Norway, measured a maximum temperature of 12.3°C on December 14. This is the highest temperature measured at the station in December since the start of observations in 1921 (the old record was 8.0°C from Dec 16, 1997). It was also the highest temperature measured at the station during 2001.

In Iceland, the first decade of the month was very stormy and a fishing boat was lost at sea, only one man was rescued. On the evening of December 13, the temperature at a coastal station in the north (Sauðanesviti) reached 18.4°C, which is a new absolute maximum in December for the whole of Iceland. This temperature is 1°C higher than the absolute maximum of the whole year 2001 in Reykjavík. Until Christmas, the weather continued to be very warm, but a cold snap during the last week of the year prevented a new monthly mean temperature record being set.

The drought in Switzerland south of the Alpine ridge continued throughout the month. These conditions engendered severe danger of forest fires. A remarkable cold spell occurred on December 13. Therefore the lowest December temperatures since 1962 were registered in the highest regions of the mountains, e.g. –30.7°C at the station Jungfraujoch.

Drought conditions prevailed also in Italy throughout the month, including the Alpine region and the Po valley. About 60% of the meteorological stations recorded a precipitation much below normal. The mean monthly temperature was below normal mostly in southern Italy and in the islands.

In Slovenia, the monthly mean air temperature was well below the average of 1961–1990. The anomaly in the Julian Alps was –4°C and in other parts of the country between –3°C and –1°C. The national precipitation amount was far from normal. No station recorded more than 60 % of the normal value. In Zgornjesavska valley, the precipitation rate was less than one fifth of the norm. Although the snow cover was not very deep, it was quite persistent and the number of days with snow cover mostly exceeded the

long term average. In the high mountains, the snow cover was not so deep as usual in December. In correlation with a low precipitation rate, sunshine duration was above normal everywhere in the country (see fig. 12.2). The central part of Slovenia got significantly more sunny weather than the mountain and coastal areas. Ljubljana enjoyed 86 hours of sunny weather, the normal is 37 hours.

In Turkey, the month was rather cold (country-wide monthly mean temperature 1°C below normal) and very wet (country-wide precipitation rate 190% of normal). A lot of extreme weather events occurred throughout the month in different places all over the country. Heavy rains, strong winds, snow storms and severe cold caused flooding and damage of houses and agricultural areas, destruction of transportation devices on land and at the seaside and the loss of lives.

In Cyprus, December was very wet with a monthly precipitation amount above twice normal. Heavy showers and flooding in various periods during the month, especially in the first week, accompanied by gale force winds and severe hailstorms, caused damage to agriculture and properties and also caused a lot of inconvenience to the population. Damage was also caused to boats and fish farm establishments at sea. However, rainfall was very beneficial to the water resources of the island.

December was cool and rainy in Israel. Rainfall amounts in most parts of the country were 120%-160% of normal. The most intense rainfall occurred on December 3-6 with 100 mm-150 mm in northern and central Israel. The coastal plain near the Carmel region received 200 mm-250 mm, and in Zikhron Yaakov there were more than 300 mm. Within two days (December 3-4) Zikhron Yaakov received 285 mm. In the last 90 years, in all parts of Israel, there were only 3 times in which larger amounts of rainfall were recorded for two successive days. A record hourly rainfall was recorded in Zikhron Yaakov with 75 mm in one hour on December 4. As a result of the heavy rains there were floods in the area as well as in other parts of the country. One person died, many homes were evacuated and there was large damage to roads and to agriculture. In the entire month there were 425 mm of rain in Zikhron Yaakov, the rainiest December since the beginning of measurements in 1915 (see fig.12.3).

Snowfall and strong winds restricted transport in Armenia on several days in the second half of the month in Armenia. In Tashir, wind velocities of 84-90 km/h were observed lasting for more than 10 hours on December 18; gusts were up to 122 km/h.

In the territories of Krasnodar and Stavropol, Russian Federation, heavy snowfall formed a snow cover in the period from December 18 to the end of the month. Black ice and hoar-frost affected transportation facilities and power lines. On December 24, melting snow and rain engendered the flooding of several localities.

In Sweden, the month started very mild. But from December 20 on, very cold air dominated the weather for the rest of the year. Heavy snowfall and temperatures close to zero caused serious problems to energy supply and traffic. Especially the south-western part of Sweden was affected; there, up to 15,000 families were without electricity after Christmas. New records of December minimum temperatures were set in Vänersborg (-25°C) and Visby (-22°C) in southern Sweden, stations with more than 100 years of observations.

In Denmark, December was near normal except the last 10 days of the month, which were dominated by frost and at times heavy snowfall.

In Germany, the month was rather cold, especially in the second half. At station Oberstdorf, -30°C was measured at the surface of the snow cover in the night of December 23-24. In the funnel-shaped mountain valley of Funtensee, -45,9°C were recorded in the same night. During the period from December 15-29, snowfall and freezing rain lead to numerous accidents and chaos on roads and motorways all over the country. E.g. on December 21-22, circa 100,000 drivers and passengers spent the night in their cars on a 150 km stretch of a motorway in Bavaria. Aviation and railway traffic was also blocked as a consequence of fresh fallen snow up to 70 cm. In eastern parts of the country, strong winds of about 100 km/h engendered snow drifts forming a snow cover up to 2 m on December 24-25.

In the Netherlands, the lowest temperature of the year was –17.0°C, recorded from station Nieuw Beerta on December 23. On December 28, a gust of 158 km/h was recorded at the coastal station IJmuiden.

In Luxembourg, a new record of sunshine duration for the month of December was set by 91.4 hours.

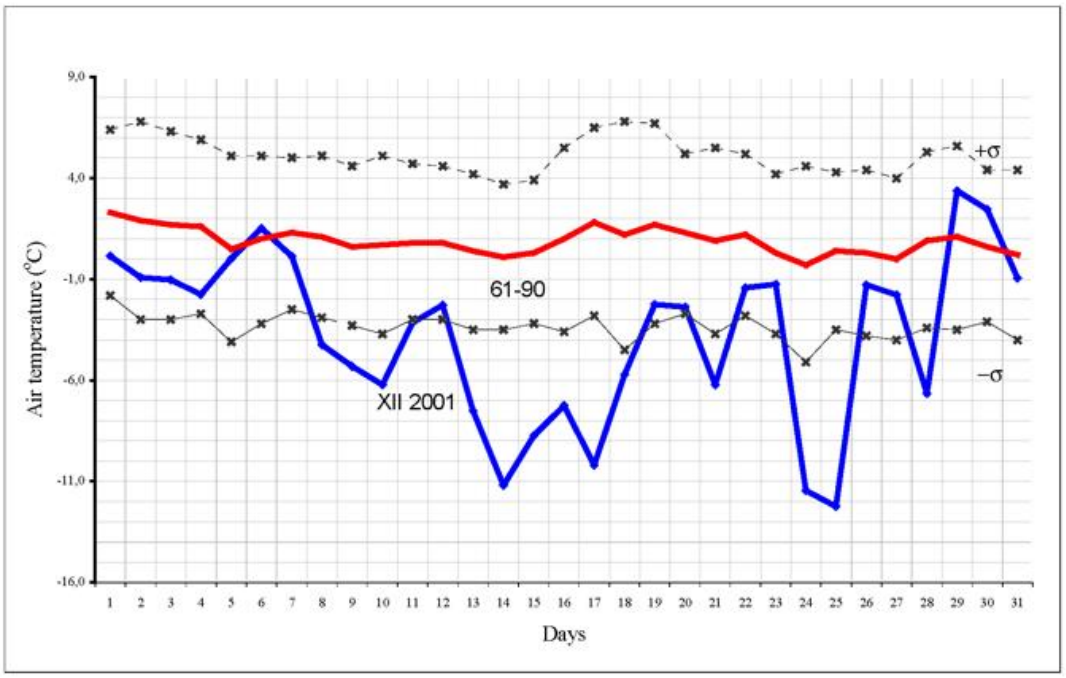


Fig. 12.1 : *Daily mean temperature in Sombor December 2001, compared to normal*
From: Federal Hydrometeorological Institute of Yugoslavia

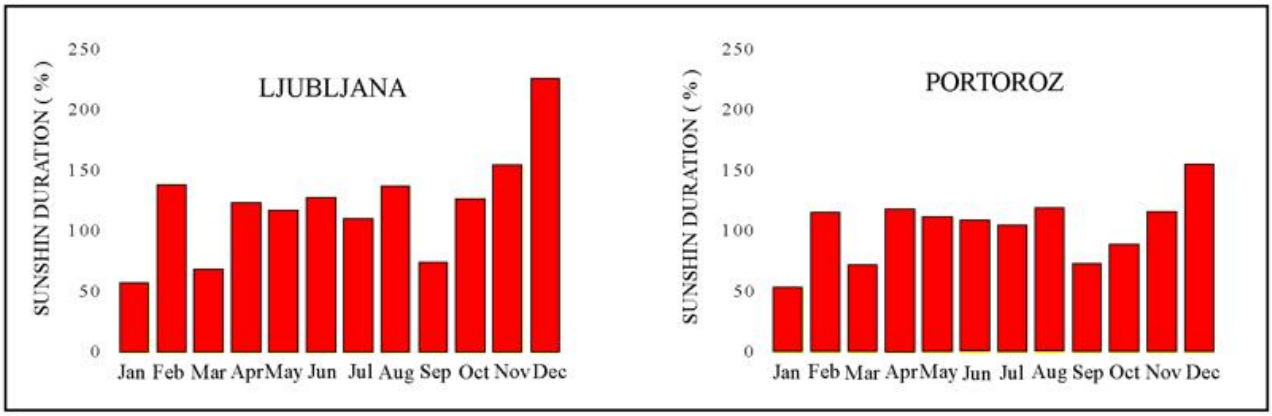


Fig. 12.2. : *Sunshine duration in the year 2001 relative to the average of 1961 – 1990 at two stations in Slovenia*
From: Hydrometeorological Institute of Slowenia

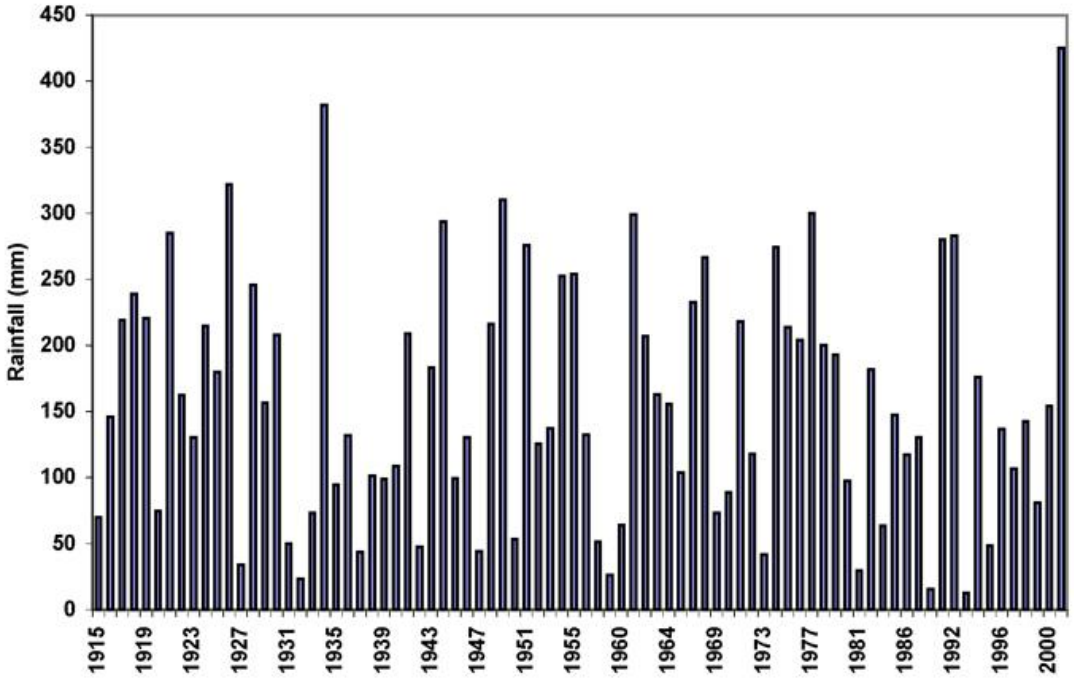


Fig. 12.3 : *Monthly December rainfall amounts in Zikhron Yaakov, 1915 – 2001*
From: Israel Meteorological Service

Activities and Results of European Climate Centres

Report on ECSN activities

by: Walter Kirchhofer, *MeteoSwiss*

- **General remarks**

The EUMETNET Council has designated MeteoSwiss as Responsible Member for the EUMETNET ECSN Programme, starting on 1 January 2001, with Dr. Walter Kirchhofer as Programme Manager.

The ECSN Advisory Committee (EAC) elected Volker Vent-Schmidt as new Chairman of EAC.

The third ECSN-Workshop on Climate Databases has taken place in Langen, Germany, 12-13 November 2001, focussing on climate data exchange and data quality. Since the EUMETNET project UNIDART (Uniform Data Request Interface) is considered to be a suitable project to develop an infrastructure for a border-crossing exchange of climate data, UNIDART was the

main discussion topic. A list of requirements has been prepared for the realisation of the pilot phase and further steps of UNIDART.

At the thirteenth Session of the WMO Commission for Climatology (CCl) in Geneva, 21 to 30 November 2001, a part of the session was devoted to scientific lectures, including a presentation of the main activities of the EUMETNET ECSN Programme.

- **European Climate Assessment (KNMI)**

In the European Climate Assessment (ECA) project the temperature and the precipitation climate was analysed for WMO Region VI, putting particular emphasis on changes in daily extremes. ECA aims at applying uniform analysis methodologies to daily observational series from as many European meteorological stations as possible. About 35 countries participate in the project and the data set contains data from over 200 stations. The project focuses on the twentieth century from 1901 to 2000. The Final Report will be published in spring 2002.

- **Generate Climate Monitoring Products (DWD)**

The status of the project Generate Climate Monitoring Products (GCMP) has been reviewed and a proposal was elaborated concerning the continuation of the project up to the end of the year 2003. It is obvious that European Meteorological Services should provide first hand information about climate variation and derived products for monitoring purposes. With this in mind the project GCMP was started, aiming at developing, generating and distributing standardized climate monitoring products on a monthly as well as on an annual basis. Monthly mean temperatures and anomalies, precipitation and anomalies, satellite cloud cover, and quite a number of other example products are already contained in the clearly structured mechanism on a test version of the GCMP Web pages.

- **Climate Atlas of Europe (Meteo-France)**

The project Climate Atlas of Europe is established for a duration of three years, starting on the 1st of January 2001. The Atlas will contain monthly normal values for precipitation, temperature, wind and sunshine duration and additional statistical information for these parameters and for the occurrence of phenomena such as fog, thunderstorm, hail and snow. The computation period will be 1971-2000. In a first step the Atlas will be made available without maps and implemented as a CD-ROM data base with visualization tools.

- **GIS in Climatological Applications (ZAMG)**

National Meteorological Services are facing many problems in their work which can be solved

more easily with the application of Geographic Information Systems (GIS) tools. Substantial advances in deriving information of various kinds from different sources have been achieved until now. The ECSN activitiy in this field has pushed forward a new action in the framework of COST, namely COST-719: The Use of GIS in Support of Climate Monitoring, Climate Data Quality Control and Climate Information. Therefore the ECSN project Geographic Information Systems in Climatological Application was terminated with a Final Report and followed up by COST-719.

- **ECSN Climate Dataset (KNMI and DNMI)**

The ECSN project Climate Dataset (ECD) is closely related to the project European Climate Assessment. The main objective of the ECD project is the preparation and the distribution of climate data sets on the daily amount of precipitation and daily temperature (minimum, mean, maximum) for the period 1901-2000 via CD-ROM and Internet.

The Bulletin is a summary of contributions provided by the National Meteorological Services.
The author does not warrant, guarantee or make any representations regarding correctness, accuracy,
reliability, or any other aspect regarding characteristics or use of the information presented.