

European
Climate Support
Network



World Meteorological
Organization
World Climate Data
and Monitoring Programme

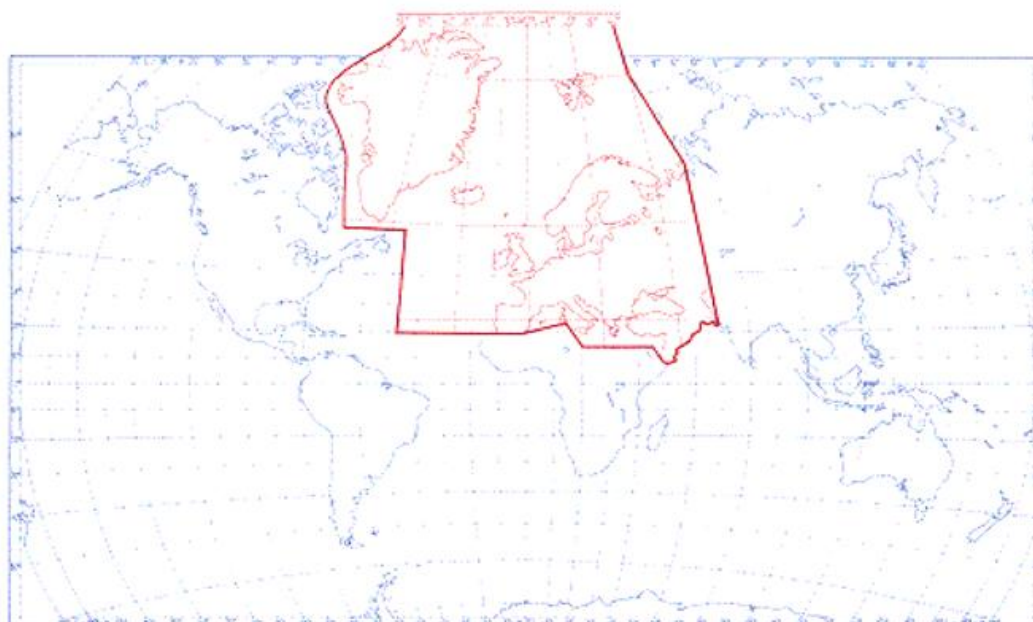


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Wetterdienst



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

1999



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**Annual Bulletin
on the Climate
in WMO Region VI
- Europe and Middle East -
1999**

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
Bulgaria
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Jordan
Kazakhstan
Latvia
Lithuania
Netherlands
Norway
Portugal
Russian Federation
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 1999 were referred from the following countries:

Italy, Romania, Slovak Republic

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Foreword

In the year 2000 the Annual Bulletin on the Climate in WMO Region VI appears for the sixth time. Right after the start, dating back to 1995, it became obvious, that here a notable publication had been created, with great interest to a broad spectrum of users, ranging from scientists and National Services to economic and political decision makers.

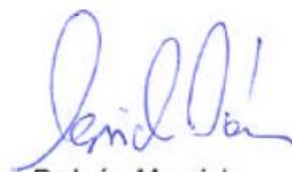
On the other hand there is a growing number of contributing National Meteorological and Hydrological Services. About 80 % of the WMO member countries of the Region supported the latest editions and provided input. It is worth mentioning in this context that this time nearly all contributions were sent in on electronic media which considerably facilitated the further preparation of the publication and smoothes the way for the development of an Internet version.

With respect to conspicuous climatic events the year 1999 is noteworthy by all means. Catastrophic snow conditions and avalanches in the Alps in winter, severe inundation in Hungary, France and other parts in Central Europe caused heavy damage and losses. This is especially true for two disastrous storms in December, partly known as 'Anatol' and 'Lothar', one of which affected northern France, the North Sea and Denmark, whereas the other swept eastward over France, Switzerland and southern Germany. Information on these events and lots of other interesting analyses, tables, graphics and comments concerned with climate monitoring are contained in this edition of the Bulletin.

A special feature of the Bulletin is the chapter related to research activities in the region. The topics of the actual edition comprise the Climate of the 20th century in Sweden, the DWD Objective Weather Type Classification (OWTC), the solar eclipse effect on the surface temperature and humidity and the Satellite Application Facility (SAF) on Climate Monitoring.

When in January 2000 the ECSN (European Climate Support Network) - project "Generate Climate Monitoring Products" was launched it was decided to incorporate the Bulletin into this framework as a special sub-project thus broadening the basis for enhancing the fruitful European co-operation in the field of climatology.

I would like to thank all those who have contributed to the success of this remarkable publication. Above all, the participation of Sweden in the editorial review process and the co-ordination, publishing and distribution of the document by Germany were greatly appreciated.



Dr Iván Mersich
President of WMO RA VI

Outstanding Events and Anomalies in 1999

- Warmest year on record in many places with extremely high mean night-time temperatures.
- Wettest year of the century in southern Scandinavia.
- 1998/99 rainfall season driest on record in the Middle East.
- Heavy snowfalls bring deadly avalanches in the Alps in February.
- Sudden snow melt and heavy rains cause severe floods in Central Europe in spring.
- Very dry from December 1998 to August 1999 in Spain.
- Heat and drought cause high economic losses and engender numerous forest fires in European Russia and the Middle East in summer.
- Heavy rains cause several severe floods, esp. in and around Hungary in June/July.
- Warmest September on record in parts of Central Europe and Scandinavia.
- Catastrophic flooding in south-western France in November.
- Again very bad start of the rainy season in the Middle East in late 1999.
- Early winter in central Europe and the East in November.
- Series of fierce storms with high losses in Western and Central Europe at the end of the year.

Annual and seasonal survey:

1999 was another warm year, in many places warmer than 1998, which so far has been the globally warmest year on instrumental record (1860 – 1999).

The series of consecutive warmer years continued at many stations (e.g. in Macedonia with records since 1926, it was the 15th warm year in a row). Annual temperature anomalies (with respect to 1961 - 1990 normal) surpassed + 1 °C in most parts of the Region and up to + 2 °C in the Russian Federation. However, near the Barents Sea, slightly cooler temperatures than usual were recorded. The annual surface temperature anomaly percentiles exceeded 90 %. For many countries, it was the warmest or at least one of the warmest

years on record (see figures 1 and 2). In Central England, 1999 became the warmest and equal with 1990 and 1949 in the 341-year record. For The Netherlands, 1999 equalled 1990, the warmest year since the start of regular measurements in 1706. A number of records illustrate, that the high annual means are caused by high night-time temperatures. e.g. the mean minimum Central England temperatures in 1999 were the warmest in the 122-year record (see figure 3). In Amman, a clear rise of the annual mean was due to the high daily minimum temperatures. Most months of the year showed positive night-time temperature anomalies (see figure 4), while maximum temperatures not were increased as much.

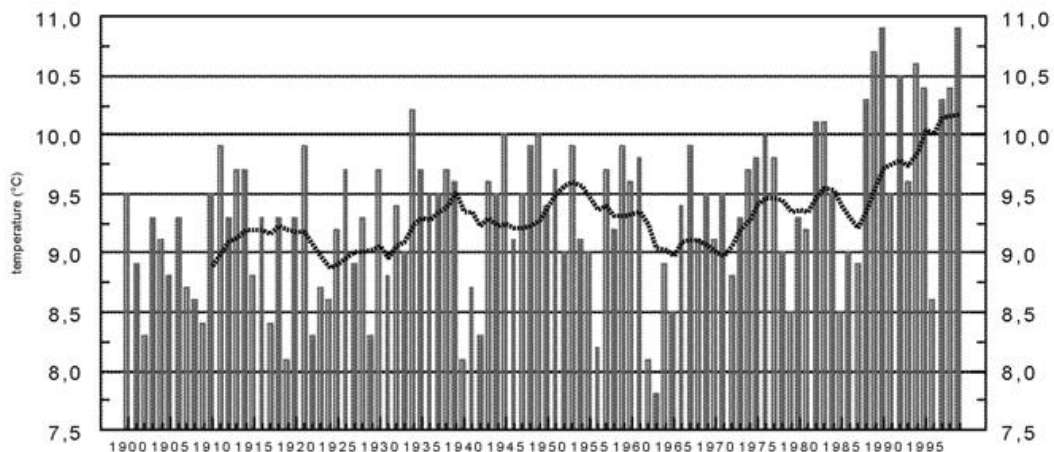


Fig. 1: Annual mean temperatures and 10-year moving average in De Bilt, Netherlands, between 1900 and 1999
From: KNMI, The Netherlands

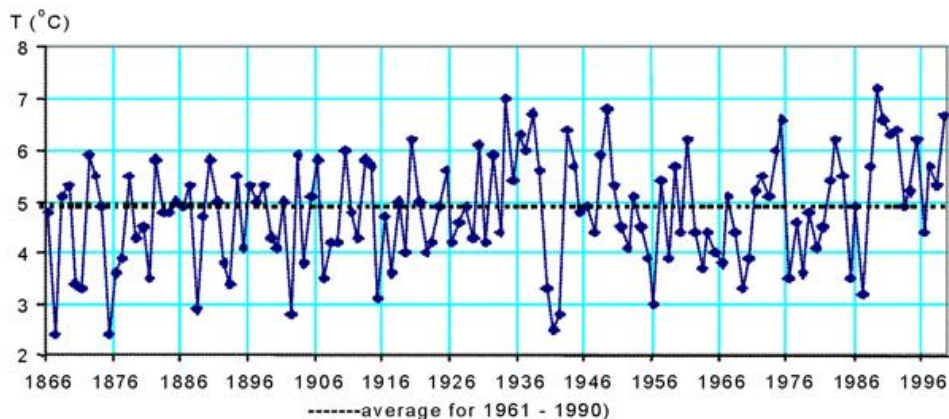


Fig. 2: Annual mean temperatures in Tartu, Estonia, between 1866 and 1999
From: Estonian Meteorological and Hydrological Institute

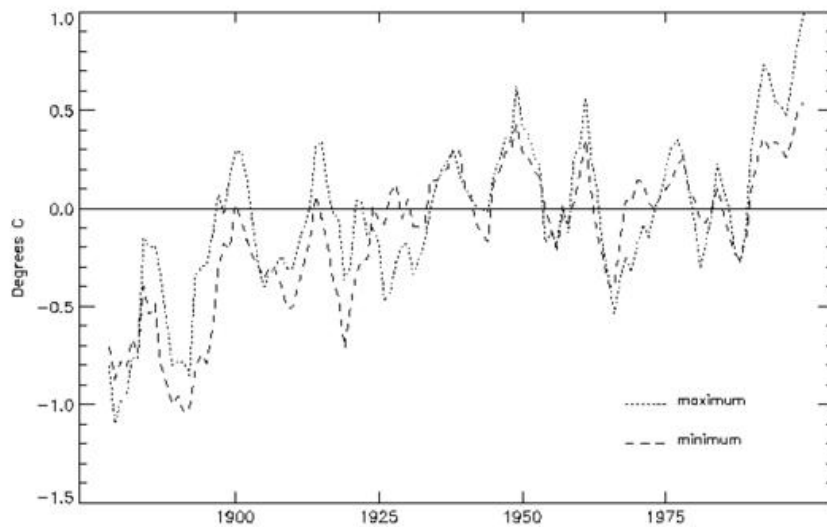


Fig. 3: Annual Central England maximum and minimum air temperature anomalies (differences from 1961 - 1990) between 1878 and 1999
From: Hadley Centre for Climate Prediction and Research, United Kingdom

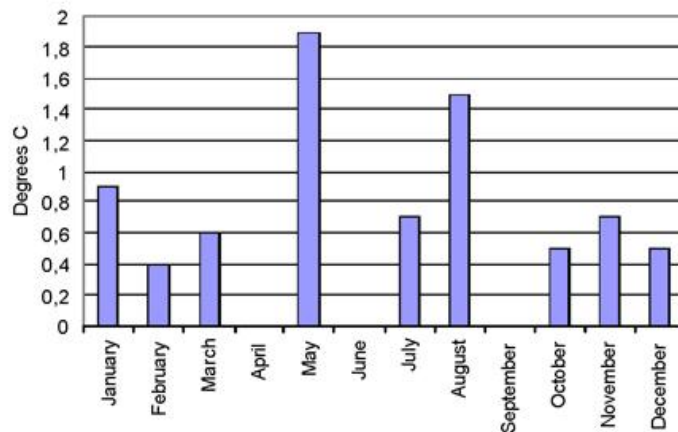


Fig. 4: Mean monthly minimum temperature anomalies (differences from 1923 - 1997) in Amman, Jordan
From: Meteorological Department, H. K. of Jordan

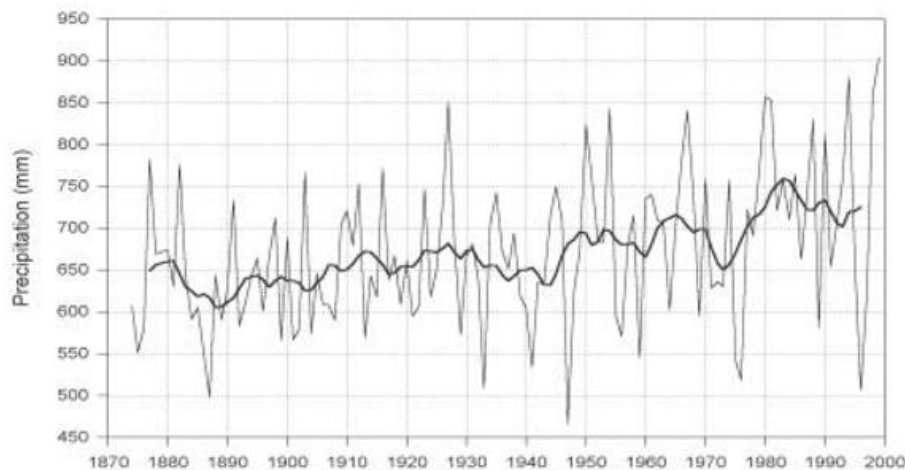


Fig. 5: Annual precipitation totals in Denmark between 1874 and 1999
From: The Danish Meteorological Institute

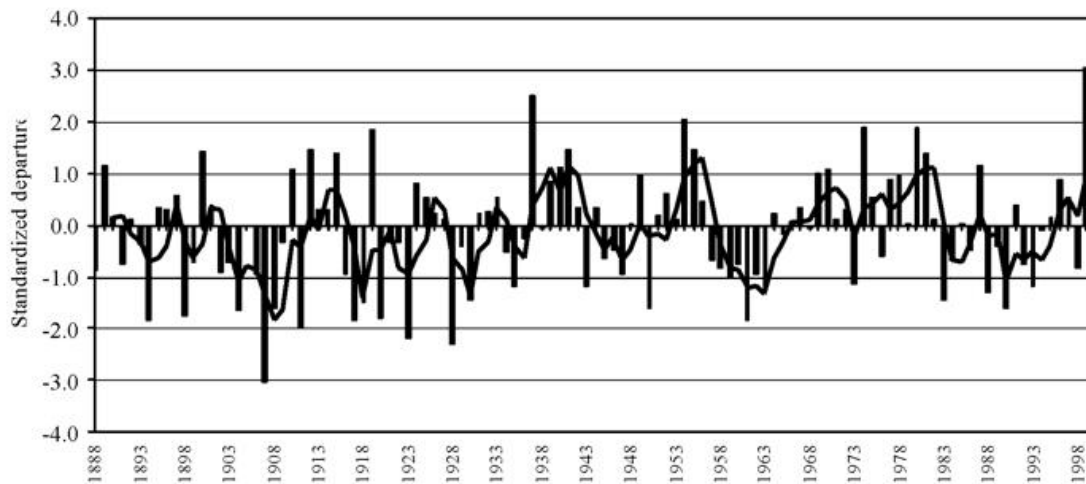


Fig. 6: *Standardised departures of annual precipitation totals from the 1961 - 1990 normal in Belgrade, FR Yugoslavia*
From: Federal Hydrometeorological Institute, Yugoslavia

The distribution of precipitation varied throughout the Region. Western Europe, southern Scandinavia, the Alps and most countries on the Balkans experienced a wet year. For Denmark and parts of the Federal Republic in Yugoslavia, it was the wettest calendar year in the history of registrations since 1874 respectively 1888 (see figures 5 and 6). However in Denmark, it was at the same time the 4th sunniest year since 1920, a rare combination which was also reported from other countries (e.g. The Netherlands). Heavy snowfall, downpours of rain, thunderstorms and hail inflicted massive economic and human distress in large parts of the Region. It was extremely wet in Hungary. There was almost continuous flooding and annual precipitation totals exceeded 200 % of normal.

Dry conditions prevailed in the southern parts of the Region. In Spain, precipitation was rare in the first half of the year with a considerable deficit in the southern half of the mainland. The situation was critical towards the end of August. However, intense rainfalls in autumn, improved the situation. In the Southeast of Spain and on the Balearic Islands, the year ended with less than 50 % of normal rainfall. Cyprus experienced the 5th consecutive year with below normal precipitation. An annual total of 321,6 mm (64 % of normal) had serious effects on the economy and the natural environment (see figure 6.3, page 34). The long-lasting dryness in the Middle East

intensified during the year with very low water levels reported from Syria, Israel and Jordan (see figure 1.1, page 27). Crop development in the growing season was seriously affected by an intensive and prolonged drought in Finland, Belarus, Ukraine and in large parts of the Russian Federation.

Fierce storms battered Europe at the end of the year, avalanche catastrophes hit in February and a high number of floods occurred making 1999, a year of severe weather related disasters. In Switzerland, the total amount of damage is estimated at 4 billion CHF, thus considerably higher than the previous record of 1,2 billion CHF for the year 1987 (inflation taken into account). The monthly means of the Atlantic-European zonal index for the latitude belt 35 - 65°N for the 20 - 40°E region, as a measure of the intensity of the circulation, illustrate very well the outstanding zonality in December (see figure 7).

The Venetian lagoon was affected in 1999 by 15 days of water levels of more than 100 cm above mean sea level triggering inundation in vast parts of Venice.

The annual mean of total stratospheric ozone at Hohenpeissenberg, Germany, was slightly decreased (321 DU compared to a 32-year mean of 329 DU), (see figure 8). Individual periods of the year, however, show large variations. Thus, at the end of November/beginning of December, new all-time minimum values were recorded over wide parts of western and central Europe.

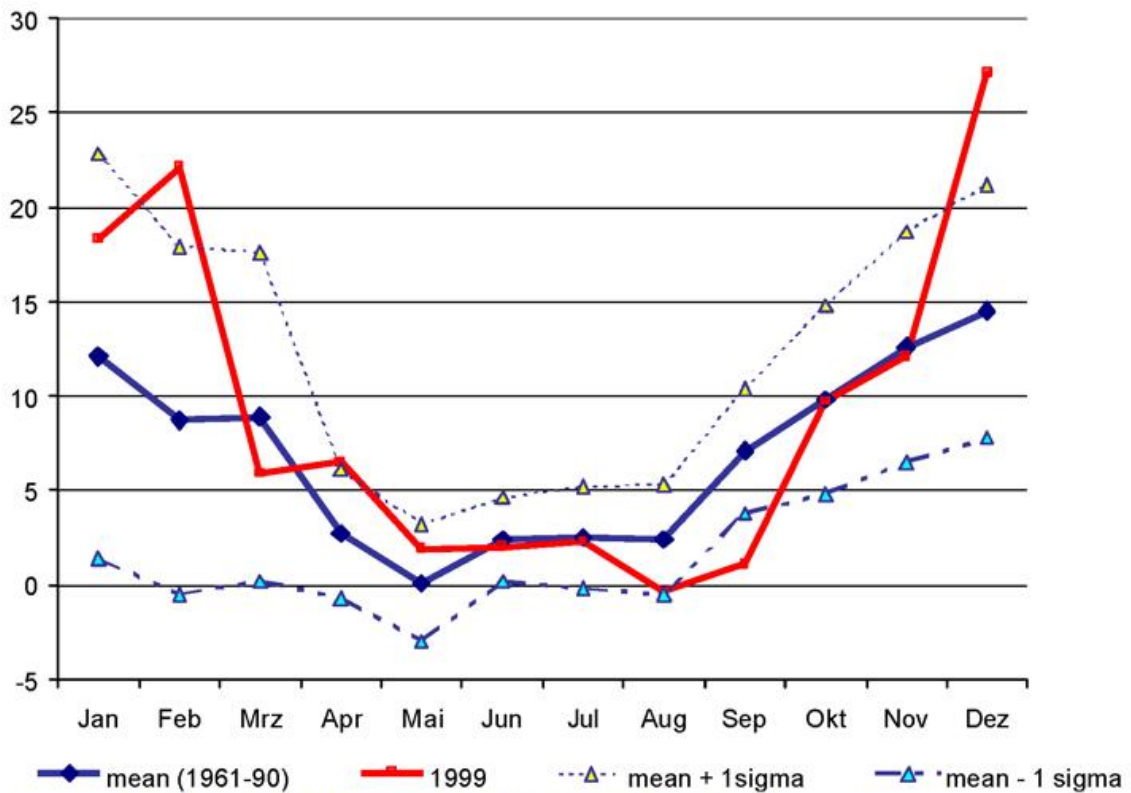


Fig. 7: Monthly values of the Atlantic-European zonal index: 1999 values, 1961 - 1990 means and means +/- 1 standard deviation Latitude belt 35 - 65°N between 20°W - 40°E From: Deutscher Wetterdienst, Germany

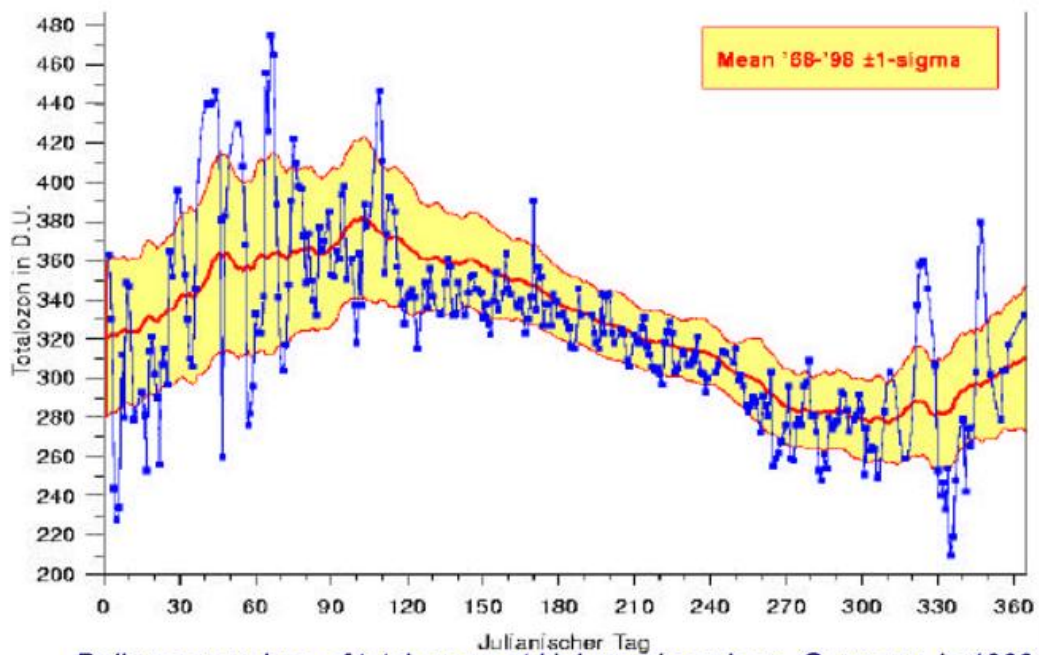


Fig. 8: Daily mean values of total ozone at Hohenpeissenberg, Germany, in 1999 and 1968 - 1998 means From: Deutscher Wetterdienst, Germany

Though the 1998/99 **winter** season was mostly mild all in all (see figures page 14), out-standing wintry periods occurred. A cold wave in late January brought some of the coldest temperatures experienced since the late 1800s in northern Fennoscandia and the western parts of the Russian Federation. In February, colder than normal temperatures in much of Europe were accompanied by extremely heavy snowfalls. In the Alps, more than 60 people were killed in avalanches. Heavy snowfall disrupted communications,

power supply and transportation in central Europe.

It was very warm in the Southeast (see figure 9) where temperature anomalies surpassed the 98 % percentile of the 1961 - 1990 normal. Dry conditions prevailed in the South (see figure page 18, above, figures 1.1 and 1.2, page 27). In the whole country of Israel, the 1998/99 rainfall season was, together with 1950/51, the driest recorded in the last 60 years.

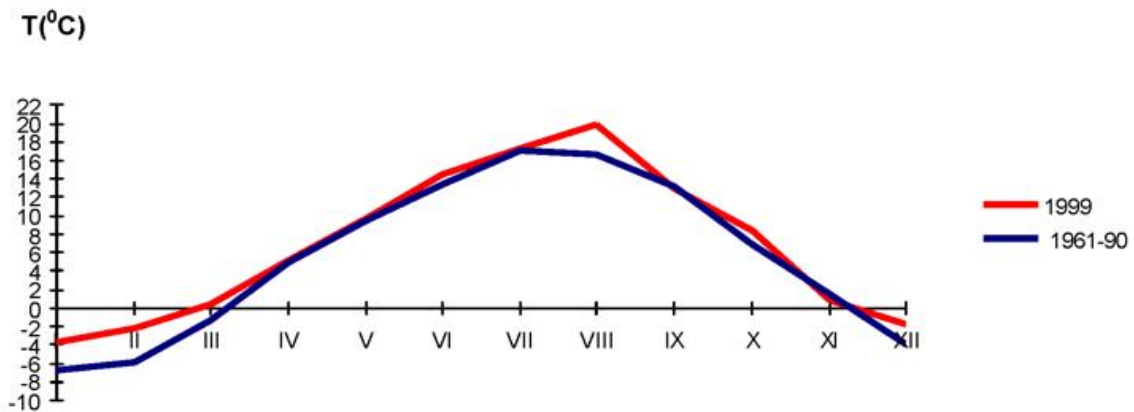


Fig. 9: Mean monthly temperatures in Armenia
Administration of Hydrometeorology, Armenia

Spring was wet and very mild in most areas (see figures page 15 and page 18, below). An early warm spring was followed by an extremely frosty period in May. In the East, this caused high losses to crops and plants. Spain experienced a very warm spring and early summer with an outstanding warm May (see figure 10).

Dry weather conditions continued to prevail in the South and East. The mild weather caused sudden ice and snow melt building up ice jams and with heavy rains this led to a number of severe floods. Latvia and Hungary reported high water levels in March and Lake Constance reached its highest level since 1858 in May. For Tyrol, Austria, it was the wettest spring in the last 50 years.

Dry weather conditions continued to

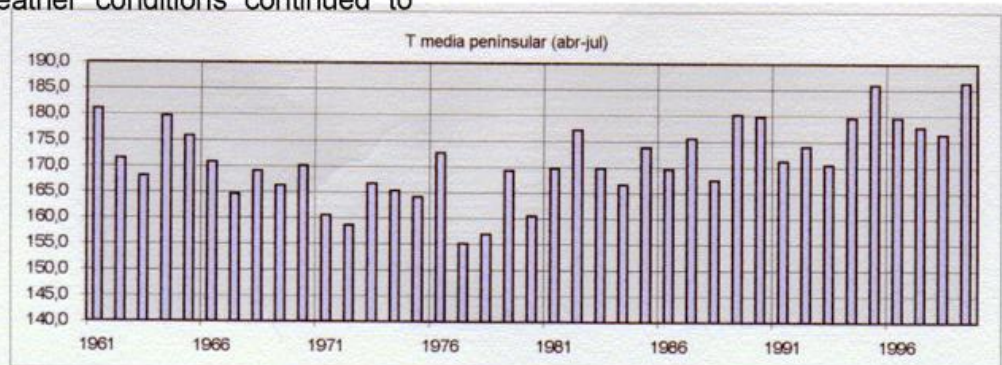


Fig. 10: Mean temperatures (in 1/10 °C) for the April - July period on the mainland of Spain between 1961 and 1999
From: Instituto Nacional de Meteorología, Spain

Dry weather that had already prevailed in May in eastern Europe and the Middle East intensified from June to August making the **summer** season of 1999 one of the driest ever in those regions. It was at the same time extremely hot (see figure 7.1, page 35, and figures 9 and 11 - 13). Anomaly percentiles of the temperatures exceeded 98 % in many countries (see figures page 16). In some places in Latvia, it was the warmest summer on record. Heat and drought caused high agricultural losses and engendered numerous forest fires. Israel reported one of the hottest summers, although it was not as hot as in 1998 (see figure 13).

Frequent thunderstorms, gusts and hail caused flooding and much damage in the Region. Heavy rains and severe floods affected Hungary, Romania and the Slovak Republic in June and July (see figure 14, page 13). Large land areas were flooded, buildings collapsed and thousands of people had to be evacuated. In Hrubarnov, south Slovakia, June - July 1999 was warmest on record (since 1881). On Zugspitze, Germany, at nearly 3000 m altitude, the heavy snow falls during winter and spring led to a permanent snow cover at this station all year around for the first time since 1984.

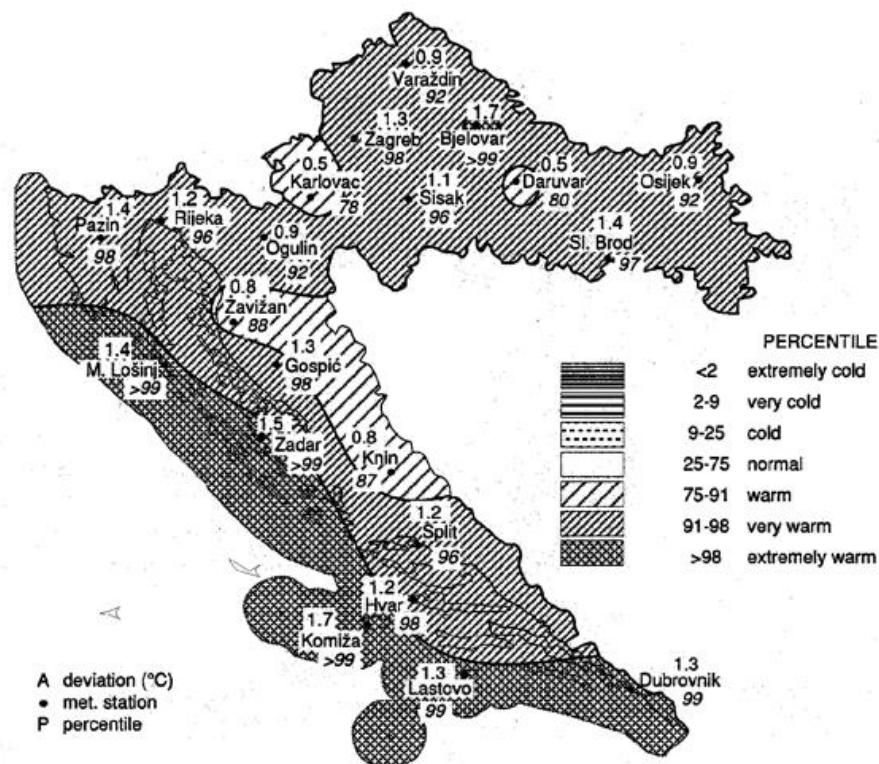


Fig. 12: Percentiles of temperature anomalies in the summer season in Croatia (reference period 1961 - 1990)
 From: Meteorological and Hydrological Service, Croatia

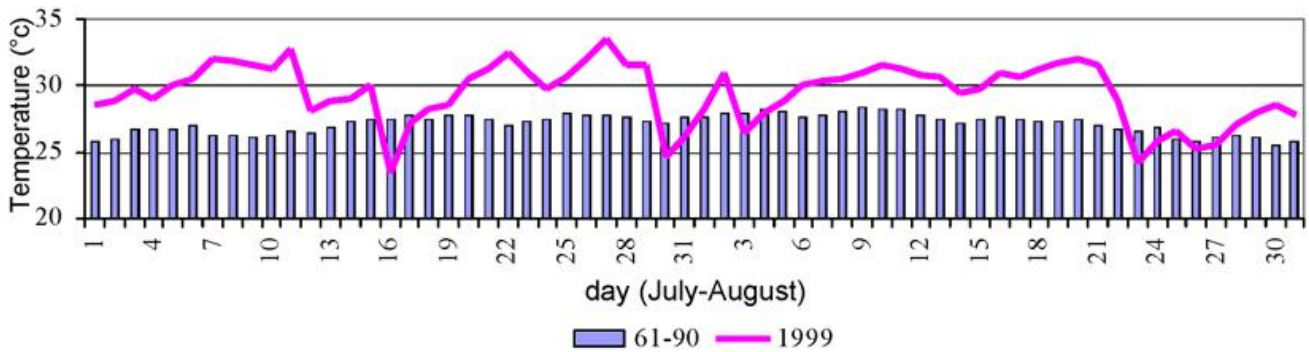


Fig. 12: *Daily maximum temperatures in Varna in July and August*
From: *Bulgarian National Institute for Meteorology and Hydrology*

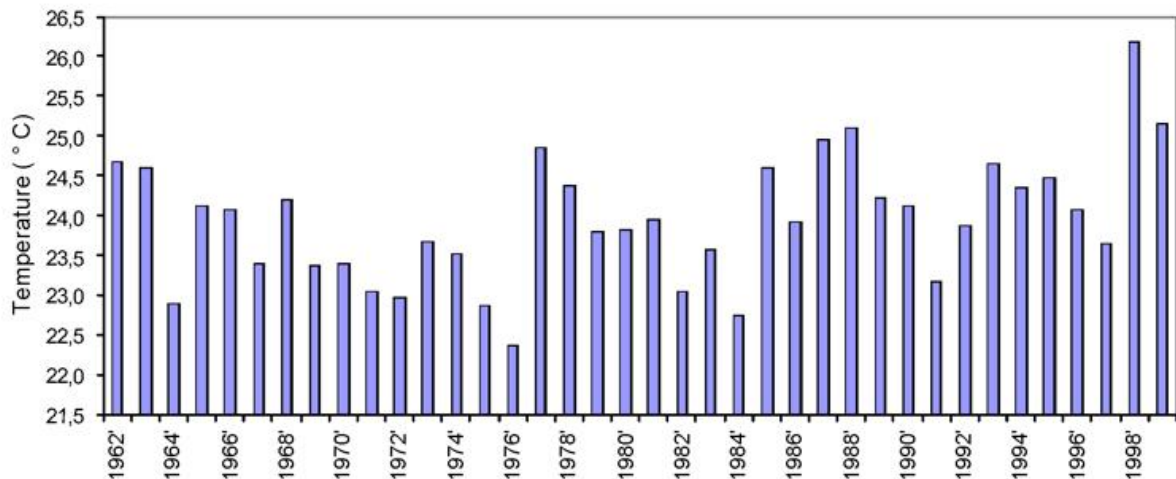


Fig. 13: *Mean daily temperatures in Bet Dagan for the July/August period between 1962 and 1999*
From: *Israel Meteorological Service*

Autumn was extremely mild from the British Isles to Northern Scandinavia as well as in the Mediterranean region (see figures page 17). For Norway, it was one of the warmest autumns of the century. Record warm temperatures prevailed also in Germany. In some parts of this country, September was the warmest month of the year. An early cold snap extended from Spain to Russia in November. Dry weather predominated in the East and Southeast of the Region. Summer drought in eastern Ukraine turned into autumn drought and still increased until the middle of October. Regionally, there was

hardly any precipitation at all for 20 to 45 days, which is extremely rare. Plenty of rains brought relief after the long-lasting drought in most parts of the Iberian Peninsula. There was a number of severe floods, among those, an outstanding flood in southern France in November. The rainfall season in the Middle East started dry (see figure 15). North and Central Israel received only 20 - 40 % of the long-term average and the southern parts of the country less than 10 %. This made it one of the worst starts of the rainy season and similar to the same period of the previous year.

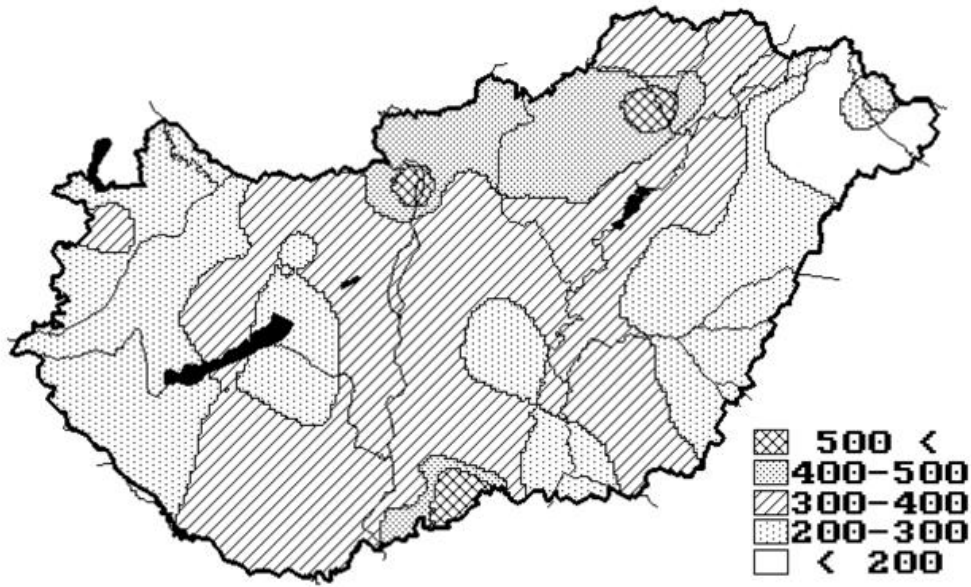


Fig. 14: *Precipitation totals (in mm) of the summer season in Hungary in 1999
From: Meteorological Service of the Republic of Hungary*

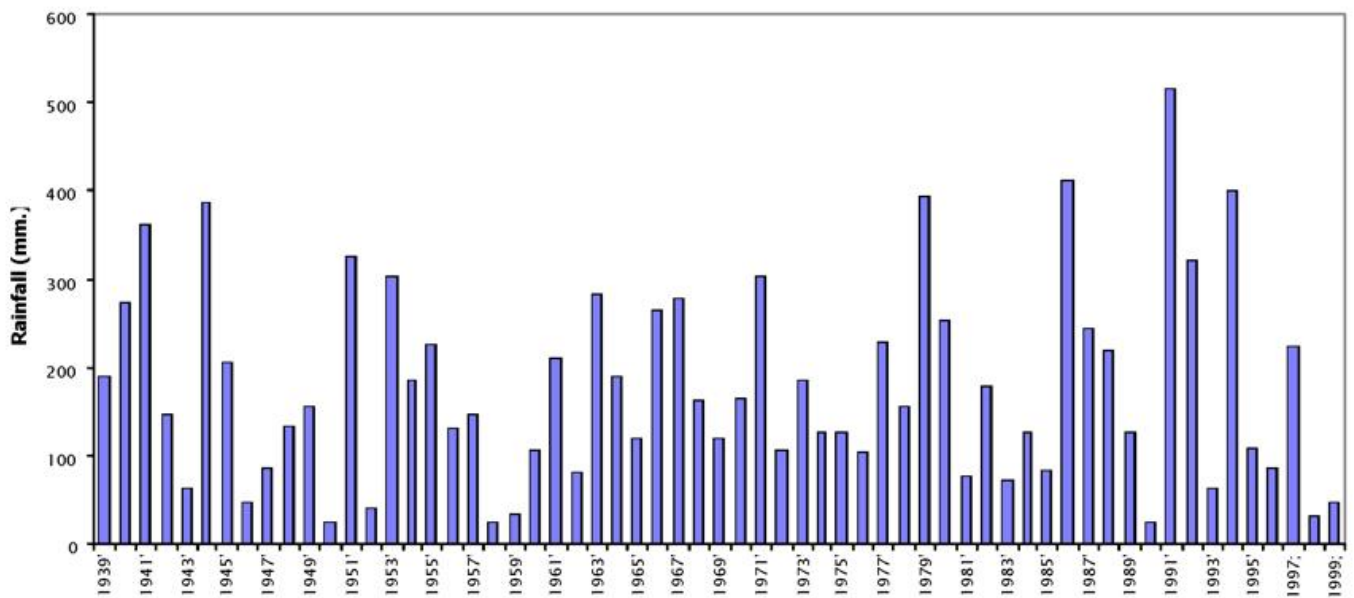
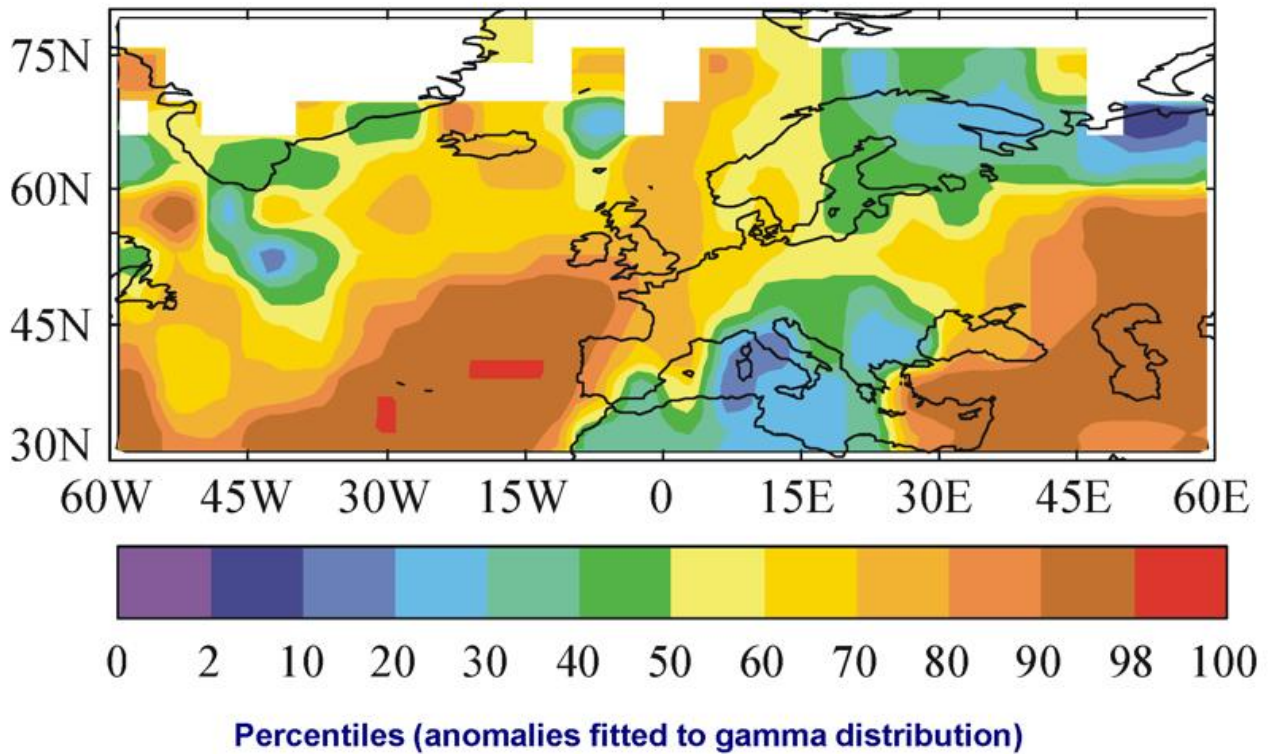
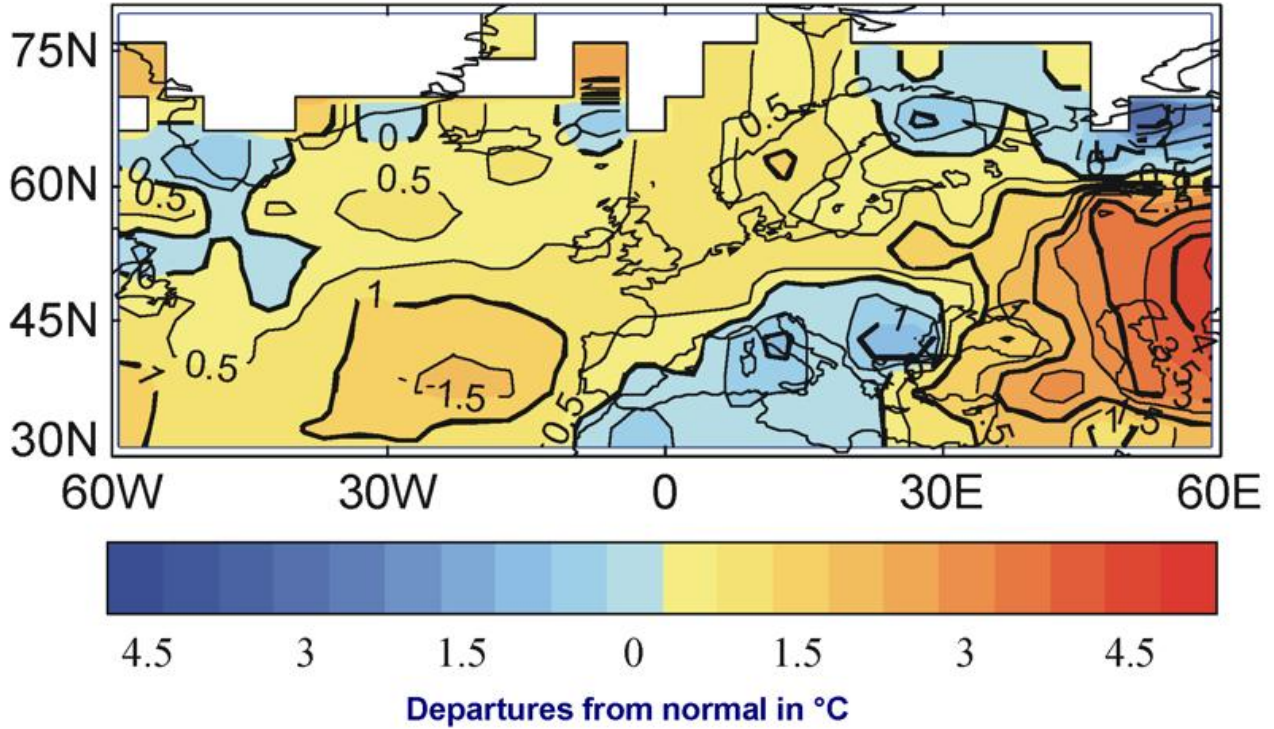


Fig. 15: *September - December rainfall totals in Jerusalem between 1939 and 1999
From: Israel Meteorological Service*

Seasonal Maps

Surface temperature anomalies: December 1998 - February 1999

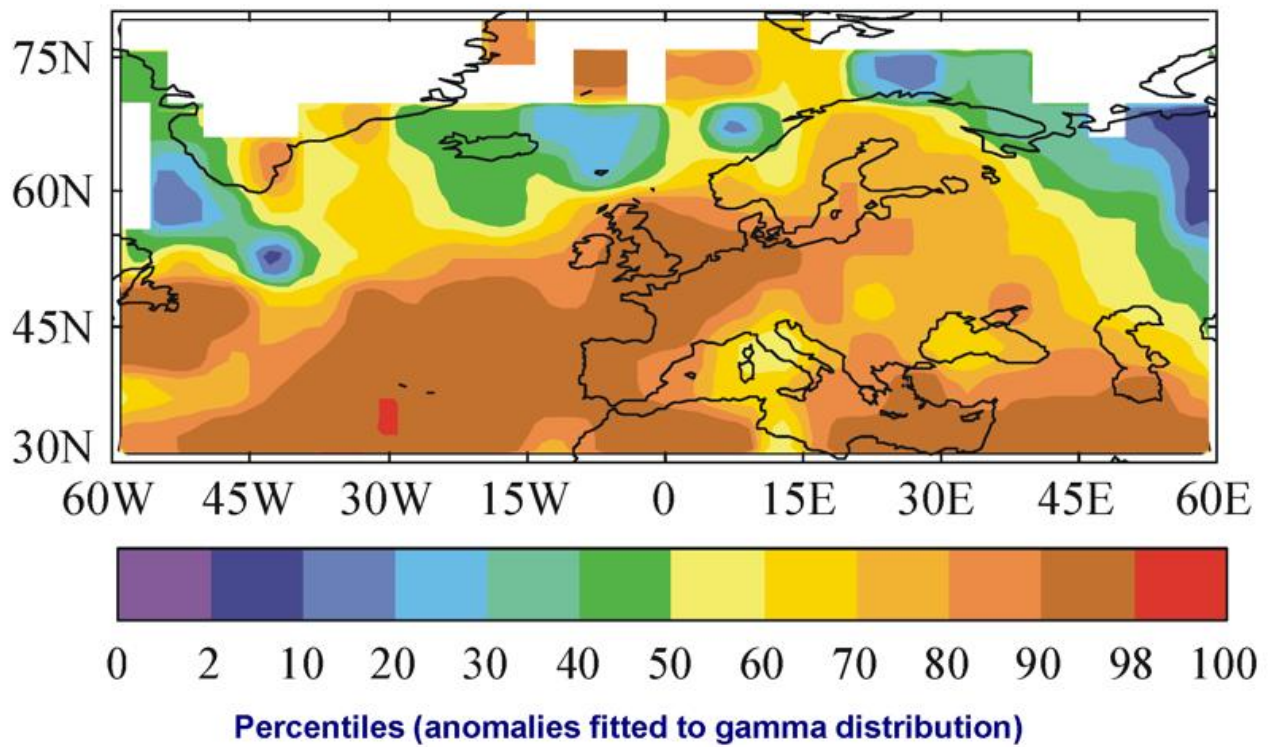
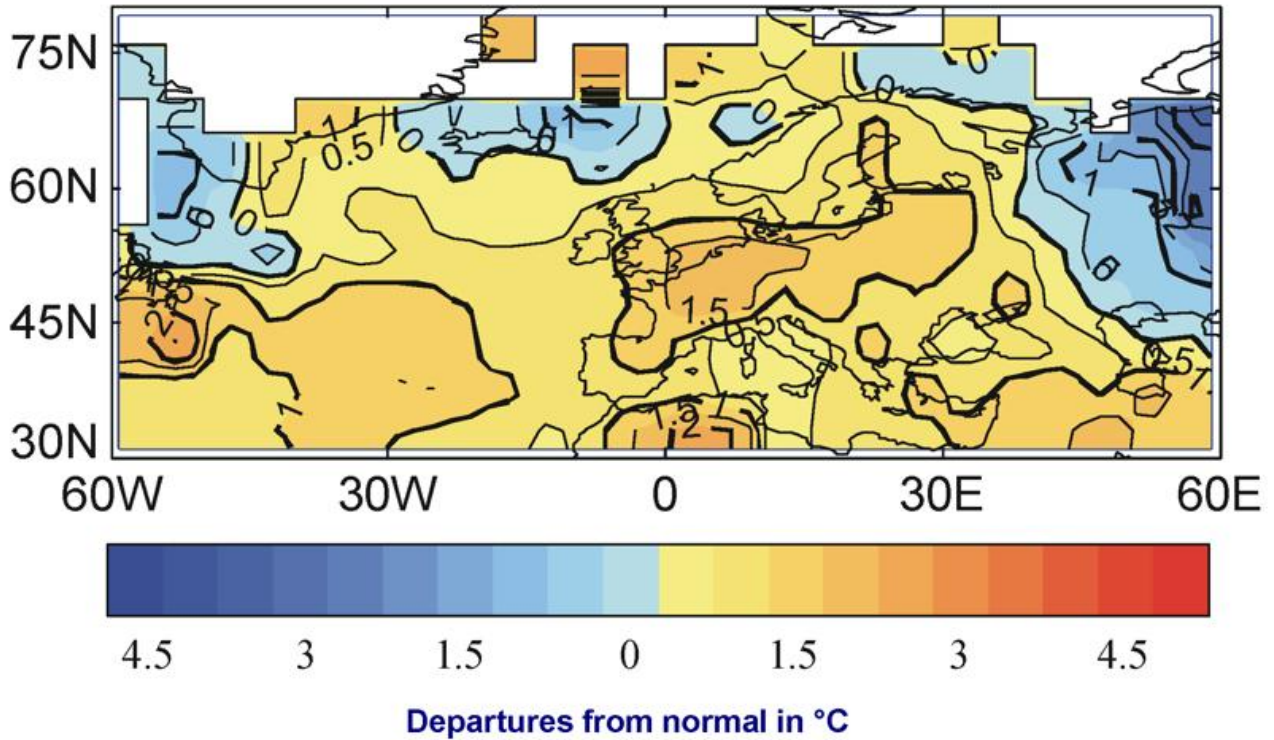
From: Hadley Centre of Climate Prediction and Research



Reference period: 1961 – 1990

Surface temperature anomalies: March 1999 - May 1999

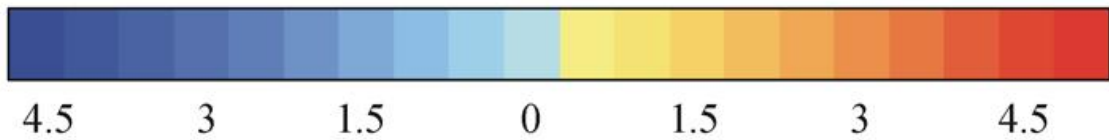
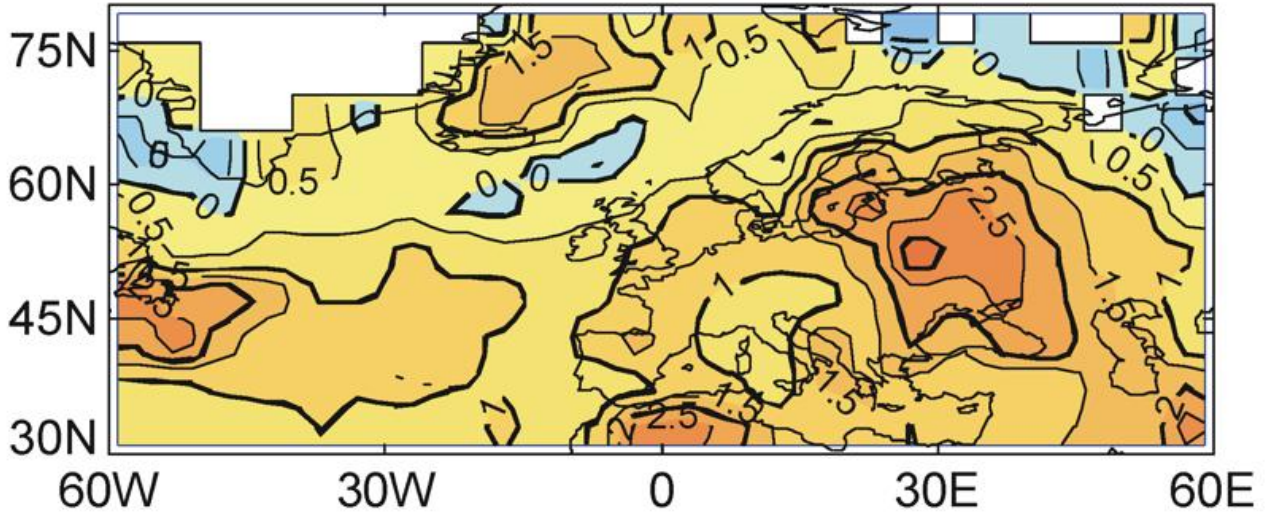
From: Hadley Centre of Climate Prediction and Research



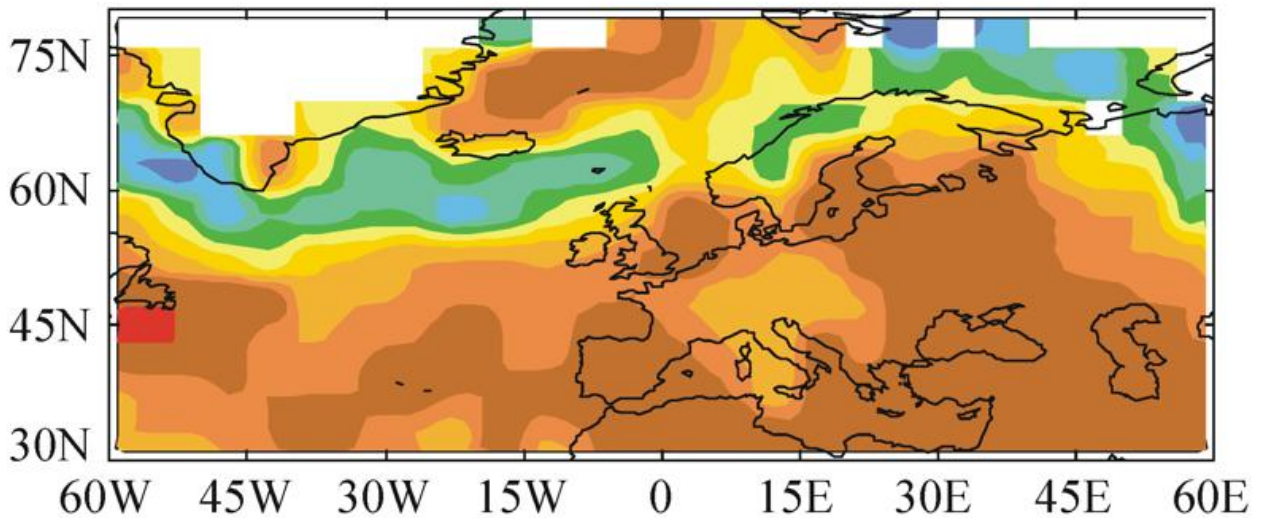
Reference period: 1961 - 1990

Surface temperature anomalies: June 1999 - August 1999

From: Hadley Centre of Climate Prediction and Research



Departures from normal in °C

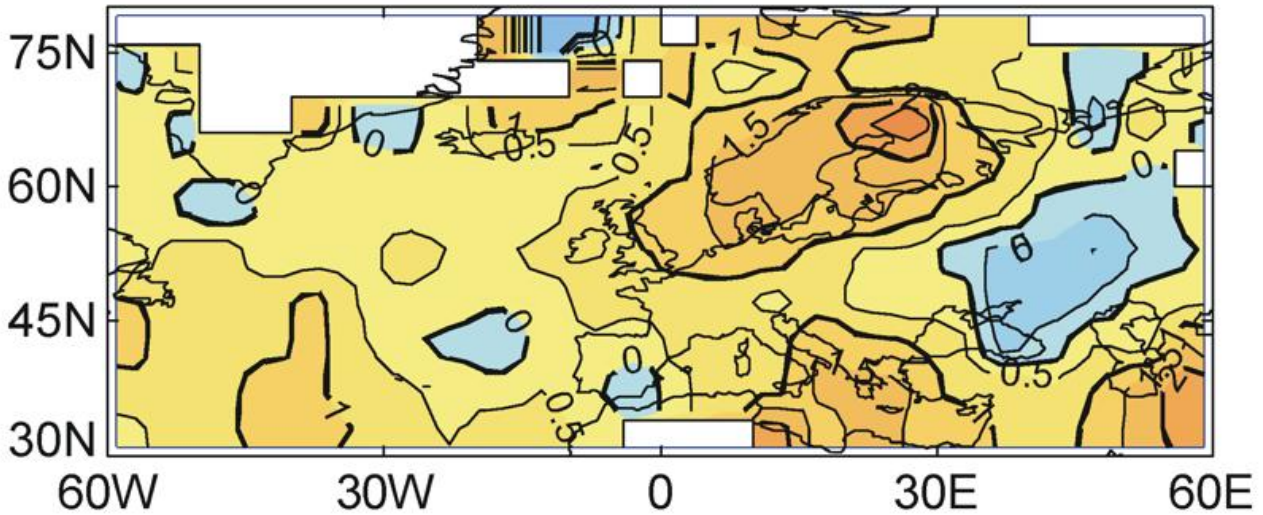


Percentiles (anomalies fitted to gamma distribution)

Reference period: 1961 – 1990

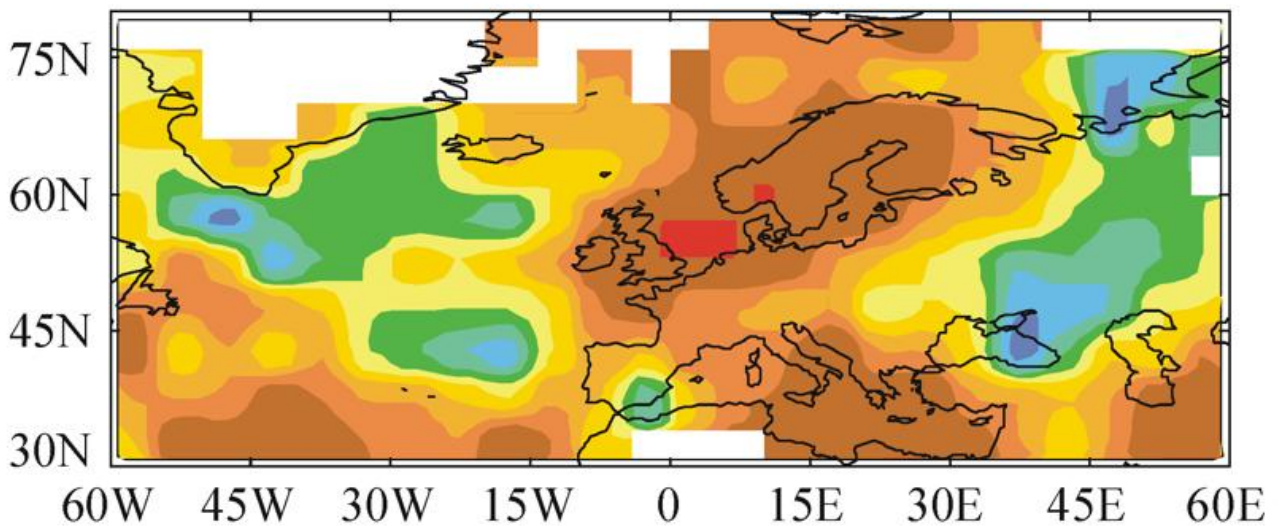
Surface temperature anomalies: September 1999 - November 1999

From: Hadley Centre of Climate Prediction and Research



4.5 3 1.5 0 1.5 3 4.5

Departures from normal in °C



0 2 10 20 30 40 50 60 70 80 90 98 100

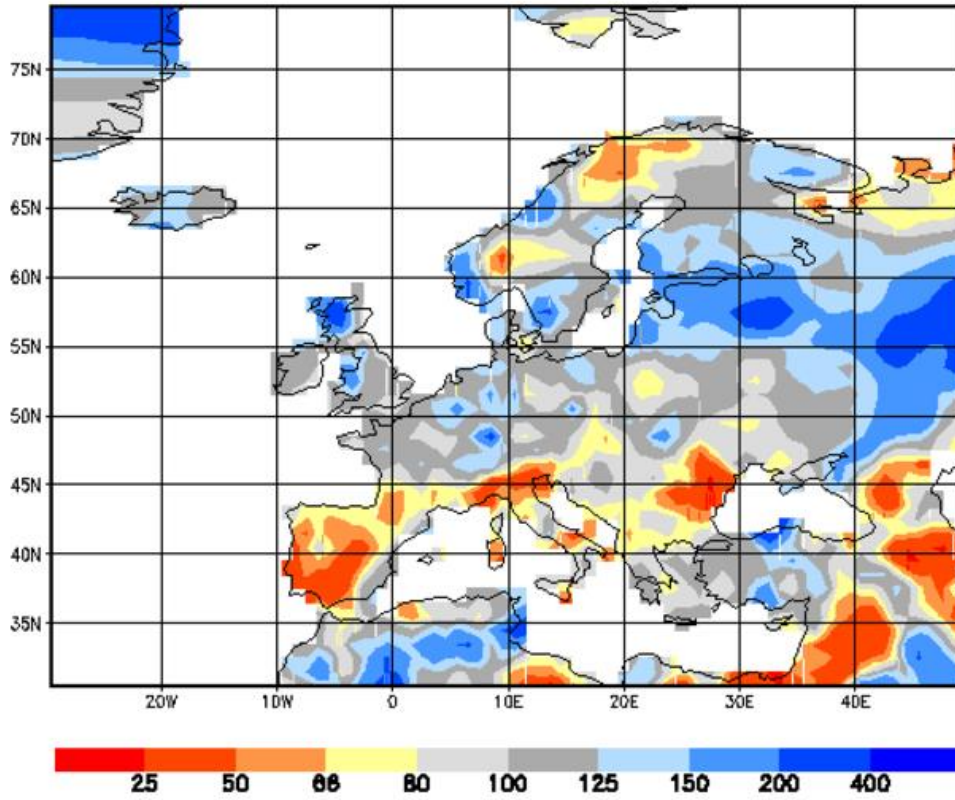
Percentiles (anomalies fitted to gamma distribution)

Reference period: 1961-1990

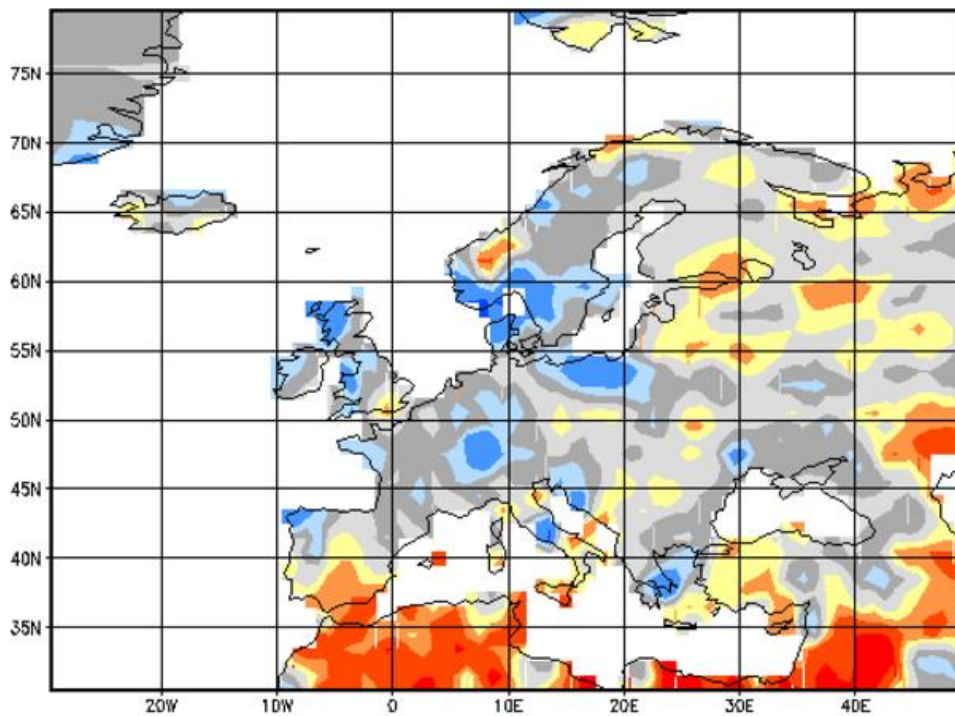
Precipitation in percentage of normal
Gauge-Based Analysis 1.0 degree, reference period: 1961-1990

From: Deutscher Wetterdienst / GPCC

December 1998 - February 1999



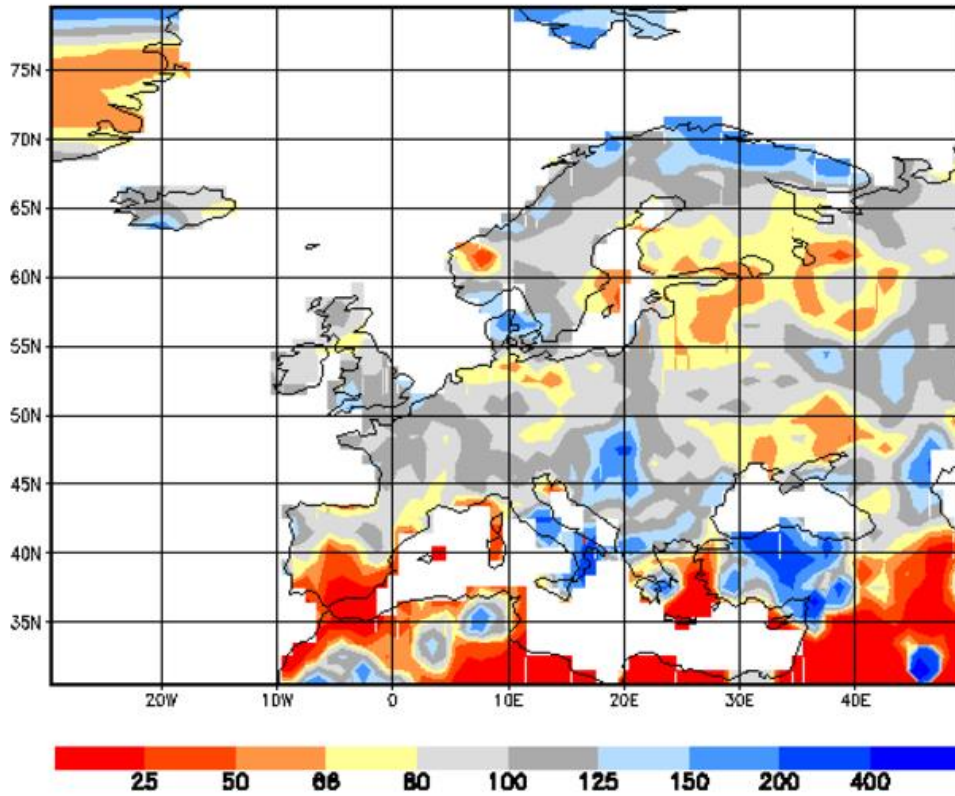
March 1999 - May 1999



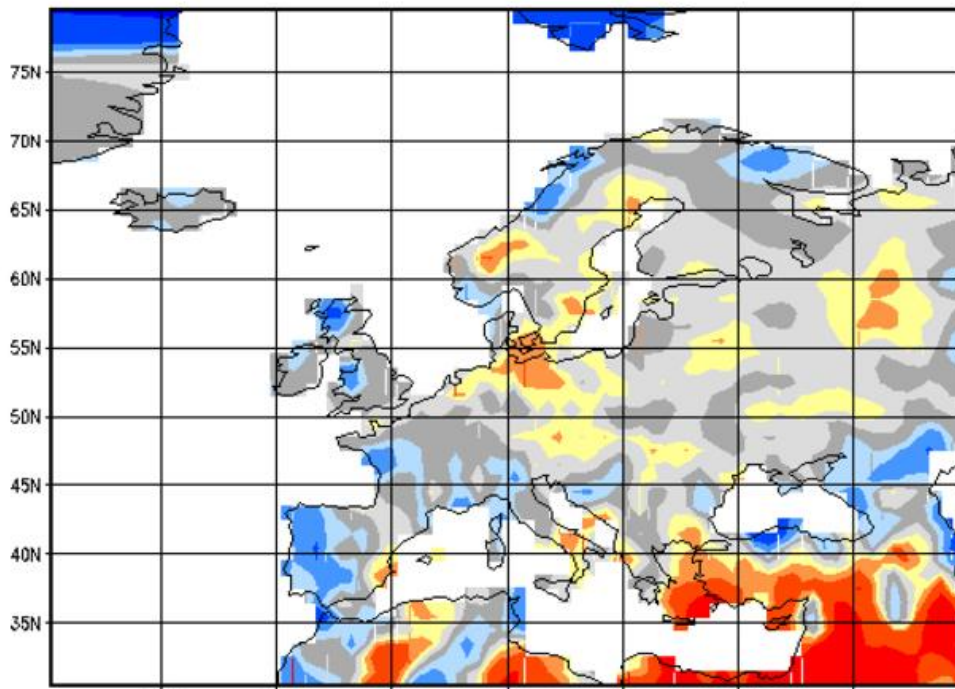
Precipitation in percentage of normal
 Gauge-Based Analysis 1.0 degree, reference period: 1961-1990

From: Deutscher Wetterdienst / GPCC

June 1999 - August 1999



September 1999 - November 1999



Monthly and Annual Tables

Temperature and precipitation values with departures from their 1961-1990 means

WMO No.	Station	January 1999				February 1999			
		Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	Temp. mean	(°C) dep.	Prec. Sum	(mm) dep.
01008	Svalbard	-10.0	5.4	6	-8	-12.8	2.9	2	-17
01025	Tromsø	-3.2	0.8	61	-20	-3.9	-0.2	50	-36
01492	Oslo-Blindern	-2.2	2.1	92	43	-2.4	1.6	36	0
02196	Haparanda	-13.1	-1.0	61	17	-11.3	0.0	46	14
02485	Stockholm	-1.2	1.6	48	9	-1.6	1.4	30	3
02974	Helsinki-Vantaa	-5.9	1.0	49	8	-7.2	-0.4	63	32
03091	Aberdeen	4.2	1.3	50	-30	3.4	0.3	51	-1
03772	London-Heathrow	6.6	2.4	69	17	6.0	1.5	21	-14
03967	Dublin (Casement)	5.5	1.1	87	21	5.8	1.4	35	-16
04030	Reykjavik	0.1	0.6	78	2	-1.3	-1.7	83	12
04320	Danmarkshavn	-24.1	-1.0	27	16	-21.2	3.1	48	37
04360	Angmagssalik	-6.2	1.3	71	-41	-8.1	-0.4	61	-30
06186	København-Landb.	2.2	1.7	48	-3	0.9	0.4	30	-1
06260	De Bilt	5.2	3.0	96	30	3.1	0.6	70	21
06447	Uccle	5.4	2.8	124	57	3.1	-0.4	76	23
06590	Luxembourg	2.9	2.7	54	-17	1.2	-0.2	49	-11
06660	Zürich	2.1	2.2	54	-16	-0.4	-1.3	176	103
06700	Genève	2.6	1.9	58	-22	1.7	-0.3	109	28
07510	Bordeaux	7.5	1.7	69	-31	6.9	-0.2	92	7
07650	Marseille	7.5	0.8	103	57	6.5	-1.4	<1	-54
08222	Madrid	6.0	0.0	14	-32	7.6	0.2	11	-35
08314	Mahon / Menorca	11.1	0.4	53	-8	9.8	-0.9	34	-19
08495	Gibraltar	13.4	0.0	70	-51	13.6	-0.2	32	-68
08515	St. Maria / Acores	15.4	1.0	67	-33	15.5	1.5	3	-83
08535	Lisboa	10.9	-0.5	75	-35	11.6	-0.7	11	-100
10384	Berlin-Tempelhof	3.2	3.4	35	-8	1.6	0.8	63	29
11035	Wien-Hohe Warte	0.7	1.4	17	-21	1.1	-0.2	113	71
11518	Praha-Ruzyně	0.4	2.8	28	5	-1.4	-0.6	20	-3
11903	Slac	-1.7	2.2	18	-26	-1.8	-0.7	50	5
12160	Elblag	0.0	2.4	39	-8	-1.4	0.8	51	26
12375	Warszawa-Okecie	-0.2	3.1	21	-1	-1.3	0.7	29	8
12843	Budapest-Lorinc	-0.8	0.8	8	-24	0.7	-0.4	42	10
13274	Beograd	1.9	1.5	51	2	2.4	-0.3	63	19
14015	Ljubljana	0.6	1.7	58	-24	0.8	-0.6	117	37
14445	Split	8.2	0.8	72	-11	6.4	-1.8	50	-18
15420	Bucuresti	-0.2	2.2	37	-3	0.7	0.8	20	-16
15614	Sofia	-0.6	1.0	22	-5	-0.4	-0.9	57	24
16090	Verona	2.3	1.1	13	-34	3.2	-0.8	5	-42
16158	Pisa	5.7	-0.4	67	-8	5.6	-1.5	38	-35
16597	Luqa / Malta	12.8	0.6	44	-45	11.3	-1.1	40	-21
16716	Athens (Hellinikon)	10.9	0.7	27	-17	10.8	0.2	14	-29
16754	Heraklion / Kreta	12.6	0.6	79	-11	12.4	0.3	48	-29
17040	Rize	8.2	1.9	129	-88	7.9	1.3	153	-20
17062	Istanbul-Goztepe	7.2	1.6	32	-67	6.8	0.9	123	56
17130	Ankara / Central	3.3	3.2	28	-19	3.2	1.3	86	50
17170	Van	0.3	4.5	8	-27	0.4	3.8	25	-9
17609	Larnaca	13.1	1.6	61	-4	12.6	0.9	40	-17
22113	Murmansk	-15.3	-3.6	18	-15	-12.8	-1.6	16	-6
26038	Tallina	-3.4	2.1	81	36	-4.8	0.9	55	26
26629	Kaunas	-2.1	2.9	41	4	-4.1	0.2	55	28
26730	Vilnius	-2.7	3.4	33	-8	-4.0	0.8	56	18
26850	Minsk	-3.1	3.8	23	-17	-4.6	1.2	59	25
27199	Wjatka (Kirov)	-13.9	0.3	72	34	-9.3	2.5	56	28
27612	Moskva	-4.6	4.7	73	28	-6.3	1.4	53	16
33345	Kiev	-2.2	3.4	48	1	-1.5	2.7	38	-8
33815	Chisinau	1.8	5.1	43	3	0.5	2.2	60	22
34300	Charkov (Kharkiv)	-1.7	5.2	44	-11	-1.5	4.2	49	17
34880	Astrahan'	-1.7	3.7	7	-6	0.2	5.1	11	1
35188	Akmola	-11.6	4.2	15	-2	-9.2	6.7	8	-6
40080	Damascus	7.2	1.0	26	-9	9.0	1.1	86	54
40100	Beyrouth	15.2	1.6	135	-87	15.6	2.1	38	-98
40180	Tel Aviv (Airport)	13.7	1.4	114	-35	14.0	1.1	69	-29
40270	Amman	9.9	0.8	29	-35	10.5	0.5	58	-6
60030	Las Palmas /Gr.Can	18.5	1.0	22	-3	18.4	0.6	3	-24

WMO No.	March 1999				April 1999				May 1999			
	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	-7.8	6.9	4	-17	-10.6	1.1	9	-3	-2.0	1.7	3	-3
01025	-1.7	0.5	41	-23	1.2	0.5	67	7	5.4	0.5	43	-5
01492	0.3	0.5	121	75	6.7	2.1	47	5	9.6	-1.2	41	-11
02196	-5.1	1.7	33	-2	1.5	2.0	15	-14	5.3	-0.8	29	-2
02485	1.6	1.5	45	19	7.5	2.9	76	46	10.1	-0.6	16	-14
02974	-1.4	1.5	26	-8	5.7	2.8	55	18	8.0	-1.9	11	-24
03091	6.1	1.5	37	-24	8.2	1.8	54	1	10.1	1.1	44	-15
03772	8.7	2.2	26	-21	10.6	1.7	35	-10	14.6	2.1	36	-15
03967	7.3	1.3	48	-1	9.2	1.4	47	0	12.0	1.5	45	-13
04030	-1.0	-1.5	21	-62	2.8	-0.1	26	-32	6.7	0.4	87	43
04320	-21.0	2.3	23	6	-16.6	0.7	3	-7	-5.2	1.4	10	6
04360	-7.3	0.8	13	-75	-2.6	1.4	38	-35	2.0	1.4	50	-7
06186	3.6	1.0	37	-5	8.5	1.9	27	-15	11.1	-0.9	38	-5
06260	7.3	2.3	86	23	9.8	1.8	62	10	14.2	1.9	52	-9
06447	7.9	2.1	72	0	10.1	1.3	71	14	15.0	2.1	40	-31
06590	6.1	1.8	64	-4	9.0	1.2	62	2	14.4	2.3	32	-45
06660	6.1	1.7	56	-17	9.0	1.0	108	14	15.0	2.7	287	183
06700	7.1	2.1	75	-3	9.7	1.0	117	52	16.7	3.8	83	9
07510	10.7	2.3	56	-18	12.4	1.4	96	24	17.9	3.3	89	14
07650	11.4	1.5	53	10	13.6	0.7	56	10	19.3	2.2	26	-16
08222	10.8	0.8	23	-10	13.8	1.6	33	-21	18.0	1.9	48	7
08314	12.8	1.0	15	-34	15.3	1.6	4	-41	19.5	2.5	24	-9
08495	15.2	0.2	77	2	17.6	1.4	33	-27	19.4	0.9	10	-25
08515	15.1	0.5	50	-29	17.0	1.8	12	-43	17.3	0.6	133	103
08535	14.3	0.6	94	25	16.2	1.1	35	-29	17.8	0.4	86	47
10384	5.7	1.5	47	10	10.4	1.8	38	-3	14.9	1.0	27	-29
11035	7.0	1.7	32	-9	11.7	1.5	48	-2	15.9	1.1	91	30
11518	4.8	1.8	20	-8	8.9	1.2	20	-18	13.8	1.1	43	-34
11903	4.5	1.5	26	-17	10.3	1.8	63	16	13.7	0.0	63	0
12160	4.6	2.5	18	-17	9.0	2.2	86	44	11.7	-1.2	88	47
12375	4.6	2.6	23	-5	10.0	2.2	76	44	12.6	-0.8	47	-12
12843	7.3	1.7	22	-7	12.8	1.7	44	6	16.3	0.3	98	43
13274	9.1	1.9	16	-34	13.4	1.0	73	14	17.5	0.3	63	-8
14015	7.8	2.4	82	-16	11.5	1.6	164	55	16.7	2.1	136	14
14445	11.1	0.7	69	-6	14.6	0.7	90	24	20.0	1.4	141	85
15420	6.2	1.4	22	-16	11.9	0.6	106	60	15.6	-1.1	53	-17
15614	5.8	1.2	44	6	10.9	1.0	40	-10	15.3	1.0	81	8
16090	8.8	0.7	69	12	12.8	0.7	75	13	19.0	2.2	56	-24
16158	10.1	0.6	45	-31	12.3	-0.2	67	-12	17.5	1.2	21	-38
16597	13.6	0.2	36	-4	16.6	1.1	1	-22	21.6	2.5	0	-7
16716	13.0	0.4	156	115	17.0	0.9	9	-16	22.0	1.4	<1	-15
16754	14.0	0.6	80	24	17.2	0.9	14	-16	21.9	2.1	2	-14
17040	8.8	0.9	137	-10	12.2	0.6	78	-28	16.0	0.2	191	89
17062	9.1	1.6	53	-9	14.4	2.4	22	-27	17.5	1.0	4	-27
17130	6.6	0.5	55	19	12.1	0.9	14	-34	16.9	1.4	7	-48
17170	2.6	1.5	63	20	8.4	1.1	49	-5	14.9	2.2	42	-7
17609	14.8	1.5	33	-16	17.7	0.3	18	7	22.9	2.0	0	-7
22113	-5.4	1.4	20	0	-0.2	1.7	29	-8	0.5	-3.3	20	-12
26038	0.1	2.3	19	-10	6.4	3.0	65	29	7.8	-1.9	5	-32
26629	2.1	2.3	41	9	9.3	3.3	42	1	10.7	-2.0	32	-24
26730	1.4	2.0	40	1	9.2	3.5	24	-22	10.2	-2.3	14	-48
26850	1.2	2.6	82	40	10.0	4.0	21	21	10.7	-2.2	23	-39
27199	-6.2	-1.1	18	-11	5.6	2.4	29	-7	6.3	-4.8	50	1
27612	-0.8	1.4	37	3	9.7	3.9	27	-13	8.7	-4.2	38	-20
33345	3.2	2.5	43	4	11.6	2.9	20	-29	12.8	-2.3	48	-5
33815	5.2	2.3	30	-5	11.4	1.2	103	61	15.0	-1.1	34	-17
34300	3.1	3.4	25	-2	12.1	3.2	18	-18	12.8	-2.8	43	-4
34880	3.4	2.1	<1	-13	12.0	0.9	20	2	14.8	-3.5	18	-6
35188	-15.4	-7.3	26	12	5.0	0.1	17	-5	15.4	2.3	22	-11
40080	12.1	0.9	4	-20	16.8	1.1	2	-10	22.9	2.5	0	-5
40100	17.1	2.0	66	-54	17.0	-0.8	52	1	22.8	2.4	0	-20
40180	16.5	1.6	27	-35	18.7	0.5	11	-12	23.2	2.1	0	-3
40270	13.2	0.3	15	-29	17.3	-0.5	4	-12	23.5	1.6	0	-3
60030	19.3	1.0	6	-5	20.6	1.8	<1	-6	21.1	1.3	0	-2

WMO No.	Station	June 1999				July 1999			
		Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	Temp. mean	(°C) dep.	Prec. sum	(mm) dep.
01008	Svalbard	2.7	0.5	22	12	6.4	0.4	10	-3
01025	Tromsø	10.3	1.0	51	-2	11.0	-0.7	162	90
01492	Oslo-Blindern	14.0	-1.2	143	78	17.4	1.0	66	-18
02196	Haparanda	14.1	1.3	73	32	15.8	0.3	46	-4
02485	Stockholm	17.2	1.6	36	-9	20.2	3.0	18	-54
02974	Helsinki-Vantaa	18.4	3.5	25	-19	19.1	2.5	25	-48
03091	Aberdeen	12.0	-0.1	74	21	14.9	1.1	48	-13
03772	London-Heathrow	15.6	-0.1	98	47	19.6	1.8	9	-37
03967	Dublin (Casement)	12.3	-1.0	65	17	16.2	1.3	24	-30
04030	Reykjavik	9.0	-0.1	47	-4	10.9	0.3	66	15
04320	Danmarkshavn	0.5	-0.2	7	2	4.8	1.1	19	5
04360	Angmagssalik	4.8	0.7	99	47	7.0	0.6	3	-46
06186	København-Landb.	15.1	-1.0	85	31	7.0	1.5	18	-51
06260	De Bilt	15.0	-0.2	89	21	19.1	2.3	37	-38
06447	Uccle	15.6	-0.1	83	4	19.7	2.2	35	-40
06590	Luxembourg	15.3	0.0	105	36	19.4	2.3	49	-18
06660	Zürich	15.1	-0.4	202	75	18.7	1.0	101	-17
06700	Genève	17.1	0.7	98	11	21.0	2.0	87	24
07510	Bordeaux	18.7	0.9	66	10	21.9	1.7	63	16
07650	Marseille	21.6	0.7	4	-24	25.0	1.2	29	15
08222	Madrid	22.1	1.5	24	-3	26.3	1.9	20	7
08314	Mahon / Menorca	21.9	0.9	3	-12	25.1	0.8	0	-5
08495	Gibraltar	22.3	1.2	<1	-10	24.5	0.8	1	0
08515	St. Maria / Acores	19.4	0.7	11	-11	22.6	1.8	16	-9
08535	Lisboa	20.6	0.4	<1	-20	22.5	0.1	7	2
10384	Berlin-Tempelhof	17.2	-0.2	45	-30	21.4	2.6	27	-25
11035	Wien-Hohe Warte	18.2	0.2	62	-12	21.0	1.1	81	19
11518	Praha-Ruzyně	15.1	-0.8	49	-24	18.7	1.2	99	33
11903	Šliac	18.0	1.4	115	29	19.8	1.6	179	120
12160	Elbląg	16.9	1.5	76	-18	19.5	2.7	62	-32
12375	Warszawa-Okęcie	18.0	1.4	122	50	20.6	2.7	24	-43
12843	Budapest-Lorinc	19.6	0.5	135	72	22.1	1.2	131	79
13274	Beograd	20.3	0.2	142	52	21.9	0.2	262	196
14015	Ljubljana	19.1	1.3	164	9	20.9	1.0	204	82
14445	Split	24.2	1.7	162	110	26.0	0.6	26	-2
15420	Bucuresti	22.2	2.0	52	-25	24.0	2.0	80	16
15614	Sofia	19.1	1.4	86	14	21.5	1.5	57	1
16090	Verona	21.6	0.8	166	78	24.2	0.7	52	-9
16158	Pisa	20.4	0.6	58	14	24.1	1.3	3	-20
16597	Luqa / Malta	25.4	2.4	0	-3	26.3	0.4	0	0
16716	Athens (Hellinikon)	27.6	2.5	<1	-6	29.3	1.5	61	56
16754	Heraklion / Kreta	25.6	2.1	0	-3	26.9	1.2	0	-1
17040	Rize	21.5	1.6	90	-38	24.9	2.7	168	32
17062	Istanbul-Goztepe	21.9	0.8	60	39	25.4	2.2	15	-4
17130	Ankara / Central	20.0	0.4	35	-2	24.4	1.5	45	31
17170	Van	20.0	2.4	7	-14	22.8	0.9	0	-4
17609	Larnaca	25.6	1.3	0.5	-0.5	28.1	1.2	0	0
22113	Murmansk	11.8	2.4	25	-28	13.1	0.3	105	45
26038	Tallina	17.5	3.0	56	3	18.3	2.0	45	-34
26629	Kaunas	19.1	3.1	54	-21	20.0	2.9	31	-37
26730	Vilnius	19.6	3.8	54	-23	20.5	3.6	29	-49
26850	Minsk	21.0	4.9	90	7	21.3	4.0	54	-34
27199	Wjatka (Kirov)	18.6	3.0	14	-50	19.5	1.3	86	0
27612	Moskva	21.4	4.8	10	-66	21.7	3.6	68	-24
33345	Kiev	22.6	4.4	47	-26	22.7	3.4	81	-7
33815	Chisinau	22.4	3.0	40	-35	24.5	3.6	4	-65
34300	Charkov (Kharkiv)	22.8	3.9	25	-33	25.0	4.7	31	-29
34880	Astrahan'	23.8	0.9	10	-12	25.8	0.5	71	48
35188	Akmola	15.1	-3.9	119	84	22.2	0.9	41	-9
40080	Damascus	25.3	0.7	0	-1	27.1	0.5	0	0
40100	Beyrouth	24.9	1.3	0	-1	27.0	1.5	0	0
40180	Tel Aviv (Airport)	25.3	1.3	0	0	27.4	1.7	0	0
40270	Amman	24.1	-0.9	0	0	26.4	0.0	0	0
60030	Las Palmas /Gr.Can	22.6	1.0	0	-0.5	24.5	1.4	0	0

WMO No.	August 1999				September 1999				October 1999			
	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	4.9	0.1	16	-9	2.8	2.3	35	12	-6.2	-0.7	13	-2
01025	9.2	-1.7	151	69	9.0	2.2	115	21	4.5	1.6	96	-29
01492	15.9	0.7	30	-60	14.2	3.4	163	73	6.4	0.0	94	10
02196	11.9	-1.4	79	16	9.9	2.0	28	-35	3.7	1.2	48	-16
02485	17.1	0.9	48	-18	16.1	4.9	64	9	8.1	0.6	23	-27
02974	15.4	0.4	66	-14	12.8	2.8	40	-33	6.7	1.3	98	25
03091	13.6	0.0	35	-40	13.8	2.1	84	16	10.0	0.9	68	-10
03772	18.4	1.0	125	74	17.2	2.2	87	36	11.8	0.1	49	-9
03967	14.9	0.3	91	13	14.3	1.3	158	89	10.4	0.1	49	-19
04030	11.3	1.0	65	3	8.5	1.1	72	5	5.6	1.2	115	29
04320	1.1	-1.3	11	-3	-3.5	0.7	15	4	-14.5	-0.9	7	-5
04360	6.0	0.0	124	63	4.3	1.2	42	-26	1.5	2.3	70	-12
06186	17.4	0.4	118	55	16.7	3.1	25	-37	9.7	-0.2	44	-15
06260	17.5	0.8	94	23	17.4	3.4	68	-1	10.6	0.1	43	-29
06447	18.1	0.8	91	28	17.7	3.2	43	-16	10.7	-0.2	47	-23
06590	17.7	1.0	73	2	16.9	3.2	69	2	9.1	-0.2	62	-12
06660	17.9	1.0	135	1	16.7	2.6	129	35	9.5	0.0	52	-20
06700	19.9	1.8	123	42	18.2	3.4	153	71	11.4	1.4	135	61
07510	21.5	1.6	85	32	19.5	1.6	169	95	14.6	0.6	96	12
07650	24.8	1.6	10	-17	22.1	1.8	122	75	16.6	0.5	127	49
08222	25.5	1.6	2	-7	20.1	-0.4	38	8	14.6	-0.2	109	64
08314	26.4	1.9	0	-26	24.3	2.1	41	-14	20.8	2.3	31	-53
08495	24.5	0.3	<1	-5	22.8	0.0	27	12	19.7	0.2	149	85
08515	24.0	1.8	25	-15	22.1	0.7	49	-8	19.4	0.1	38	-46
08535	22.2	-0.6	24	18	20.7	-1.0	129	103	18.1	-0.4	213	133
10384	19.1	0.7	42	-19	18.5	3.9	11	-35	10.1	0.1	17	-19
11035	19.1	-0.1	73	8	17.5	2.1	59	14	10.7	0.6	15	-26
11518	17.1	0.1	21	-49	16.6	3.3	54	14	8.4	0.1	21	-9
11903	17.6	0.3	40	-31	16.5	3.1	17	-41	8.3	0.0	43	-7
12160	17.1	0.4	99	18	16.2	3.5	19	-51	8.4	-0.5	90	37
12375	17.9	0.6	29	-34	15.8	2.6	20	-23	8.3	0.0	41	3
12843	20.3	0.0	51	0	18.9	2.5	15	-25	11.0	0.1	36	2
13274	22.7	1.4	13	-39	19.6	1.9	86	35	12.4	0.0	56	16
14015	20.4	1.3	121	-23	18.0	2.5	74	-56	11.8	1.4	87	-28
14445	26.6	1.4	14	-36	22.9	1.5	56	-4	17.8	0.9	63	-16
15420	21.7	0.5	136	78	17.3	0.4	125	83	10.6	-0.2	82	50
15614	21.7	2.3	12	-40	17.3	1.5	32	-7	11.4	1.0	43	6
16090	23.6	0.9	52	-32	20.6	1.8	102	39	14.2	1.0	98	19
16158	25.0	2.5	26	-31	21.6	2.1	148	59	16.3	1.0	130	10
16597	29.3	3.0	20	13	25.8	1.7	42	2	22.9	2.2	10	-80
16716	29.5	1.9	<1	-4	25.0	0.8	8	-2	21.8	2.5	30	-22
16754	27.6	2.0	0	-1	24.7	1.6	2	-16	22.3	2.6	4	-72
17040	24.9	2.7	215	32	19.3	-0.1	297	76	15.8	0.4	409	137
17062	24.6	1.6	51	25	20.7	1.0	28	-13	16.2	0.9	35	-36
17130	23.8	1.2	31	19	18.8	0.5	21	2	13.9	1.3	43	16
17170	23.8	2.6	2	-5	17.5	0.7	17	3	11.6	1.5	82	34
17609	28.4	1.3	0.5	0.5	26.2	1.1	9	9	23.1	1.8	5	-14
22113	9.8	-1.2	179	114	8.1	1.4	59	7	3.5	2.5	92	50
26038	15.5	0.2	37	-47	13.4	2.6	25	-57	7.4	1.1	136	66
26629	16.8	0.5	86	23	14.4	2.3	29	-30	7.2	0.3	79	28
26730	16.6	0.3	53	-19	13.9	2.3	60	-5	6.8	0.2	56	3
26850	17.7	1.2	48	-24	13.8	2.1	46	-14	6.9	0.6	24	-25
27199	14.4	-1.1	89	24	9.3	0.1	32	-39	6.0	4.3	28	-34
27612	16.4	0.0	89	15	11.8	0.9	48	-16	7.4	2.4	33	-25
33345	19.3	0.7	132	63	15.8	1.9	8	-39	8.2	0.1	52	17
33815	22.2	1.7	27	-18	17.9	1.7	26	-22	10.5	0.4	44	17
34300	19.9	0.4	45	-5	15.3	1.2	12	-29	8.8	1.5	36	1
34880	26.0	2.7	79	60	16.9	-0.4	10	-16	11.9	2.8	62	45
35188	20.4	2.7	9	-31	13.3	1.3	12	-12	7.5	4.7	11	-19
40080	27.6	1.4	0	0	23.9	0.6	0	0	19.4	0.8	0	-12
40100	28.1	1.7	0	-1	27.3	2.1	0	-5	24.4	1.8	77	23
40180	28.4	2.3	0	0	27.0	2.2	0	0	23.8	1.8	<1	-25
40270	27.5	1.1	0	0	24.5	-0.7	0	-0.3	21.2	-0.6	0	-7
60030	25.7	1.8	3	3	24.8	1.0	9	1	23.1	0.6	16	0

WMO No.	Station	November 1999				December 1999			
		Temp. mean	(°C) dep.	Prec. sum	(mm) dep.	Temp. Mean	(°C) dep.	Prec. sum	(mm) dep.
01008	Svalbard	-3.9	6.6	37	24	-10.1	3.2	11	-1
01025	Tromsø	3.2	4.0	140	36	-4.1	-1.1	118	14
01492	Oslo-Blindern	4.1	3.4	27	-48	-2.7	0.1	68	12
02196	Haparanda	0.6	4.7	93	35	-10.3	-0.8	46	14
02485	Stockholm	4.8	2.2	18	-35	-0.9	0.1	117	71
02974	Helsinki-Vantaa	2.5	2.4	37	-35	-2.3	1.8	109	51
03091	Aberdeen	6.9	1.7	53	-22	2.9	-0.8	92	19
03772	London-Heathrow	8.7	1.5	31	-24	5.7	0.6	77	20
03967	Dublin (Casement)	7.7	1.0	59	-11	4.9	-0.4	84	7
04030	Reykjavik	2.0	0.8	72	-1	-1.0	-0.8	59	-19
04320	Danmarkshavn	-14.4	5.5	22	12	-21.9	-0.1	9	-4
04360	Angmagssalik	-3.2	1.5	130	34	-6.6	0.6	27	-76
06186	København-Landb.	5.9	0.4	11	-51	2.6	0.4	67	9
06260	De Bilt	6.7	0.8	60	-21	4.8	1.6	146	66
06447	Uccle	6.2	0.1	33	-43	4.2	0.7	172	96
06590	Luxembourg	3.4	-0.6	41	-38	2.2	1.0	163	85
06660	Zürich	2.1	-2.0	109	24	2.0	1.3	140	63
06700	Genève	4.4	-0.6	62	-30	3.5	1.6	132	45
07510	Bordeaux	7.8	-0.9	58	-32	7.6	1.2	160	65
07650	Marseille	9.2	-1.3	76	19	6.8	-0.5	11	-41
08222	Madrid	7.8	-1.6	33	-31	5.9	-0.5	29	-20
08314	Mahon / Menorca	13.6	-0.8	128	51	11.6	-0.2	44	-36
08495	Gibraltar	15.8	-0.3	43	-98	14.5	0.4	35	-111
08515	St. Maria / Acores	16.5	-0.9	184	82	16.7	1.3	56	-39
08535	Lisboa	13.4	-1.1	41	-73	12.2	0.4	70	-38
10384	Berlin-Tempelhof	4.3	-0.6	26	-23	2.8	1.4	71	-18
11035	Wien-Hohe Warte	3.5	-1.3	52	2	1.6	0.6	64	20
11518	Praha-Ruzyně	2.0	-0.8	26	-6	0.6	1.2	23	-3
11903	Šliac	2.3	-0.7	31	-36	-2.6	-0.9	60	4
12160	Elbląg	2.9	-0.4	52	-4	1.1	0.8	52	0
12375	Warszawa-Okęcie	3.0	-0.2	31	-11	0.7	1.6	22	-10
12843	Budapest-Lorinc	3.2	-1.6	99	47	0.4	0.0	65	25
13274	Beograd	5.1	-1.9	73	19	2.6	0.3	153	95
14015	Ljubljana	3.1	-1.5	108	-27	0.7	0.7	189	88
14445	Split	11.9	-0.4	81	-29	9.1	0.1	121	16
15420	Bucuresti	4.4	-0.8	12	-37	1.6	1.4	68	25
15614	Sofia	4.9	-0.1	39	-8	2.0	1.5	83	44
16090	Verona	6.8	-0.2	61	-12	2.1	-0.1	29	-23
16158	Pisa	10.0	-0.4	144	20	7.4	0.6	91	6
16597	Luqa / Malta	18.1	1.1	391	311	14.7	0.7	104	-5
16716	Athens (Hellinikon)	15.8	0.3	24	-26	14.0	1.8	45	-26
16754	Heraklion / Kreta	18.3	1.7	6	-53	15.4	1.6	123	49
17040	Rize	10.9	-0.7	278	28	9.1	0.8	53	-189
17062	Istanbul-Goztepe	11.5	-0.1	118	29	10.8	2.7	88	-34
17130	Ankara / Central	6.7	-0.4	31	-2	5.0	2.4	39	-10
17170	Van	4.6	0.6	39	-3	1.0	1.9	5	-29
17609	Larnaca	17.6	1.2	27	-17	14.9	1.7	51	-25
22113	Murmansk	-3.3	1.8	37	-3	-9.4	-0.1	35	-3
26038	Tallina	2.8	1.6	33	-35	-0.8	2.1	109	54
26629	Kaunas	1.2	-0.9	35	-18	-0.5	1.9	57	13
26730	Vilnius	0.3	-0.9	50	-7	-0.9	2.0	50	-5
26850	Minsk	-0.8	-1.6	46	-6	-1.2	2.6	55	2
27199	Wjatka (Kirov)	-9.8	-5.1	48	-4	-6.3	4.0	60	15
27612	Moskva	-4.9	-3.8	40	-18	-1.7	4.4	55	3
33345	Kiev	-0.2	-2.3	47	-4	-0.2	2.1	58	6
33815	Chisinau	2.8	-1.6	44	5	1.4	1.7	59	21
34300	Charkov (Kharkiv)	-2.1	-3.4	33	-11	-0.3	3.1	45	0
34880	Astrahan'	-0.1	-3.4	26	7	1.4	3.3	8	-7
35188	Akmola	-7.9	-2.0	36	14	-10.0	2.6	3	-14
40080	Damascus	11.9	-0.4	0	-27	7.7	0.1	17	-29
40100	Beyrouth	20.3	1.6	47	-57	17.4	2.6	72	-102
40180	Tel Aviv (Airport)	19.6	1.6	28	-40	15.2	1.4	29	-109
40270	Amman	15.8	0.2	<1	-29	11.7	1.0	3	-47
60030	Las Palmas /Gr.Can	21.3	0.6	24	3	18.7	0.4	32	10

Year 1999

WMO No.	Station	Temp. mean	(°C) dep.	Prec. sum	(mm) dep.
01008	Svalbard	-3.9	2.5	168	-15
01025	Tromsø	3.4	0.6	1095	122
01492	Oslo-Blindern	6.8	1.0	928	159
02196	Haparanda	1.9	0.8	615	63
02485	Stockholm	8.3	1.7	539	0
02974	Helsinki-Vantaa	6.0	1.5	604	-47
03091	Aberdeen	8.8	0.9	690	-98
03772	London-Heathrow	12.0	1.4	663	64
03967	Dublin (Casement)	10.0	0.8	792	57
04030	Reykjavik	4.5	0.1	791	-9
04320	Danmarkshavn	-11.3	0.9	201	69
04360	Angmagssalik	-0.7	1.0	728	-204
06186	København-Landb.	9.4	0.7	548	-88
06260	De Bilt	10.9	1.5	903	98
06447	Uccle	11.1	1.2	887	69
06590	Luxembourg	9.8	1.2	823	-18
06660	Zürich	9.5	0.8	1549	428
06700	Genève	11.1	1.6	1232	288
07510	Bordeaux	13.9	1.2	1099	176
07650	Marseille	15.4	0.6	617	83
08222	Madrid	14.9	0.6	384	-73
08314	Mahon / Menorca	17.7	1.0	377	-206
08495	Gibraltar	18.6	0.4	478	-297
08515	St. Maria / Acores	18.4	0.9	644	-131
08535	Lisboa	16.7	-0.1	786	33
10384	Berlin-Tempelhof	10.8	1.4	449	-135
11035	Wien-Hohe Warte	10.7	0.7	707	94
11518	Praha-Ruzyne	8.8	0.9	424	-102
11903	Slac	8.7	0.8	705	16
12160	Elblag	8.8	1.2	732	42
12375	Warszawa-Okęcie	9.2	1.4	485	-34
12843	Budapest-Lorinc	11.0	0.6	746	228
13274	Beograd	12.4	0.5	1051	367
14015	Ljubljana	11.0	1.2	1504	111
14445	Split	16.6	0.6	945	115
15420	Bucuresti	11.3	0.8	793	198
15614	Sofia	10.7	1.0	596	33
16090	Verona	13.3	0.7	778	-15
16158	Pisa	14.7	0.6	838	-66
16597	Luqa / Malta	19.9	1.2	688	139
16716	Athens (Hellinikon)	19.7	1.2	376	7
16754	Heraklion / Kreta	19.9	1.4	358	-143
17040	Rize	15.0	1.0	2198	26
17062	Istanbul-Goztepe	15.5	1.4	629	-68
17130	Ankara / Central	12.9	1.2	435	22
17170	Van	10.7	2.0	339	-46
17609	Larnaca	20.4	1.3	245	-84
22113	Murmansk	0.0	0.1	635	157
26038	Tallina	6.7	1.6	666	-1
26629	Kaunas	7.8	1.4	582	-26
26730	Vilnius	7.6	1.6	519	-164
26850	Minsk	7.7	1.9	571	-106
27199	Wjatka (Kirov)	2.9	0.5	582	-43
27612	Moskva	6.6	1.6	571	-117
33345	Kiev	9.3	1.6	622	-27
33815	Chisinau	11.3	1.7	514	-33
34300	Charkov (Kharkiv)	9.5	2.1	395	-124
34880	Astrahan'	11.2	1.2	323	103
35188	Akmola	3.7	1.0	319	1
40080	Damascus	17.6	0.9	135	-59
40100	Beyrouth	21.4	1.7	487	-401
40180	Tel Aviv (Airport)	21.1	1.6	279	-288
40270	Amman	18.6	0.2	109	-166
60030	Las Palmas /Gr.Can	21.6	1.0	116	-23

Monthly Surveys

January 1999:

- **Extremely warm in Central Europe, bitterly cold in the North**
- **Mostly very dry, especially in the Middle East**
- **Destructive winter storm on the Canary Isles**

The year started warm in most parts of the Region with temperature anomalies surpassing +4 °C over Western Russia and Turkey. The mild conditions peaked towards the 6th when several places in Western and Central Europe noted all-time record January temperatures (e.g. London and Paris +16 °C, Jungfrauoch, Switzerland, 3580 m a.s.l., +3,3 °C). For Lithuania, it was the warmest month of the winter. For 13 days, the mean air temperature was positive and anomalies often exceeded +4 - 6 °C, up to +10 - 12 °C in the warmest period. In Estonia, the wet snow seriously wrecked power lines and damaged forests.

The wet and mild weather supported the generation of fog. Airports had to be closed in Central Europe on several occasions. Ljubljana, Slovenia, had 17 days with fog. At least 11 people were killed and 20 were injured in road accidents caused by foggy weather in Syria.

The warm conditions were on contrast to the cold weather in north-western Russia and northern Fennoscandia. On January 27, temperature dropped to -49 °C in Karesuando, Swedish Lapland, establishing a new record in a series from 1879. It is the lowest temperature at an official station in Sweden since February 1966 when Vuoggatjålme in south-western Lapland touched the national record (-53 °C). In Kittilä, northern Finland, a new absolute minimum temperature record of -51,5 °C, was recorded on January 28. On the same day, the second lowest ever recorded temperature in Norway occurred: -51,2 °C in Karasjok. The exceptional cold weather caused substantial problems to traffic, electric power supply and to the heating of houses. Shipping at Arkhangelsk port, Russia, was temporarily disrupted.

A wet belt stretched eastward from the UK over southern Sweden and the Baltic states. Heavy rain affected parts of Cumbria and North Wales, UK, on the 4th and 5th, and Cape Curig received 106 mm of rain in 24 hours. On the 11th and 12th, the Middle Volga region, was affected by heavy snow, with blizzards and gusts of up to 80 km/h. The city of Ulianovsk proclaimed a state of emergency. Heavy snowfall and icy winds caused havoc on the roads in parts of France and northern Spain around the 10th. Rain and flooding brought severe damage near Antalya, Turkey, on the 31st.

Elsewhere, dry conditions prevailed. In Hungary, the driest stations measured monthly sums around 10 mm and the country wide average of 16,3 mm was less than half of the climatological mean. Extremely dry conditions were also reported from Portugal and the Southeast of the Region (see figure 1.1 and 1.2). In Israel, rainfall amounts reached 60 - 80 % of normal in the northern and central parts and less than 50 % in the South. Dryness was even worse in Jordan where monthly precipitation amounted to less than 96 % of normal.

Strong winds occurred. In the town of Selsey in West Sussex, UK, a combination of high tides and gale force winds caused localized flooding in the town when the sea walls were breached. Malin Head, Ireland recorded the highest gust of the year on January 4 (154 km/h). In Galicia, Spain, a strong storm forced the fishing fleet to remain in port for two weeks.

Gusts exceeding 120 km/h haunted the Canary Islands on January 9 and 10. Storm and waves high up to 6 m caused losses above 400 Million US\$ to port installations, fish farms and infra-structure.

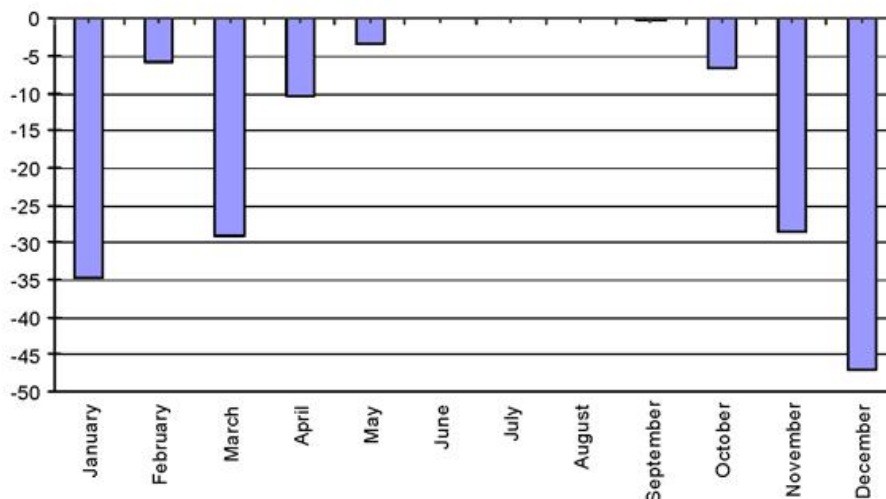


Fig. 1.1: Monthly rainfall anomalies in mm (reference period: 1923 - 1997) of Amman
From: Meteorological Department, Jordan

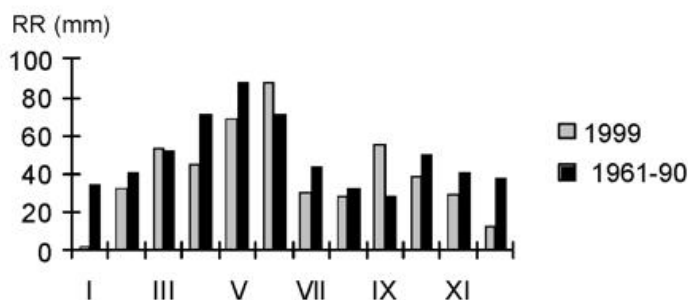


Fig. 1.2: Monthly rainfall totals and long-term means at Yerevan
From: Administration of Hydrometeorology, Armenia

February 1999:

- **Abundant snow and deadly avalanches in the Alps**
- **Very dry from the Iberian Peninsula to Greece**
- **Extremely warm in the Southeast**

From January 26 - February 24, enormous amounts of snow fell during several days in the Northern and Inner Alps (see figure 2.1) and snow depths in the mountains exceeded 5 - 7 meters in some regions (Switzerland: Braunwald (1330 m) recorded 723 cm, Säntis (2500 m) 735 cm). In the provinces of Tyrol and Vorarlberg, Austria, the monthly precipitation sums reached 300 - 400 % of normal. Kufstein, Tyrol, received 233 mm which is the highest monthly total in the last 50 years.

The snowfalls caused numerous avalanches, also in regions which had been considered as safe. A deadly avalanche hit Chamonix, France, on February 9. In Galtür, Tyrol, 38 people died on February 23. An avalanche swept away a holiday village near Evolène, Switzerland. All in all, there were at least 60 avalanche victims in the Alps. Many valleys were isolated and some of them during several weeks. More than 100 000 tourists were trapped in their ski resorts.

Around the middle of the month, snow related problems dominated from Spain to The Netherlands and from Germany to Ukraine and the Balkans. In Slovenia, the snow cover in the lowlands was between 30 and 90 cm. In eastern Slovakia, the maximum depth of snow came up to more than 50 cm in the lowlands and 120 – 140 cm in the mountain valleys. These are amongst the highest values since the beginning of snow registrations in 1921. Sicily had its first snow since 1981. Abundant snowfalls and blizzards were also reported from Lithuania and Estonia. The latter reported the greatest amount of snow in the 17 years' record. Two periods with severe blizzards occurred in the Middle Volga region. Wind speeds reached 97 km/h.

In the lowlands north of the Alps, snow, rainfalls and snowmelt caused landslides and flooding. Floods were also reported from north-eastern France and Germany. In the south-western parts of Turkey, heavy rain and strong winds caused considerable damage.

The precipitation was distributed unevenly. Excessive precipitation fell over

wide parts of northern Europe, it was extremely dry in Portugal and in Middle East. The northern and central parts of Israel received only 40 - 60 % of average, while rainfall amounts in the southern parts were above normal.

Winds with gusts of 159 km/h were recorded at Kirkwall, UK, on February 4. Strong gusts in Yorkshire caused the closure of the A 1 road where 20 lorries were overturned. At the same time in North and West Scotland around 8 000 homes were left without power as a result of the winds. On February 16/17, a severe winter storm caused wide-spread damage across northern Germany. On the island of Norderny, a tornado destroyed several buildings. Hurricane-like winds devastated towns and villages in northern Bulgaria on February 22/23.

While warm conditions prevailed from Ireland across southern Scandinavia to Western Russia (where anomalies were most extreme with values above +8 °C) subnormal temperatures dominated in the North, over the Alps and in the south-western parts of the Region.

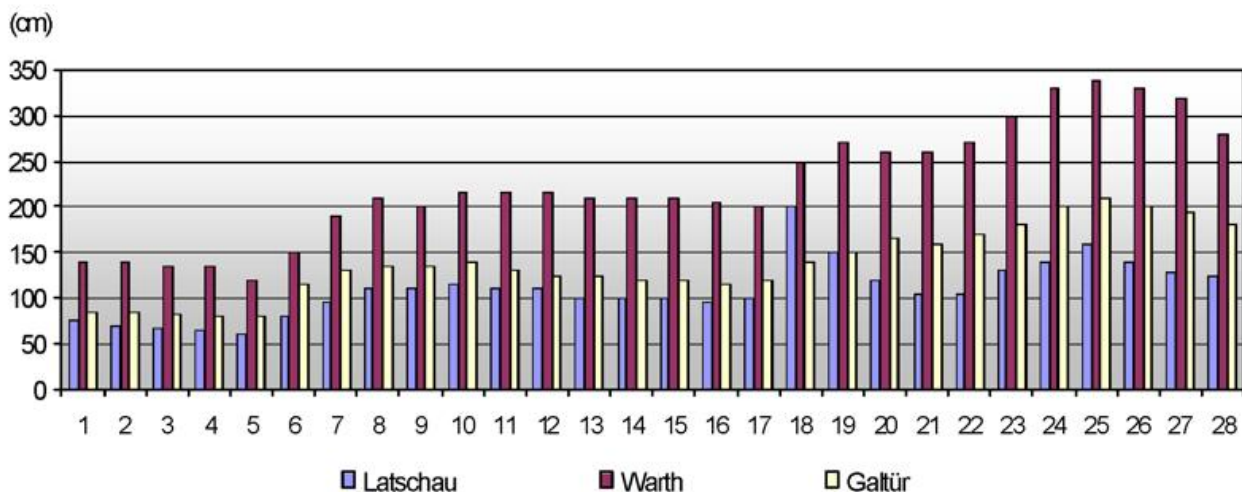


Fig. 2.1: Daily records of depth of snow (cm) at Latschau and Warth, Vorarlberg, and Galtür, Tyrol, in February 1999
From: Central Institute of Meteorology and Geodynamics – ZAMG, Austria

March 1999:

- **Mostly very mild**
- **Heavy flooding over northern Hungary and in the Carpathian mountains**

In Iceland, March became the coldest month of the year and in most parts of the country this was the coldest March in 20 years. Except for the utmost East, unusually warm conditions prevailed in the Region. In the UK, it was the eleventh March out of the past twelve which were warmer than average.

The warm weather caused sudden snowmelt leading to severe flooding regionally. The situation was especially bad in north-eastern Hungary, Slovakia, Ukraine and Romania and Latvia: Many ice barriers developed, water from rainfall and melting snow could not penetrate into the already saturated soils. Therefore by mid-March about 370 000 hectares of land were flooded in Hungary and the resulting damage was among the biggest in this century, only comparable to the losses in the early 1940's or those in 1966. Thousands of homes were endangered or damaged. Rivers Tisza and Bodrog exceeded their highest water-levels, recorded during the past 150 years. In south-eastern Slovakia, the highest water levels

since 1921 were registered in the Streda nad Bodrogom profile.

In Portugal, it was extremely rainy. Also northern Spain saw heavy rainfalls: La Coruña (246 mm) and much of the Galician coast, registered record high monthly totals. A new record of daily precipitation (up to 133 mm) was established in Galicia on March 8. In the UK, there were large regional variations in the rainfall amounts. South-east England was particularly dry with only 41 % of the average rainfall, the north-east, however, was very wet with 78 % more than normal. Heavy rain at the start of the month caused river Derwent to flood its banks, and the towns of Malton and Norton had their worst floods since 1931.

Israel and Jordan had another very dry month (see figure 1.1, page 27). South-west Iceland experienced the driest and sunniest March for 20 years. The month started extremely dull in The Netherlands with only 6,5 hours of sunshine in the first ten days of the month.

April 1999:

- **Unusually warm**
- **Regionally heavy snowfalls**

For all parts of Europe, except for Iceland, it was another warm month. The positive temperature anomalies were highest (more than +4 °C) in Belarus, the Baltic states and western Russia.

The rainfall distribution was uneven: Wet conditions prevailed in the UK, France and a belt, stretching from Scandinavia to Romania (more than +200 % of normal in north-eastern France and from southern Sweden to Poland).

Several villages in south-eastern Belgium were without electricity or telephone services after unusually heavy snow on April 15. In Switzerland, on the southern slopes of the Alps and in the central Alps new fallen snow piled up to more than 100 cm on April

16. On the Säntis, there was a record snow depth of 816 cm from April 21 - 23 (records started in 1959). On April 18, 30 - 50 mm of wet snow fell on higher terrain in south-western Sweden where about 12 000 households lost the electricity during the night 18/19. Rainfalls and the warm weather in April after a snowy winter led to severe ice jam and flooding in the Baltic states. River Emajogi in Estonia reached its highest water level in 43 years. On April 28, an ice jam near Arkhangelsk, Russia, caused the river Kholmogory to leave its banks, affecting 136 houses and 9 industrial enterprises.

In Hungary, the wet weather continued and hindered the decreasing of inland water.

An hailstorm caused heavy damage to vineyards in Pyrénées-Orientales on April 21. From April 22 - 25, severe showers with thunderstorms and hail crossed eastern Germany. Locally, hailstones with diameters up to 3 cm fell and hail covered the ground. Orchards and gardens were badly damaged.

There were also high losses by extreme winds: Kocaeli, Turkey, experienced

a destructive storm on April 13. The city of St. Petersburg suffered from wind squalls with peaks of 101 km/h on April 18. Trees and advertising boards were broken and blown over, roofs blown off houses and power lines blown down. A tornado occurred in Povoia do Varzim, north-western Portugal, on April 21 leaving a trail of destruction.

May 1999:

- **Extremely cold in the Northeast and warm in the Southwest**
- **Severe flooding in the northern Lower Alps**

The north-eastern parts of the Region experienced extremely cold weather: Low temperatures, reaching 1 - 7 °C below zero, damaged the spring plantings, cherry and apple trees on large territories in European Russia. Such cold weather in May after an early spring had been registered only once before in this century (1918). New fallen snow on May 10 brought down power lines in many areas in Estonia. Lithuania saw as much as 20 nights with frosts, which damaged even cold-sensitive vegetables in greenhouses. After a sharp temperature drop, Armenia received 8 - 12 cm snow in the mountains on May 17 - 21.

While chilly weather prevailed in the Northeast, it was very warm in the South and West of the Region (see figure 6.3, page 34 and figure 9.2, page 39). In Greece, the month started extremely hot with maximum temperatures between 32 and 36 °C (long-term means 23 - 26 °C). In southern Spain, in the past 40 years only May 1964 was warmer. A significant Sharav event occurred in Israel on May 22/23: Temperatures reached 44 - 46 °C in the Jordan Valley and 42 - 43 °C in the coastal areas (the highest temperatures along the coast since May 1988). For England, the warm temperatures ensured that May 1999 was the sixth month in succession to be warmer than normal.

Heavy precipitation coupled with snow melting (see figure 5.1) in European alpine regions of more than 2 000 m altitude triggered heavy flooding in the catchment areas of the Danube River and Lakes

Constance and Thune in Germany, Switzerland and Austria. Some regions received from May 20th until 22nd in 3 days precipitation amounts to be expected in a „normal“ month of May. Large regions in the Danube catchment area received during May 1999 more than double up to threefold the normal May precipitation (see figure 5.2). Reutte, Tyrol, recorded a daily amount of 213 mm on May 21 and a monthly total of 445 mm. Precipitation totals of May 1999 as well as river levels exceeded record values. Lake Constance reached its highest level since 1858. 13 people died. Damage estimates due to flooding were calculated to more than 750 million US\$.

Snowmelt floods caused inundation of hundreds of homes in the Sverdlovsk district, Russia, between May 9 and 15 and on May 29. A tornado with hail stones big as eggs caused damage of property in Jaltusha village, Bulgaria, valued above 250 000 US\$ on 15 May. The wind blew off house roofs, rooted out trees and urned over trucks. Hail and rain damaged agricultural areas in parts, of Turkey on May 6 and 26. Edirne, Thrakya experienced heavy rain inundating settlements on May 14.

Towards the end of the month, there was a sequence of very warm days in southern England which triggered off several severe thunderstorms causing local flooding. The 30th of the month brought a series of devastating storms: 20 000 cars were damaged in a severe hailstorm which hit the port of Gent, Belgium.

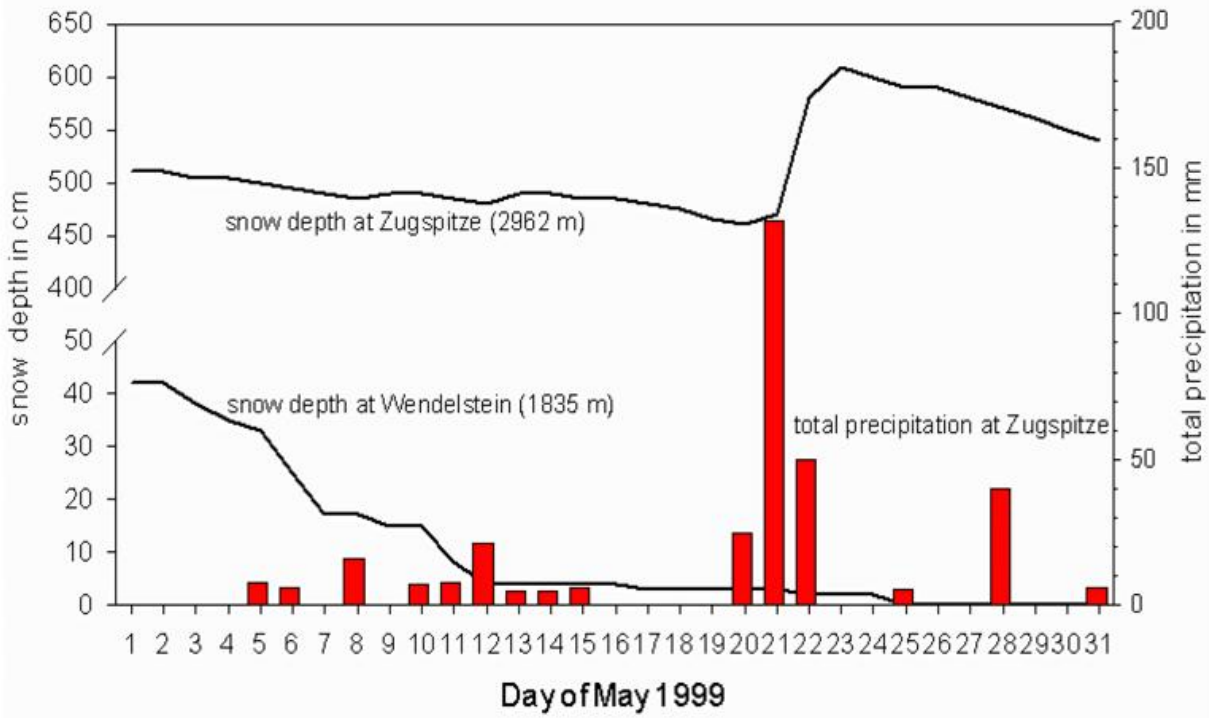


Fig. 5.1: Variations of daily snow depth measurements at the mountain stations Zugspitze and Wendelstein in comparison to daily precipitation totals at the Zugspitze during May 1999.
From: Deutscher Wetterdienst, Germany

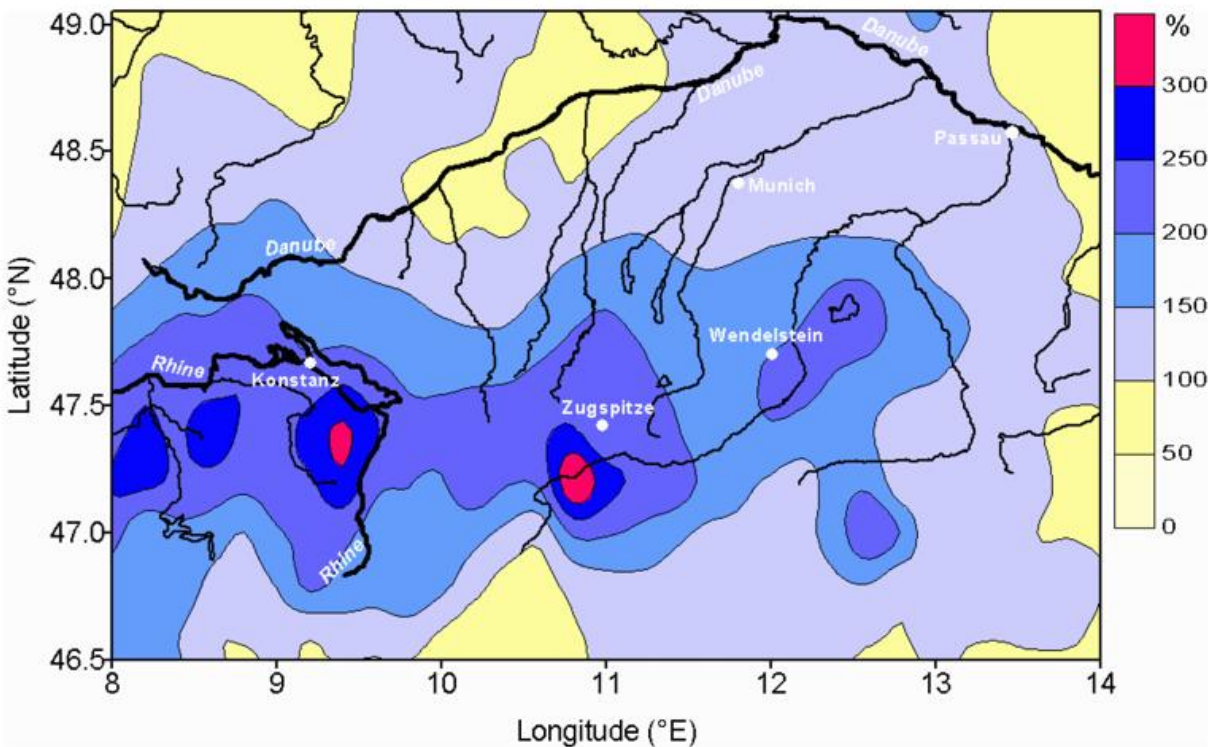


Fig. 5.2: Rainfall in the catchment area of Danube and Rhine River in May 1999 shown as percent anomaly from the 1961 - 1990 base period.
From: Deutscher Wetterdienst, Germany

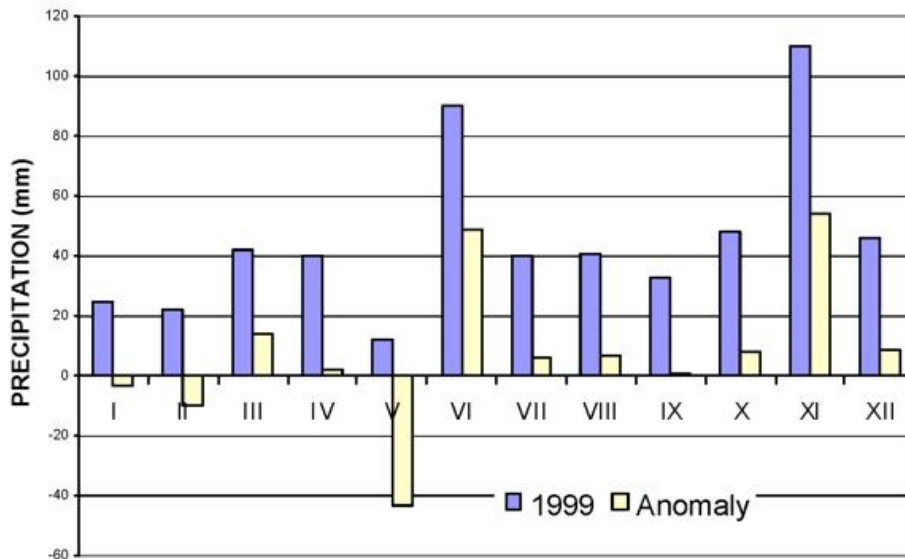


Fig. 5.3: *Monthly precipitation totals and anomalies in Skopje, in 1999*
Reference period: 1961 - 1990
From: Republic Hydrometeorological Institute, Macedonia

An exceptional thunderstorm, in the morning of the 30th of May, stroke Central France. Hail and strong winds were reported with gusts reaching 112 km/h. A cold front crossed with severe thunderstorms, squalls and hailstorms

with stones having diameters of 20 - 30 mm in Lithuania.

Most parts of south-eastern Europe and the Middle East were affected by drought (see figure 5.3).

June 1999:

- **Exceptionally warm and dry in the East**
- **Very wet and cool from Scandinavia to the UK**
- **Devastating flooding in Hungary and Romania**
- **Extreme number of heavy thunderstorms**

After the very cold May, a heat wave swept eastern Europe in June (temperature anomalies surpassed + 5 °C, see figure 6.1). In spite of it, isolated frosts (down to - 8 °C) badly damaged 30 % of maize and buckwheat crops in the Perm district.

But also on the Balkans and in the south-western parts of the Region, hot and dry weather prevailed. For the Baltic states, it was one of the warmest Junes of the century. In many parts of Belarus, there was almost no rain from beginning of May - mid-June. As a result, the rainfall deficit increased to critical 50 - 80 % causing considerable agricultural damage. Spain recorded its lowest rainfall in 50 years devastating arable land, sugar beet and livestock farming.

In contrast, it was unusually cold and wet in the north-western parts of the Region. Despite of a temperature rise in the second half of the month, for the UK it was the coolest June since 1991, and the only month in 1999 to have below-average temperatures.

Denmark experienced its second wettest June since records started in 1874 (see figure 6.2). Very large amounts of rain fell also in south-western Sweden. 200 - 350 % of normal precipitation was observed along the west coast of southern Sweden. Varberg established with a monthly sum of 185 mm a new record for June (24 mm more than in 1912).

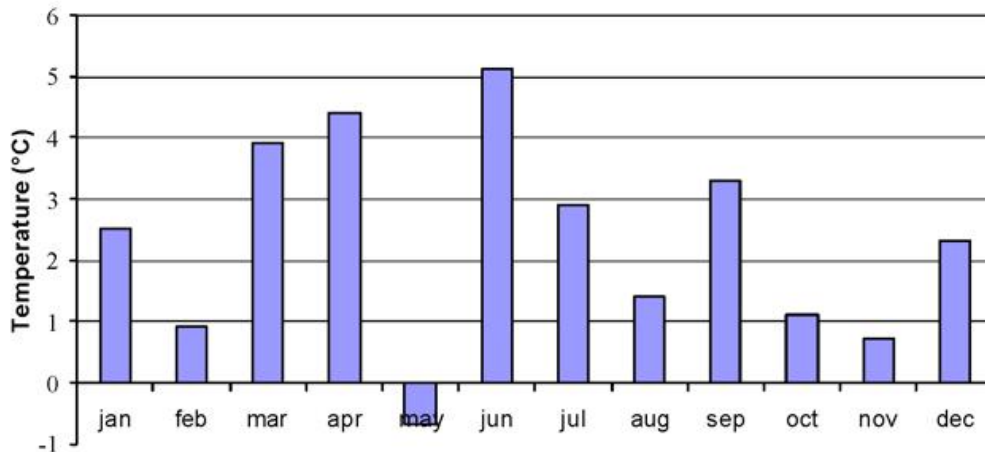


Fig. 6.1: *Monthly temperature anomalies in Riga in 1999, reference period: 1961 - 1990*
 From: Latvian Hydrometeorological Agency

In the northern alpine region, the flood situation which had started in May eased slowly and in some areas further rainfall made it extremely long lasting. Lake Constance kept its record level for several weeks and large areas around the lakes of southern Germany remained inundated until July.

Macedonia, after extreme drought in May, received lots of rainfall this month (see figure 5.3). Inundation after heavy rain was reported from Elazig, Sakarya and Kocaeli, Turkey. Hungary and Romania, which had been hit by a severe flood in March, had another devastating flooding. In Hungary,

precipitation fell evenly, rains returning every 3 - 4 days. In the northern areas 200 - 400 % of average was recorded. On the pre-saturated soil, on 21 June, 23 mm precipitation fell on the average. Many areas experienced more than 50 mm of rain causing short, but devastating floods. Situation was worst north of Budapest, in the Börzsöny hills, where 100 mm rainfall triggered a never before seen local flood on the small river Kemece. The water demolished houses, bridges and dams in two villages. Other local floods occurred around Budapest and the Balaton region. Losses amounted to about 145 million US\$.

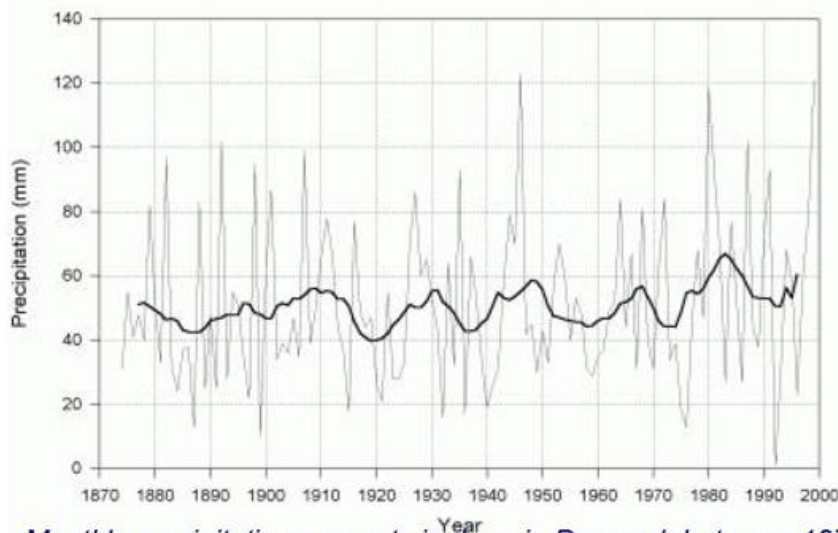


Fig. 6.2: *Monthly precipitation amounts in June in Denmark between 1874 and 1999*
 bold curve : 10 year running mean
 From: Danish Meteorological Institute

Also in Romania, floods destroyed numerous houses and bridges and inundated vast agricultural fields. In Slovakia, it was the 4th most rainy June in the 20th century, following June 1926, 1958, and 1965. The average precipitation total for the country was 140 mm, which is 163 % of normal.

The Region had a very high number of thunderstorms, hail and showers, especially in the hot countries in the East. In Lithuania, thunderstorms roared on 22 days of the month and there were a number of extreme showers: On June 18, Alytus meteorological station recorded 50 mm of rainfall in 12 hours. In the afternoon of June 20 in some areas of Eastern Lithuania hailstones 20 - 30 mm in diameter were falling. About 16 kilometres north-east of Vilnius, a very strong squall ravaged in the vicinity of the lake Balzio where many people were spending the weekend. A very heavy shower occurred

in Trakai, Lithuania, on June 21 resulting in 54 mm of precipitation. A catastrophic shower was recorded by Birzai meteorological station on June 23 with 98 mm of rainfall in 6 h 49 min. More heavy showers occurred on June 29 resulting in 59 mm in 1 h 10 min.

In Latvia, thunders roared 15 - 16 times within the month as against 3 - 7 times normal for June. In Bulgaria, hailstorms occurred on 19 days. A shower with gusty wind and hail caused considerable damage in Plovdiv on June 12. Three persons were killed.

Although temperatures were near the 30 years-normal only 3 days without thunderstorm were recorded over Austria. Violent hail storms raged northern Switzerland on June 2. Flash floods caused by a severe summer storm trapped people in cars and flooded houses and roads in Cyprus (see figure 6.3).

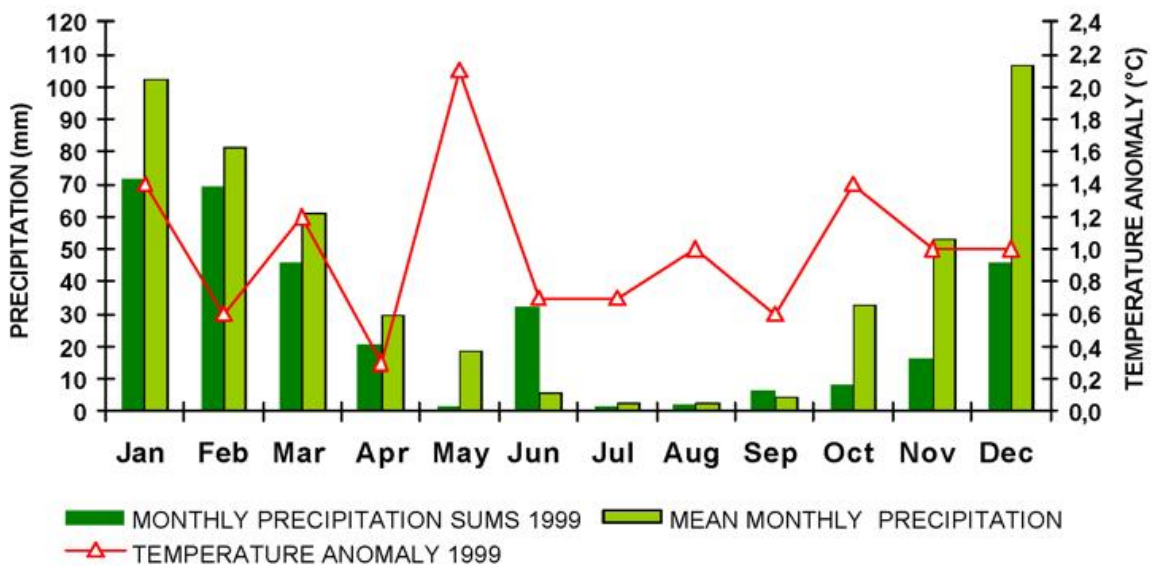


Fig. 6.3: Monthly area average precipitation and temperature anomalies in Cyprus
Reference period: 1961 - 1990
From: Meteorological Service of Cyprus

July 1999:

- **Hot and dry from Russia to England**
- **Heavy rains and devastating floods, especially in south-eastern Europe**

The heat over eastern Europe, that had started in June continued in July and for European Russia, it became the biggest heat wave of the century. The record temperatures were equalled last in 1895. Heat and drought sparked off some of the worst forest fires in the recent history. For the whole month, vast areas especially in the Northwest but also around Moscow, suffered from exceptional fire hazard. Also in Ukraine, the hot and dry weather (see figure 7.1), that had started in May, went on, becoming the most severe drought for the last 50 years.

Central and Western Europe experienced an extremely sunny and warm summer month. Across the southern parts of the UK, it was the driest July since 1911 and the sunniest since 1990. The first 10 days of the month were extraordinarily hot in Portugal, and July 8 - 10 set in many places new temperature maximum records (see figure 7.2). In Israel, too, the average daily temperature in July–August 1999 was one of the highest ever recorded, yet not as high as the year before (see figure 13, page 12).

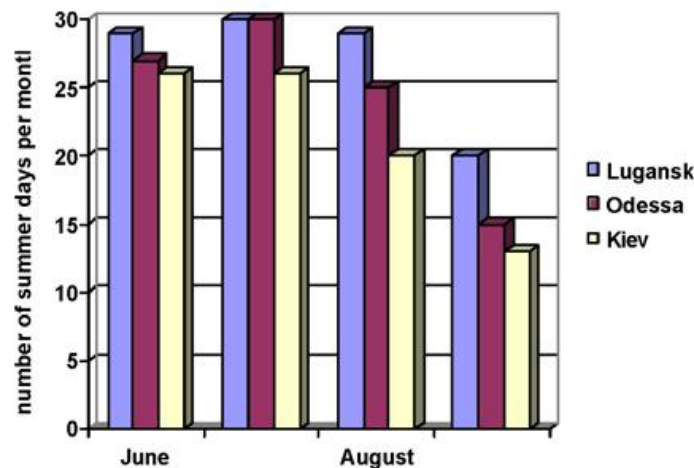


Fig. 7.1: Number of days with maximum temperatures above 25 °C in Ukraine in 1999
From: Ukrainian Hydrometeorological Center

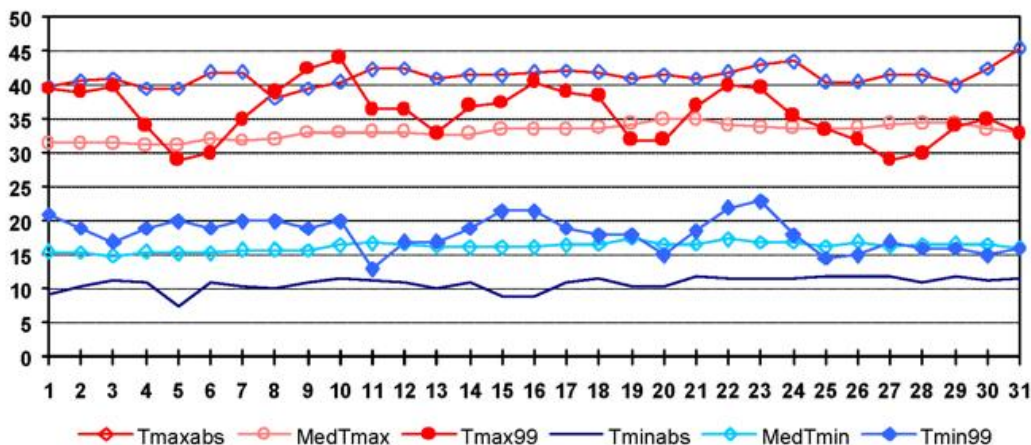


Fig. 7.2: Daily temperatures in Elvas, Portugal, in July, reference period: 1961 - 1990
From: Instituto de Meteorologia, Portugal

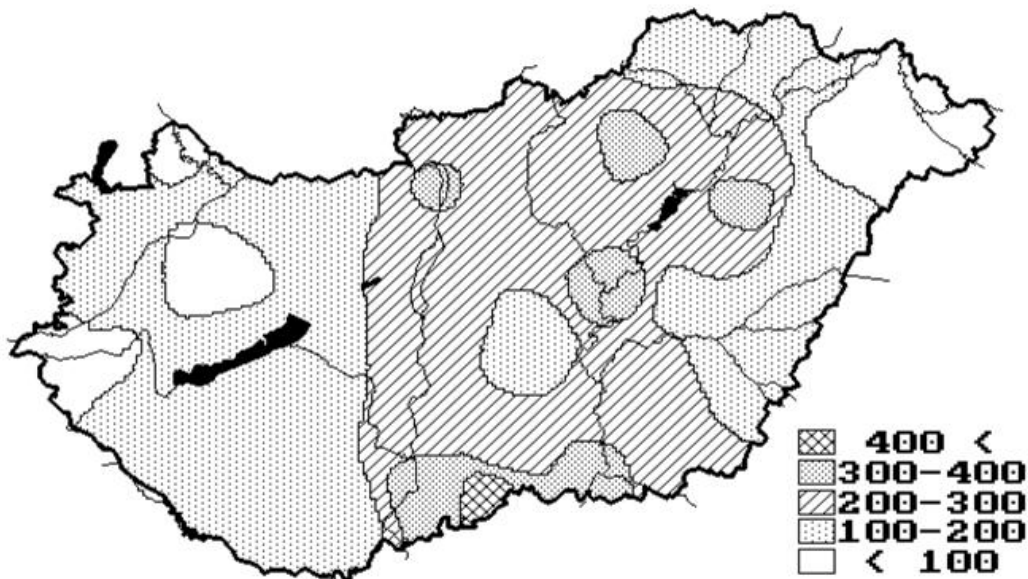


Fig. 7.3: *Precipitation amounts in percent of normal in Hungary in July 1999*
Reference period: 1961 – 1990
From: Meteorological Service of the Republic of Hungary

July was also a month of heavy rainstorms:

- Floods causing substantial damage followed severe thunderstorms in eastern Belgium and southern Netherlands on July 4/5.
- In the UK, widespread thunderstorms (83 mm of rain at Charing, Kent), mini tornadoes and local flash floods occurred on July 5/6.
- Between July 4 - 8 and 12 - 20, again and again thunderstorms and downpours occurred in the Rhine-Main-area and in parts of south and south-eastern Germany. Intense rainfall (up to 160 mm within 3 hours) and hail (diameters up to 4 cm) caused damage amounting to more than 10 million Euro.
- A cold front, that had crossed Latvia on July 6, fostered showers, hail, thunderstorms and a squall line which raged Sigulda, near Riga.
- Considerable damage by hail occurred in western and north-western Switzerland on July 5.
- Rain and hail caused high, mostly agricultural losses in Turkey in mid-July. 4 people died and 200 houses were flooded in Ki?ikkale.
- Heavy rains caused severe mudflows in the Zaragoza province, Spain.
- On July 18, 21 members of a canoeing group lost their lives when the water level of a small river near Interlaken,

Switzerland, rose abruptly after a violent thunderstorm.

- Widespread deluges occurred in south-eastern Europe causing extreme losses, estimated to more than 600 million US\$. Vast fields were flooded, industry and infrastructure badly damaged. In Slovakia, the month belongs to the top ten rainy Julys of the century. The heavy rains caused isolated floods. The most extreme situation was in the Krupinica river basin, south-central Slovakia, where the culminating discharge had an estimated return period of about once per 1 000 years. Total losses in Slovakia were estimated to 56 million Euro.
- In Hungary, the monthly precipitation sums exceeded 100 mm at most places, this is for some locations 200 - 400 % of the average (see figure 7.3). Frequent thunderstorms occurred, some of these poured down more than 100 mm of rain in one day. In Heves county, unprecedented losses occurred as a result of floods and high waters, which affected about 40 000 hectares of agricultural lands, one third of the total in the county. In many settlements, water rose to surround houses, many buildings suffered damage or collapsed, several thousands people had to be evacuated. By the end of July, losses due to extreme weather in Hungary were estimated slightly less than 300 million US\$.

- Severe damage was caused by rains in Romania on July 11/12: The heaviest losses (33 % of the total annual damage) occurred in the south-western parts of the country. 130 mm of rain in 12 hours made river Fenes to exceed its flooding level by 160 cm. The exceptional amount of 136 mm in 2 hours recorded on July 12 in the mountain area of the Raul Mare river basin caused very water levels flow which triggered flooding and destruction of two blocks of flats. 13 people died and many were injured by mud flows, driven rocks, logs and other wood debris. 217 mm of rain in 48 hours entailed flooding of river Husnita river on July 13.
- In Bulgaria, stormy winds and heavy rain caused disastrous flooding on July 10/11. On July 27, downpours with hail like "apple" (20 cm layer depth) (48 mm in four hours in Montana) led to floods and high damage in the north-west of the country.
- Belgrade, Yugoslavia, recorded a precipitation amount of 262 mm. This is a new record since instrumental measurements started in 1888 (see figure 7.4). The previous maximum precipitation amount was reported in July 1890, amounting to 191mm.

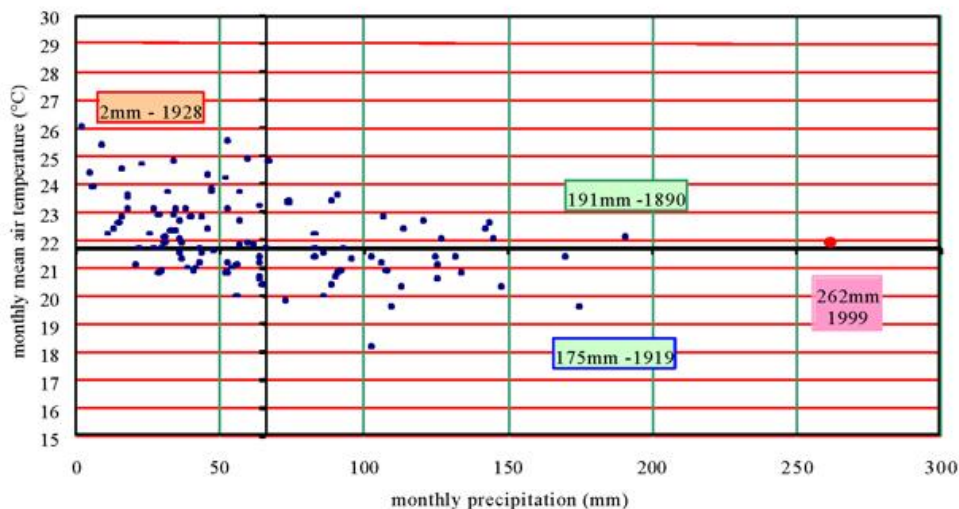


Fig. 7.4: Monthly mean air temperatures and precipitation totals between 1888 and 1999 in Belgrade in July opposed to the 1961 - 1990 normal (temperature of 21,7°C, precipitation of 66 mm)
From: Federal Hydrometeorological Institute, Belgrade

August 1999:

- Relief from the heat wave in the East
- Warm and dry in the South
- Local heavy thunderstorms, abundant rain in Turkey and Portugal

August started hot, dry and sunny in most parts, thus the bush fire risk in the Baltic States and European Russia still increased. From August 5 onward, normal temperatures and precipitation conditions brought relief from the long lasting drought. Southern Italy, Greece and Israel were affected by scorching heat waves: Temperatures climbed up to more than 40 °C setting new temperature records at some places (e.g. Catania

Signonella 45 °C on August 10). Hot and dry weather affected also Armenia which recorded daily average temperature of 6 - 8 °C above normal. The dry weather in the South engendered a number of bush fires. In Bulgaria, losses due to wild fires reached 5 million US\$ (see also figure 11, page 11).

Rainfall conditions varied a great deal across the Region. Precipitation totals of less than 50 % of normal were recorded in

Finland, regionally in Central Europe and in most parts of the Mediterranean. Cardiff and Birmingham, England, however, had their wettest August on record, with 176 and 154 mm of rain respectively. Abundant rain (more than 300 % of normal) fell in Portugal, in parts of Turkey and north of the Caspian Sea. Rainy weather persisted in Hungary. The northern part of the country suffered again receiving as much as 200 - 300 % of the long-term average. In a sub-basin of river Leitha, a tributary of river Danube, in Austria, an extreme flood with a return period of more than 100 years was observed.

Lithuania was hit twice by rain storms: On August 9th, a heavy shower in the city of Kaunas, resulted in 54 mm of rainfall in 1 h

25 min, with hailstones 22 - 30 mm in diameter. On August 16, in the town of Klaipėda 55 mm of rain fell in less than 12 hours and turned streets into streams. The lower parts of the town were inundated. Bulgaria, recorded 15 days with thunderstorms and 12 with hail. Most severe hailstorms (with stormy gusts > 90 km/h) crossed the South and Northeast of the country. Losses were estimated at about one million US\$.

In Denmark, an unusual high number of water spouts caused locally considerable damage.

On August 28, a severe storm hit the Azores Islands.

September 1999:

- **Extraordinarily warm in most parts**
- **Very dry in the East**
- **Wet in the West and on the Balkans**

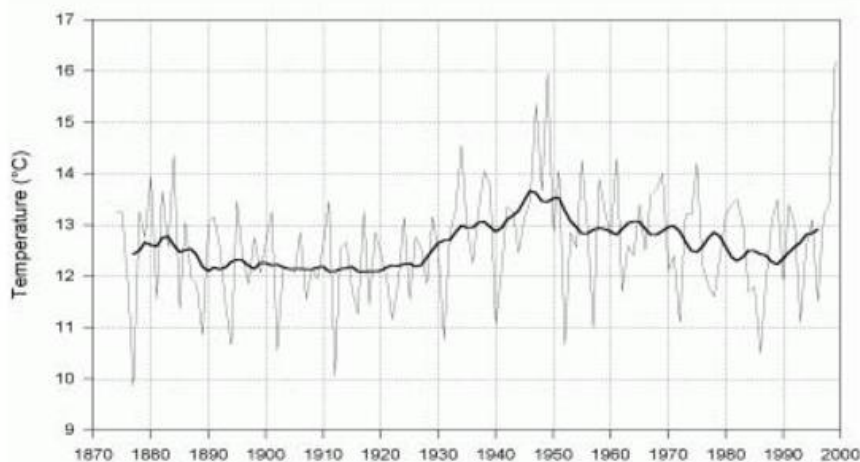


Fig. 9.1: *Mean temperatures in Denmark in September between 1874 and 1999*
Bold line: 10 year running mean
From: Danish Meteorological Institute

September 1999 was extremely warm and mostly very sunny. For Denmark (see figure 9.1), Norway and the Netherlands it was the warmest September since records started in 1874, respectively 1860 and 1706. Over all of Germany, it was the warmest September of the century and at several stations, it was the warmest month of the whole year. For Belgium, the mean temperature and the

mean minimum temperatures equalled those of September 1949, which was the warmest since 1833 (see figure 9.2). Gravesend, Kent, reached 30,4 °C on September 11 - the highest September temperature in the UK since 1973. In spite of unsettled weather in the second half of the month, the high temperatures in the earlier part made it the warmest September since 1949, and

continued the trend for warm months during 1999. Also in Austria, it was one of the warmest September of the last 50 years. Only in the utmost East of the Region and on the Iberian Peninsula, slightly sub-normal monthly mean temperatures were recorded.

In north-eastern Europe, the warm

weather went along with extreme dryness. In south-western and southern Finland, an exceptional drought had developed during the summer (see figure 9.3). The deficit was considerable for more than two months from mid-July to the second half of September and caused a very poor harvest in these regions.

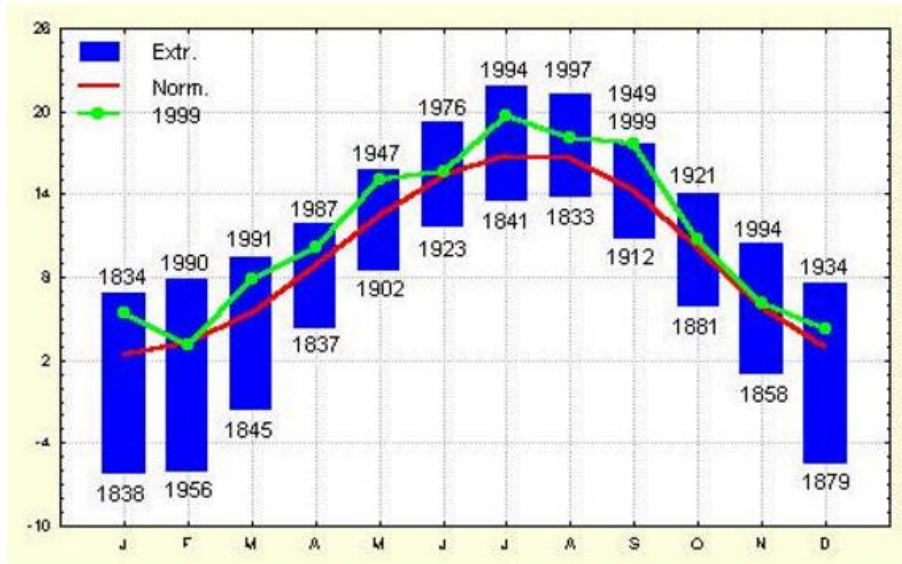


Fig. 9.2: Mean monthly temperatures at Uccle, Belgium: 1999 means, 1833 - 1985 normal and absolute extremes since 1833 From: Royal Meteorological Institute of Belgium



Fig. 9.3: Accumulative precipitation (mm) of the growing season 1999 at Turku, Finland From: Finish Meteorological Institute

In the eastern parts of Ukraine, the summer drought continued and still increased severity in September. This period was one of the warmest and driest of the last 100 years. In many regions, there was hardly any precipitation at all for 20 - 45 days. In Estonia, there was no precipitation during the first 20 days of the month. The rains at the end of the month were the first in almost 3 ½ months.

After a series of extremely wet months, Hungary was more lucky in September when calm, sunny, warm and dry weather prevailed.

The weather was extremely unsettled, especially in the West of the Region and on parts of the Balkans:

- In Ireland, it was the wettest September on record at many stations;
- Heavy rains, local flooding and storms occurred in the second half of the month in central and southern England;
- In Portugal, the rainfall amounts were much above normal all over the country causing great damage due to flooding;
- Valladolid, north-western Spain, received 106,8 mm of rain, the highest monthly total in more than 130 years of measurements. In Segovia, there were up to 17 days with more than 1 mm of rain, this was the highest number of rainy days in September for any year in the last century. Three severe tornadoes occurred in the south-eastern provinces of Alicante, Murcia and Granada;

- The north-eastern parts of Italy were affected by severe rainfall on September 20/21 (up to 230 mm per day with estimated return periods exceeding 50 years);
- Towards the end of the month, a flood situation at some tributaries of the river Inn in Austria appeared with a return period of about 100 years;
- In Slovenia, especially the coastal region suffered from drought. However, precipitation in the central parts were copious. The surrounding of Kocevje and Bela Krajina got about twice their long-term precipitation amount. There were several episodes with intense precipitation, causing local landslides and flooding;
- In north-eastern Bulgaria and along the southern parts of the Black Sea coast, rainfalls from September 2 - 5 caused disastrous floods. The total precipitation for the 4 days period reached 270 mm in Preslav (see figure 9.4) and 289 mm in Staro Oryahovo. Rivers left their banks, dams broke. There were bridges and vehicles carried away, arable fields were flooded with mud, houses, camping and hotels were inundated. Losses surpassed 25 million US\$. Thirteen persons died;
- On September 22, torrents in the mountains of the Republic of Dagestan destroyed roads and houses.

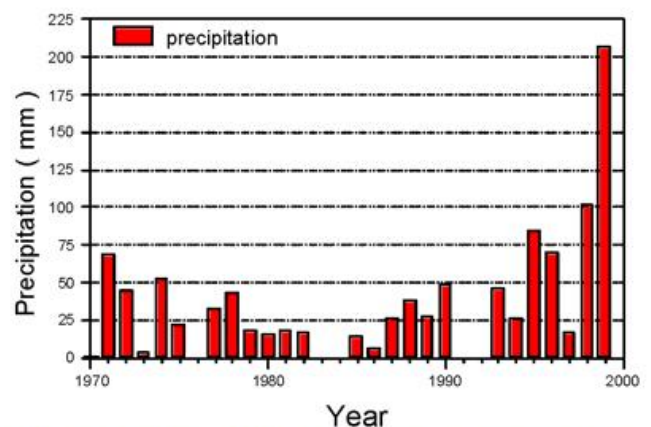
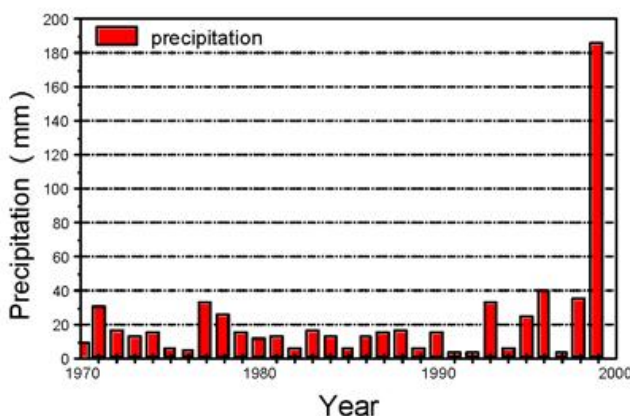


Fig. 9.4: Maximum daily (left) and monthly (right) precipitation totals at Preslav, northeastern Bulgaria, in September between 1970 – 1999
From: Bulgarian National Institute for Meteorology and Hydrology

October 1999:

- **Very warm in the South and Northeast of the Region**
- **Early frost in the East**
- **Abundant rains on the Iberian Peninsula**

October temperatures were near normal in most countries. Temperature anomalies of more than + 2 °C were restricted to the Mediterranean and the far Northeast of the Region. Warm weather in southern Europe led to temperatures of 37,4 °C in Palermo and 38,6 °C in Catania, Sicily, towards the end of the month. On contrast, early cold snaps with temperatures as low as -8 °C and snow affected eastern Europe in the second part of the month. In the north of the Astrakhan district, snow and sleet caused havoc on October 22/23: Roads were blocked by snowdrifts, power and telecommunication lines demolished and schools closed.

In the UK and in Central Europe, rainfall was mostly sub-normal and there was an above-average number of sunny days. In England, it was even the sunniest October since 1959, and the second sunniest on record.

Copious rains caused floods and damage in wide parts of Portugal and Spain and the monthly totals reached more than 400 % of normal in the Southeast of Spain.

Moreover, there were a number of regional severe rainfall events:

- The second highest daily precipitation amount in October of the period 1863 – 1999 was recorded in Zagreb-Gric, Croatia, at the beginning of the month (see figures 10.1 and 10.2).
- During the night between October 3 and 4, heavy showers brought 60 - 80 millimetres of precipitation in the western area of The Netherlands, causing a lot of troubles in this rather low lying area of the country.
- On October 6, heavy rain and lightning in the centre of the town of Rujiena. Latvia, were accompanied by falling of 29 – 40 mm large hailstones that covered the ground with a 10 cm deep layer. The hail destroyed greenhouses, damaged crops and cars. This hail event was the fifth during the last 40 years.
- Torrential rains with floods occurred in the mountain watersheds near the Venetian Plain and along the northern Apennines, Italy, between October 23 and 26.
- On October 24, heavy rain and gales hit the British Isles. Many places in North Wales had more than 60 mm of rain in 24 hours while Portland reported a gust of 113 km/h.

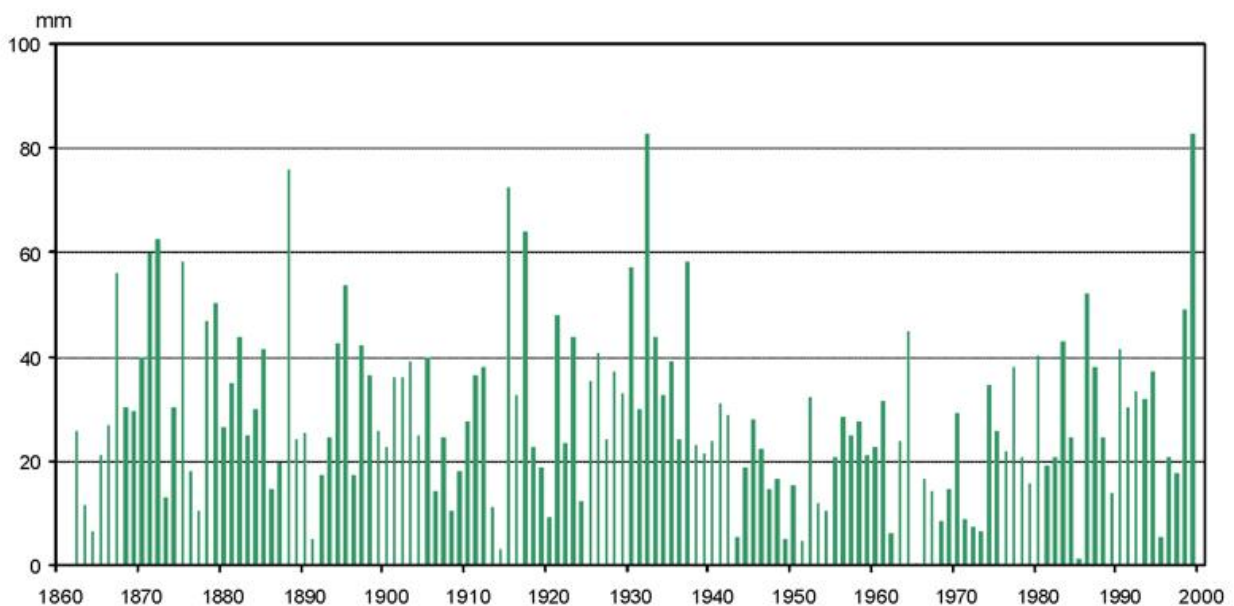


Fig. 10.1: Maximum daily precipitation totals in October in Zagreb-Gric from 1863 - 1999
From: Meteorological and Hydrological Service of Croatia

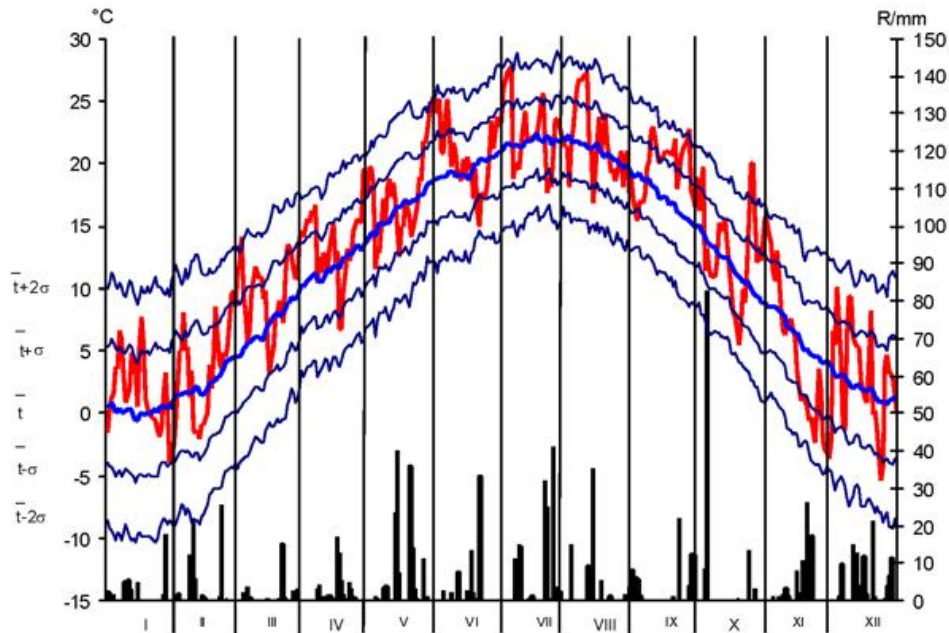


Fig. 10.2: Mean daily temperatures in Zagreb-Gric in 1999 (thick line), compared to long-term means (central line) and standard deviations (thin lines), reference period: 1862 -1995. Daily precipitation sums (columns) in 1999
From: Meteorological and Hydrological Service of Croatia

November 1999:

- **Very mild in the North**
- **Cold, especially in the East**
- **Mostly dry, but severe floods in southern France, Italy and Greece**

This month, northern Europe was on the warmer side. New monthly maximum temperature records were set in Sweden. In Iceland, two short but extremely warm periods occurred: During the first, there was a new absolute November temperature record for the country as a whole when in the evening of the 10th the temperature rose to 22,7 °C at Dalatangi in the east (prior record 19,7 °C, set in 1971). On the 19th, the temperature in Reykjavik reached 12,6 °C which is the highest temperature ever at that location in November.

For 8 consecutive days (November 17 - 24), temperatures in the coastal area and in the Negev in Israel exceeded 28 °C (5 °C above normal) and even reached 32 - 33 °C.

To the contrary, in a broad belt from Spain across Central Europe to Russia, it was extremely cold. In Russia, monthly temperature undercut the long-term means

by more than minus 5 °C and dozens of people died from the early cold snap. For Spain, it was one of the coldest November of the reference period. Only 4 years since 1961 had registered lower November values, and all those were before 1974. For Bulgaria, it was the only month of the year with a negative anomaly of the monthly mean.

The cold and heavy snowfall caused traffic chaos in Central Europe in the second half of the month. In Tyrol and Vorarlberg, Austria, up to 70 cm of snowfall in only 48 hours were recorded on November 22 - 23. On the 24th, Innsbruck reported a new record snow depth for November with 55 cm, the former being only 29 cm in 1977. In eastern Switzerland, too, snow depth records were established (e.g. St. Gallen and Bad Ragaz 62 cm). An unusual high number of days with snow cover occurred in Croatia (see figure 11.1). In Hungary, 20 - 40 cm snow fell and

stormy winds built snowdrifts blocking roads and villages.

It was dry in most parts of the Region. Precipitation totals reached less than 50 % of normal in the Middle East, in southern Scandinavia and in the Southwest of the Iberian Peninsula. In Denmark, November – the statistical wettest month of the year of that country - became the driest month in 1999 (33 mm). In Israel, rainfall amounts were just 15 - 30 % of normal. The dry and warm weather engendered immense forest fires in some areas causing severe damage.

Unsettled weather prevailed in northern Scandinavia and in some parts of South Europe (see also figure 5.3, page 32):

- In Greece, heavy rains and thunderstorms occurred between the 7th and 9th. The heavy storms led to floods and landslides which caused high losses to infrastructure and crops. Four people died.
- From November 12 – 14, an exceptionally rainy episode caused catastrophic floods in Aude, Tarn, Hérault and Pyrénées-Orientales departments, south-western France. Remarkable rainfall amounts were reported, reaching 620,2 mm in 48 hours at Lézignan-Corbières (Aude) (see figure 11.3). The losses were estimated to more than 500 million US\$.

- Seven speleologists were captured in a flooded cave for 11 days.
- In Italy, on November 13, an exceptional flooding occurred in the Cagliari district, Sardinina (the Decimomannu weather station recorded 196 mm of rain in 24 hours). A state of emergency had to be declared.
- On November 18/19, rainstorms (100 mm in 10 hours), snow and gale-force winds caused serious problems in Tuscany, Italy. Industrial areas and settlements were inundated, trees uprooted and roads blocked .
- In the lowlands of Slovenia, fog and low cloudiness was very frequent. Thus it was the least sunny month of the year (see figure 11.2).

The month ended stormy in the Baltic area: On November 29, in western part of Estonia storm with gusts over 116 km/h damaged forests and power lines. The same storm felled huge amounts of wood in the provinces Närke and Södermanland in south central Sweden. In St. Petersburg, Russia, wind speeds up to 83 – 94 km/h entailed a severe tidal wave, and badly damaged the municipal infrastructure.

A wild storm caused several casualties and large material damage in the Rize area, Turkey.

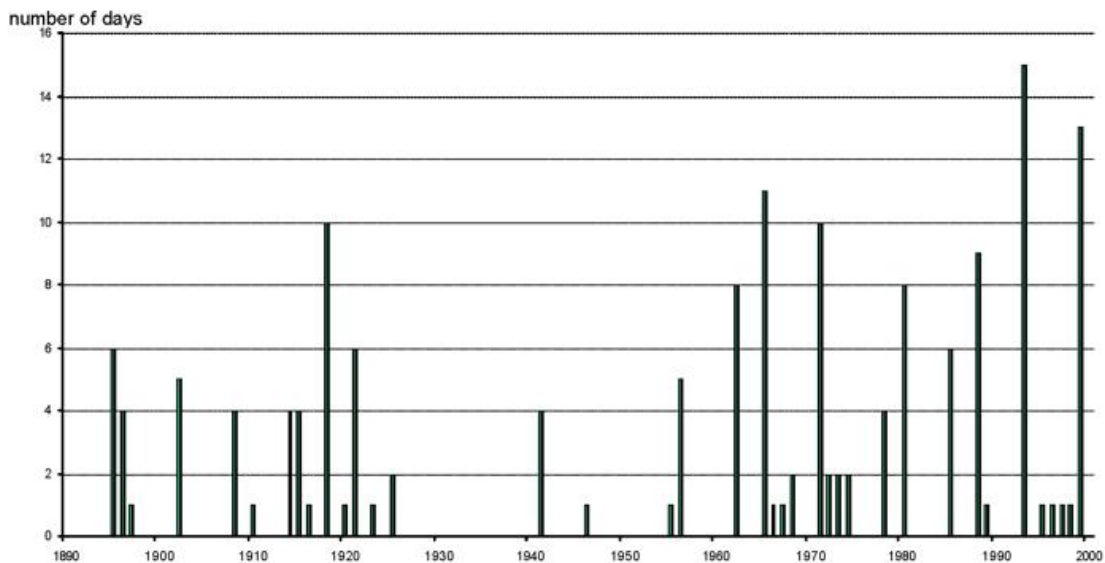


Fig. 11.1: Maximum number of days with snow cover in November in Zagreb-Gric from 1890 - 1999
 From: Meteorological and Hydrological Service of Croatia

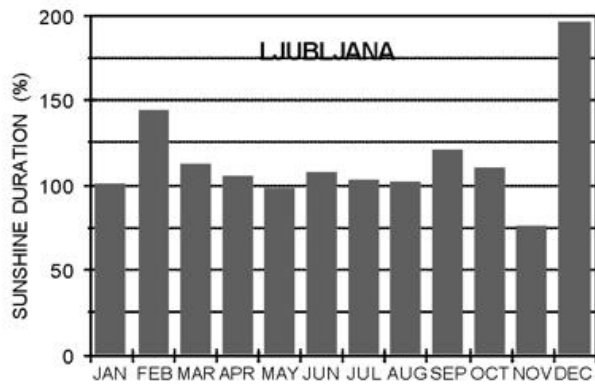


Fig. 11.2: Monthly sunshine duration in 1999 in percent of normal
Reference period: 1961 - 1990
From: Hydrometeorological Institute of Slovenia

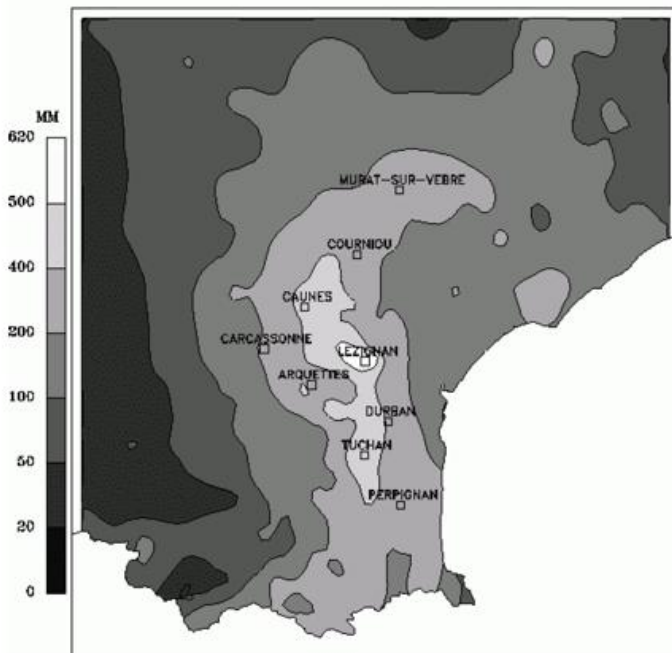


Fig. 11.3: Precipitation totals in south-western France from 12/11/1999 to 13/11/1999
From: METEO FRANCE

December 1999:

- **Devastating storms**
- **Wettest December on record in places, but dry in the South-east**
- **Very mild in the East, but cold in the North-west**

It was a very windy and rainy month in most parts of the Region. A series of severe storms brought the highest wind speeds ever recorded in parts of Europe. Two periods of strong winds stand out.

The first major storm, *Anatol*, struck northern Europe on December 3-4 (see figure 12.1, above). New records of maximum wind speed (up to 185 km/h) were set on the islands of Rømø, Denmark, and Sylt, Germany (see figure 12.2). Denmark was hit hardest, but also southern Sweden, Poland

and the Baltic states suffered high losses: The winds downed trees, blew off roofs, knocked over trucks and raised hazard tidal waves. Storm-related deaths totaled 20.

Two more fierce storms, *Lothar* (Dec. 25-26, see figure 12.1, below) and *Martin* (Dec. 27-28), struck wide parts in the West and South of the Region after Christmas, causing even higher losses. In France, these events combined led to wind gusts of more than 200 km/h (see figure 12.3) (Mandelieu-la-Napoule: 205,2 km/h. The corresponding

return period of such an event is estimated to 150 years, or even more.) In the mountains, wind squalls of more than 250 km/h (Wendelstein, Germany: 259 km/h, Jungfrauoch, Switzerland, 249 km/h) were

recorded. Freak storms and avalanches claimed over 130 lives in France, Spain, Switzerland and southern Germany. Material losses were estimated at about 11 000 million US\$.

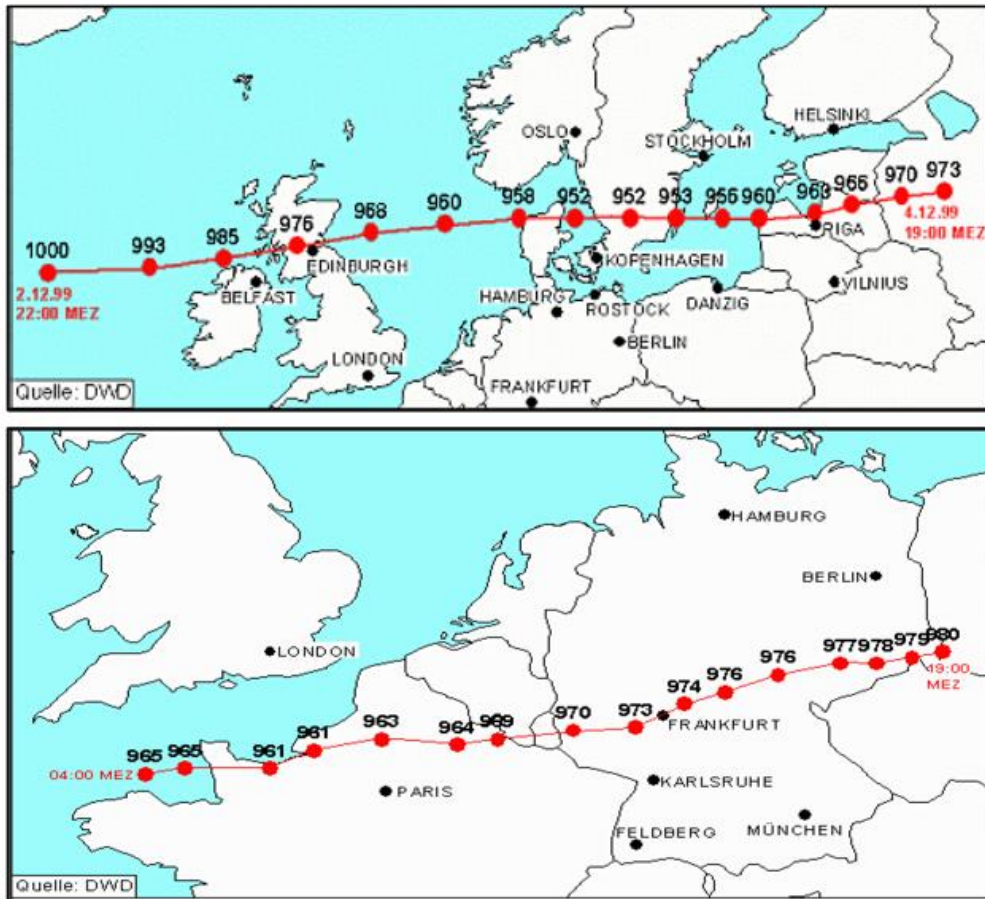


Fig. 12.1: 3-hourly positions and core pressure values in hPa of "Anatol" on Dec. 2/4 (above) 1-hourly positions and core pressure values in hPa of "Lothar" on Dec. 25 (below) From: Deutscher Wetterdienst, Germany

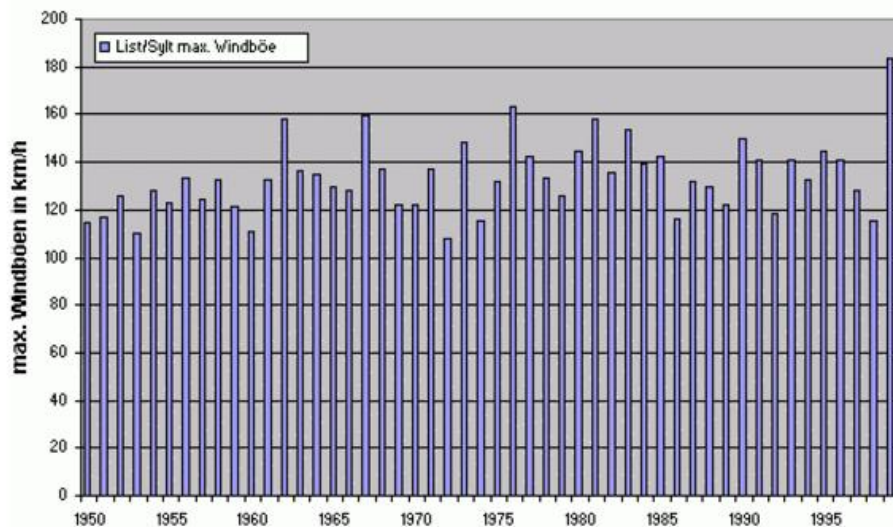


Fig. 12.2: Maximum wind gusts (km/h) in List, Sylt, between 1950 and 1999 From: Deutscher Wetterdienst, Germany

The stormy days went along with considerable pressure changes, even at sites far from the pressure centres (see figure 12.4).

The westerly winds brought mild and unsettled weather. And there were frequent rains and thunderstorms. For Belgium (see figure 12.5) and Ireland it was the wettest, for

Denmark, the second wettest December on record. From south-western Sweden, several new records and maximum monthly precipitation amounts of around 300 mm were reported. Again, there was plenty of rain in Hungary, increasing the still existing risk of floods in parts of the country.

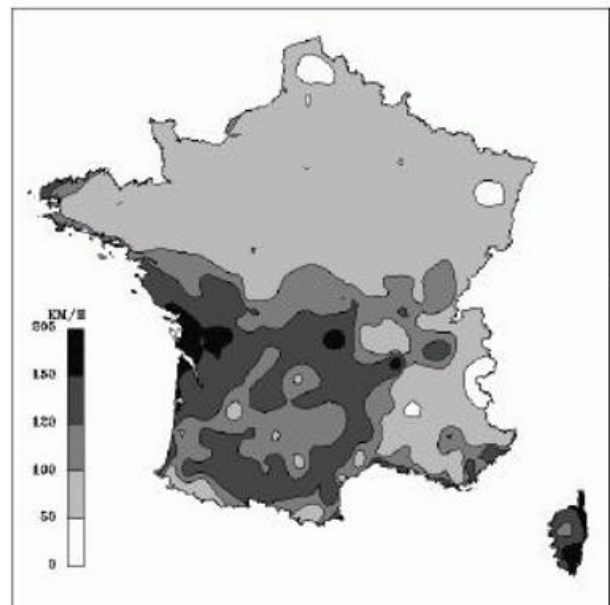
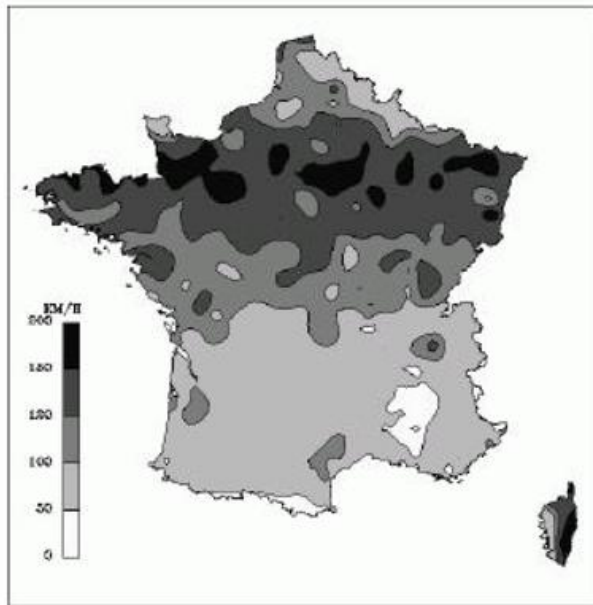


Fig. 12.3: Maximum gusts in France on December 25 - 26, 1999 (left) and December 27 - 28, 1999 (right), using stations with elevation <= 500 m From: METEO FRANCE

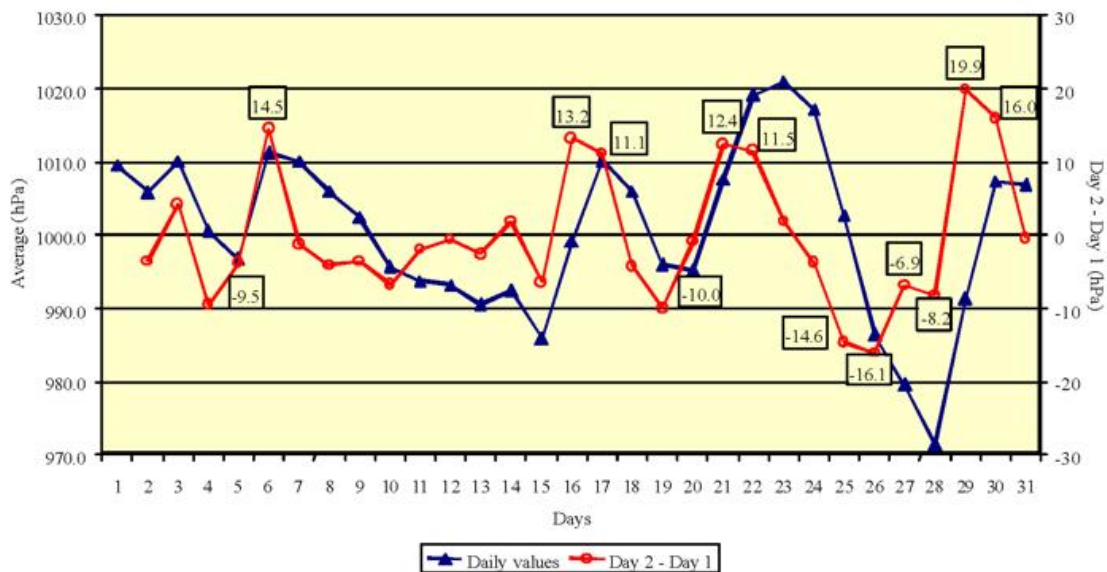


Fig 12.4: Station pressure and pressure change from day to day in Belgrade in December 1999 From: Federal Hydrometeorological Institute of Yugoslavia

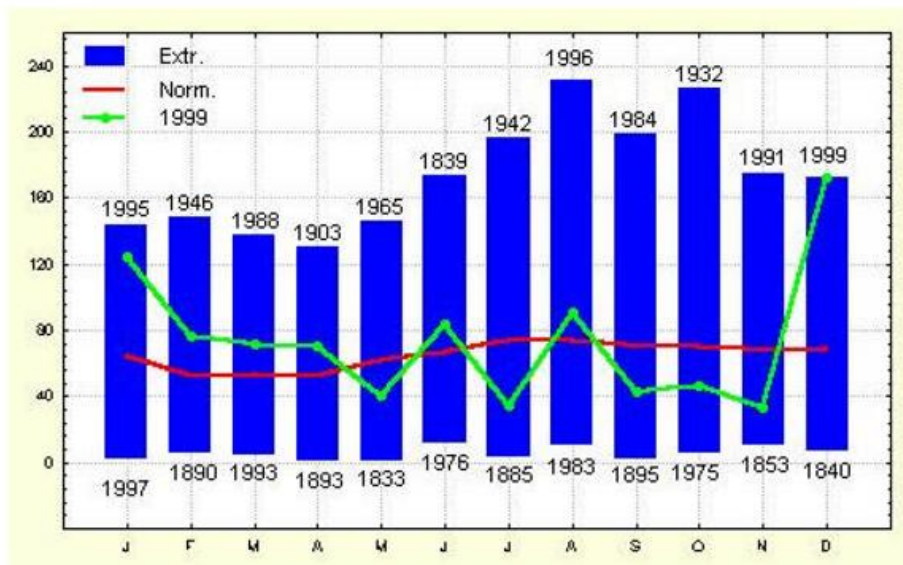


Fig. 12.5: Mean monthly precipitation totals in mm at Uccle, Belgium: 1999 means, 1833 - 1985 normal and absolute extremes since 1833 From: Royal Meteorological Institute of Belgium

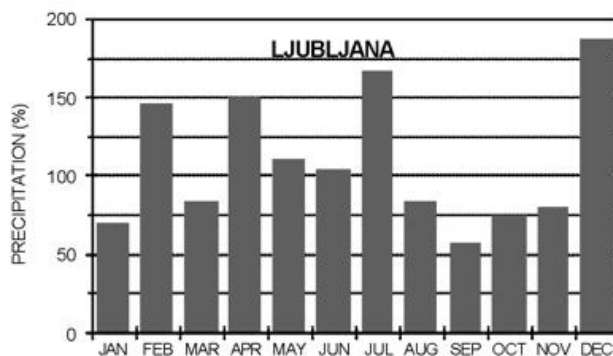


Fig. 12.6: Monthly precipitation totals in percent of normal (1961 - 1990) in Ljubljana in 1999. From: Hydrometeorological Institute of Slovenia

On December 14 - 17, a severe rainstorm affected central and southern Italy as well as parts of the former Yugoslavian Republic, triggering regional floods and mudflows with 6 casualties. In the Campania area, east of Naples, 324 mm of rain were recorded within 2 days (return period 80 years).

In Slovenia rainfall was abundant. Some areas in the western mountains received more than twice the monthly average (see figure 12.6). Nevertheless, the bright sunshine duration considerably exceeded the long-term average (see figure 11.2., page 44). This was also true for the UK where the month was mostly wet but, at the same time, one of the sunniest since records started.

However in the Southeast of the Region it was again extremely dry. With only 20 - 40 % of normal precipitation, dry

conditions caused severe water shortage in parts of Armenia (see figure 1.2, page 27). Jordan received not even 10 % of normal (see figure 1.1, page 27). In Israel, December rainfall amounts were just 30 - 50 % of the long-term averages. Thus, altogether the accumulated rainfall amounts from the beginning of the rainy season in September till the end of December were much lower than normal - North and central Israel received only 20 - 40 % of normal, and the southern areas less than 10 %. This makes it one of the worst starts of the rainy season, and very similar to the beginning of the 1998/99 rainfall season.

While mild weather prevailed in the East with monthly anomalies surpassing plus 5 °C, it was very cold in the North. Reykjavik, Iceland, recorded 25 days with snow cover, which is highly unusual.

Activities and Results of European Climate Centres

News from the European Climate Support Network

ECA2000

The European Climate Assessment 2000 has as its main goal the description of the climatological variability through observed records of temperature and precipitation. Since the latter are essential in order to fulfil the objective, during the last year the project has continued to put a lot of effort in building its long series dataset. This dataset now comprises over 150 daily and 200 monthly time series from 28 European countries, but the aim is to cover all RA VI territory. Such valuable dataset will form the basis for another ECSN project that will soon be started with the objective of producing a historical daily dataset with no restrictions of use.

Besides making headway in the necessary groundwork of data gathering, the series have also been analysed. A list of climatic variability indicators has been drawn up and applied to the series (these can be found at:

<http://www.knmi.nl/samenw/eca/index.html>).

This has allowed the intercomparison of the behaviour of the indicators between nearby stations and so detect possible breaks of homogeneity or anomalies in the spatial coherency that may have escaped the earlier controls at the NMSs. On the other hand the trends in the different indicators have been computed and drawn on maps that give an overall view of the climatic variability for the period analysed. In some regions the lack of complete series casts some doubt on the significance of the trends found, although the precise formulation of those limits is a difficult task that is being tackled now.

Database management

The first workshop of this project took place in Oslo in October 1999. The participants, 27 from 14 countries, gave an overview of the different climate databases in their respective countries. In addition to this different topics were discussed, among them the problems in

using commercial database products, the opportunities offered by the relational databases, questions about design and optimisation, storing techniques and retrieval possibilities. Special attention was devoted to the use of web-tools in presenting the information stored in climate databases, which was recognised as having a great potential. A report on this workshop has been issued by DNMI (DNMI Klima 05/2000).

In order to continue this exchange of views and experiences on a regular basis the possibility is being studied of setting up an Internet-based news group. The next workshop is scheduled for next year, and workshops addressing special topics could also be arranged. One of this could deal with quality control issues, a subject that has been already discussed inside the NORDKLIM group and could clearly benefit from a collation and standardisation of methods among the NMSs.

GIS in climatological applications

The Oslo meeting of the Databases project also offered an opportunity for discussing the work plan of this GIS project and exchanging ideas about how to proceed. An enquiry on the use of GIS in the different NMSs has been compiled. The project has produced a report about the different spatial interpolation methods, schematically describing their relative advantages and disadvantages and listing some of their characteristics. It is planned to distribute a package of interpolation methods to be compiled by each receiver.

The relation of this ECSN project with the similar COST719 action, was clarified in a meeting in March this year in Vienna. Both activities should interact constructively, and the broader scope and scientific depth of the COST action will permit the better development of GIS applications in the frame of the ECSN project. Two possibilities are being considered in this respect at the moment, GIS-based information tools and analytic applications.

Climate monitoring products

A kick-off meeting was held in Hamburg (January 2000). A first point in the agenda was to review the activities related to climate monitoring matters that are presently done at the NMSs, as well as the products available from other international institutions like WMO, especially those published by Internet. It was recognised that there is a great variety of weekly, monthly, seasonal and yearly monitoring reports and products available on national levels. However, in order to provide European monitoring products on a monthly and event related basis in a timely manner it is necessary to smooth differences at the border and to standardise formats. The project envisages giving access to such products through a special homepage. The work was divided in five areas according to the type of data, with co-ordinators appointed for each of them: in situ data, satellite data, model output data, special climatological events and RA VI Bulletin.

European Climate Atlas

After a feasibility study showed that the initial objective of making a European Atlas of extremes and climate applications related parameters lacked sufficient agreement on technical questions and was likely to have difficulties in gathering the necessary data, the idea now is to concentrate on producing a climate description for Europe based on monthly values for the 1971 - 2000 "normal" period. Tables with climate statistics and maps will be put in a CD-ROM, extending to Europe the CD-ROM that Meteo-France has commercialised for the 1961 - 1990 normal period. If the proposal of the project co-ordinator is found acceptable to all Members work could begin next year.

Drought project

The activities of this project with few participants (Hungary, Spain and Portugal) have consisted mainly in the comparison of drought indices. At the last ECSN Advisory Committee meeting (Oslo, June 2000) the idea was suggested of including in the ECA2000 some indicator for drought, probably the SPI index. More countries like Austria and Norway have shown their interest in collaborating with this project.

ECSN Climate Dataset (ECD) project

Last year ECSN undertook the creation of a dataset of historical instrumental long series of daily data in order to meet the demand that the scientific community has expressed in this sense (for instance EUROCLIVAR). The EUMETNET Council (June 1999) considered positively a proposal presented by the ECSN Responsible Member INM consisting in building such a dataset with basically no constraint on use and distribution and a network density at a minimum that of the GCOS-GSN. A small working group worked out the details in the summer of 1999. The density of stations envisaged now for this daily dataset is 2 per 100 000 km² (plus some mountainous stations and a correction for coast line) and the basic parameters to be included are temperature (both maximum and minimum), precipitation and pressure, starting from as long in the past as possible (recommended at least since 1951). A call for proposals in order to carry out this plan was distributed and only one joint proposal from KNMI-DNMI has been received. If everything goes all right, the project should get its official start with the approval by the EUMETNET Council in November this year.

Results of the ECSN Council Review

Since this is the last year of the present 3-year EUMETNET-ECSN Programme contract, the Council reviewed in April the ECSN activities. Summarising the conclusions, the objectives for ECSN remain valid and the continuation of ECSN was agreed. For the climate Atlas, the drought and climate monitoring projects a decision will be taken as to their further continuation in a year. The Council also gave some general guidelines for the future work of ECSN, for instance to foster the common development of tools and exchange them, to focus the research actions in exploiting the wealth of data stored by the Members and provide a structure allowing to merge European climate data, and to improve the access to the Members' climate data bases.

More information about ECSN at <http://www.inm.es/wwc/html/dtemint/ecsn/ecsnhome.html>.

The climate of the 20th century in Sweden

By: Swedish Meteorological and Hydrological Institute

In an effort to summarise the climate of the 20th century 10 homogenised series of temperature and 20 series of homogenised precipitation have been used to produce graphs of winter and summer temperature and annual precipitation. It should be emphasised that especially precipitation is loosely or even negatively correlated between some parts of the country so it is a bit artificial to construct nation-wide averages.

The warmest decades of the 20th century were the 1930-ies and the 1990-ies, especially in winter. In both temperature plots there is also a maximum in between around 1970 - 1975. Two very contrasting pairs of summers (very warm

and then very chilly) occurred close to the ends of the interval, 1901 - 1902 and 1997 - 1998.

The most obvious trend is the increase of the annual precipitation and it is thought that this, in spite of the efforts to homogenise data, to some extent depends on better instruments and better shelter from winds. But it has also been shown in various studies that the increase is, at least qualitatively, supported by an increase of wet, cyclonic (often westerly or southerly) weather types and/or a decrease of dry, anticyclonic (often easterly) types. The increase from the 1970-ies to the high levels 1980 - 1999 is quite large and undoubtedly real.

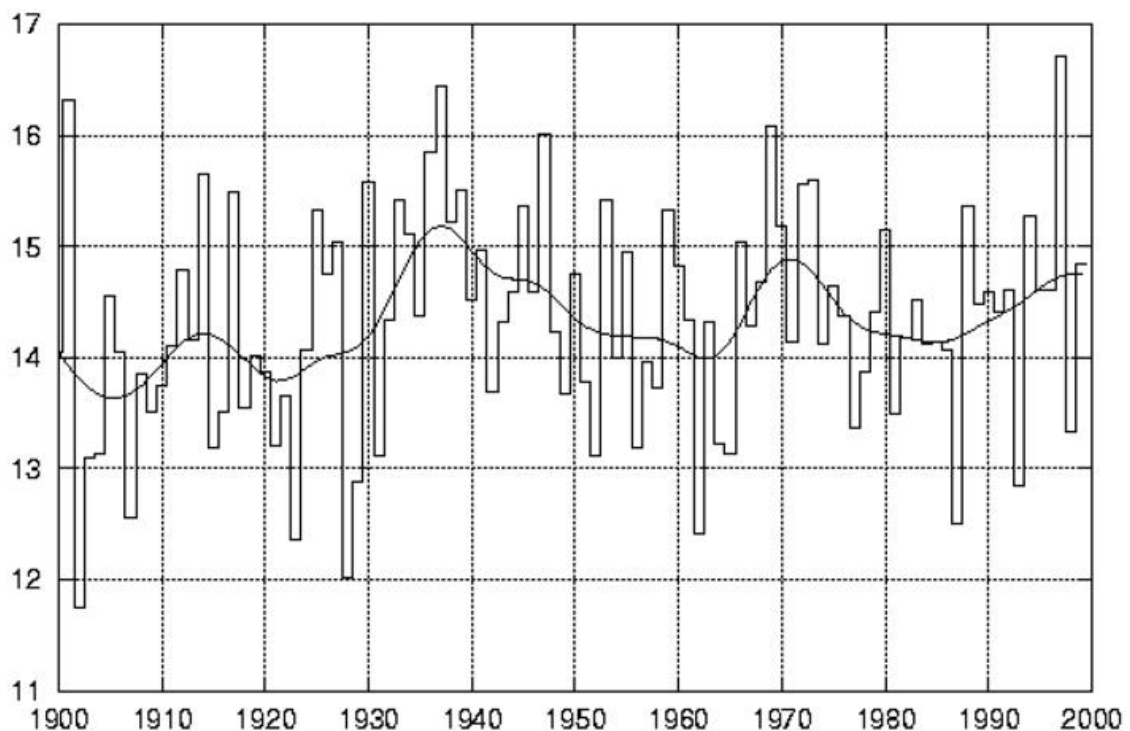


Fig. 1: Summer (June - August) temperatures in Sweden 1900 - 1999, average from 10 homogenised series. The smooth line represents a low-pass filtered curve of Gaussian type emphasising variations on time scales of ten years and longer.

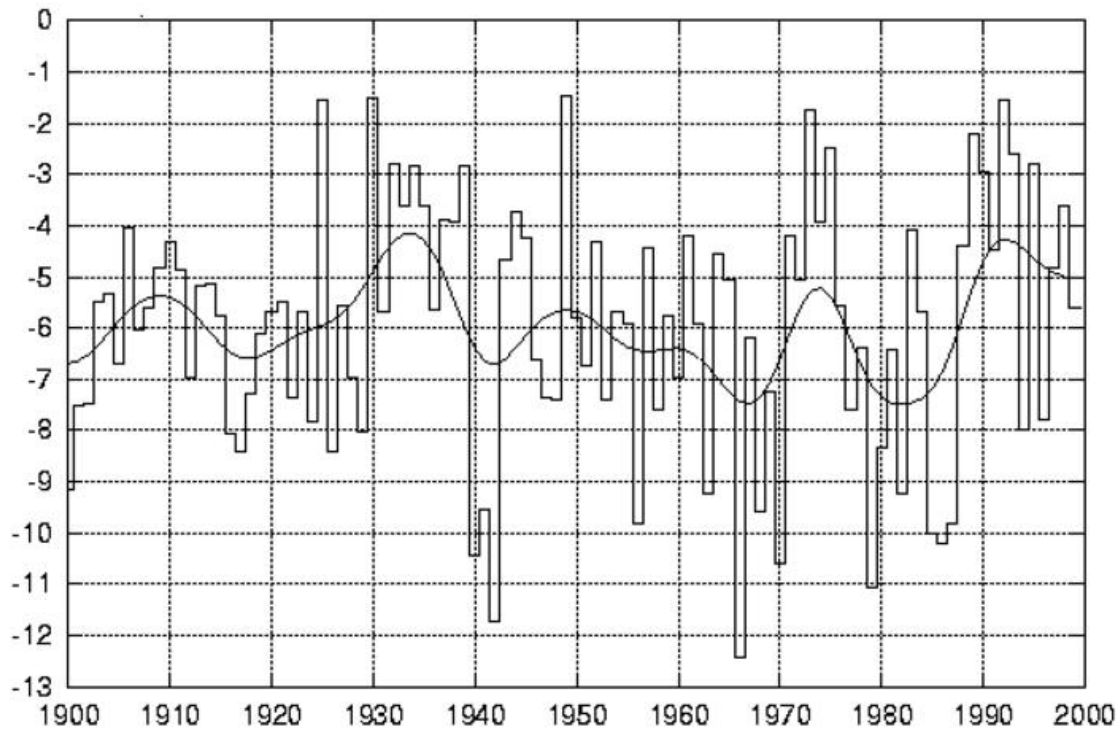


Fig. 2: Winter (December previous year to February actual year) temperatures in Sweden 1900 - 1999, average from 10 homogenised series. The smooth line represents a low-pass filtered curve of Gaussian type emphasising variations on time scales of ten years and longer.

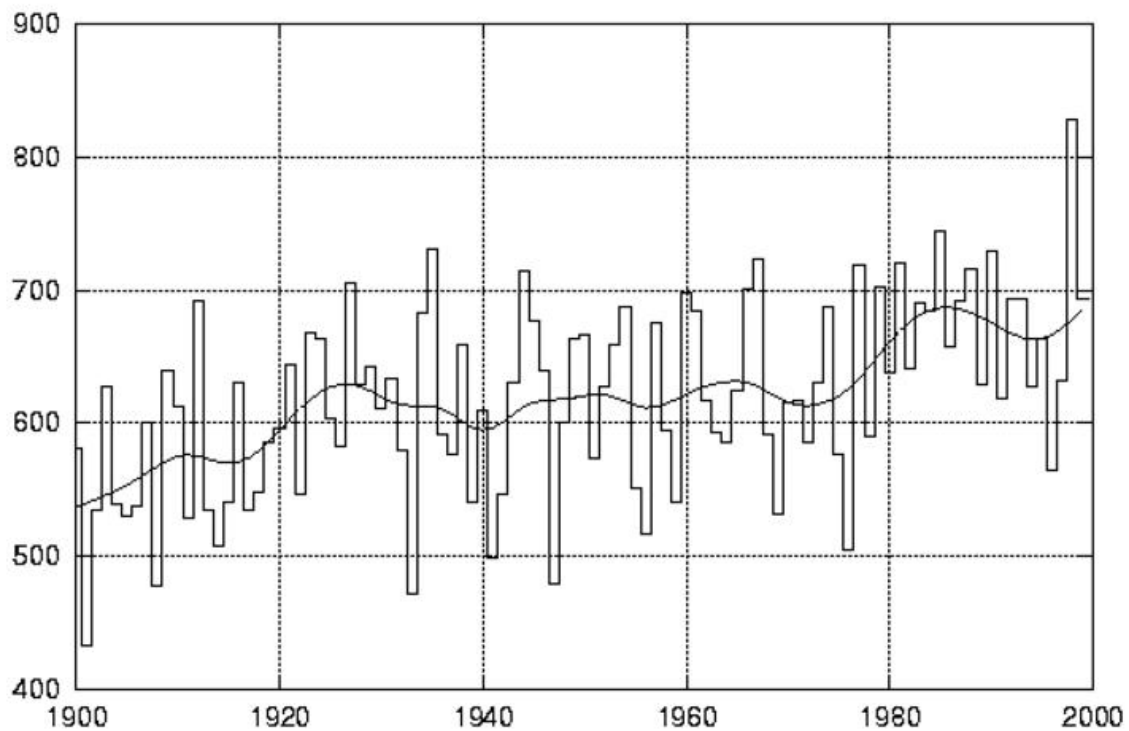


Fig.3: Annual precipitation in Sweden 1900 - 1999, average of 20 homogenised series. The smooth line represents a low-pass filtered curve of Gaussian type emphasising variations on time scales of ten years and longer.

The DWD objective weather type classification (OWTC)

By: Dr. Peter Bissolli and Dr. Ernst Dittmann, Deutscher Wetterdienst

The OWTC is based on daily numerical 12 UTC-analyses of the operational weather forecast models of the German Weather Service (Deutscher Wetterdienst = DWD). The focus is on an area covering Germany and adjacent regions. Principally, the OWTC could be applied to other European regions as well.

The classification consists of 40 different weather types, based on the following criteria:

- the advection of air masses (prevailing wind direction in 700 hPa), 5 classes: NE = Northeast, SE = Southeast, SW = Southwest, NW = Northwest, XX = no prevailing direction;
- the circulation pattern (cyclonicity) in 950 hPa and in 500 hPa, 2 classes each (anticyclonic or cyclonic);
- the humidity integrated over the whole troposphere, 2 classes (dry or wet, referring to deviations of the precipitable water from climatic monthly means 1979 - 1996).

In 1999, the most frequent weather type was a north-westerly one with anticyclonic conditions near the surface, but cyclonic conditions in 500 hPa and a mainly dry

atmosphere (see figure 1). Such a situation happens quite often in summer and is frequently accompanied by convective precipitation. This year, however, this weather type has occurred in February and December too for several days. During these months the precipitation sums in Germany were considerably higher than normal.

Other weather types which were quite frequent in 1999 are those south-westerly and north-westerly ones with anticyclonic conditions in both height levels and a humid atmosphere. But this is not unusual.

The Christmas storm over Central Europe (December 26, named "Lothar" in Germany) has been taken place during a south-westerly type with cyclonic conditions in both levels and a humid atmosphere. Some other storms have occurred in Germany in December during south-westerly weather types too.

It is remarkable that there is a tendency to an increasing number of wet weather types during the last 20 years (see figure 2). In 1999 this number was in fact the highest since the beginning of the time series 20 years ago.

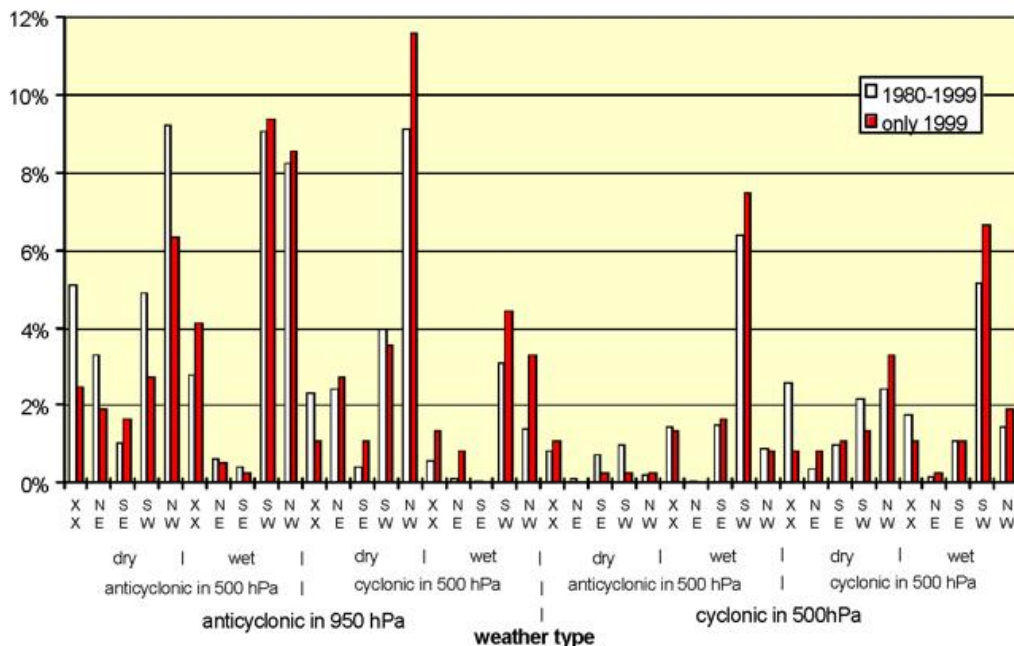


Fig. 1: Relative frequency distribution of the 40 DWD objective weather types 1999 in comparison to 1980 - 1999.

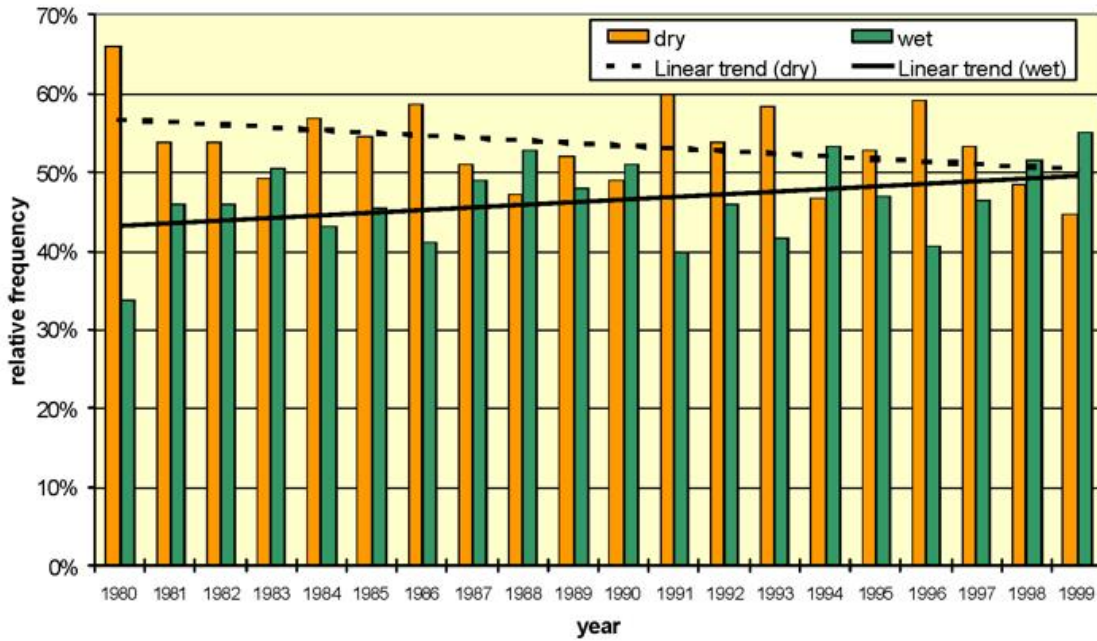


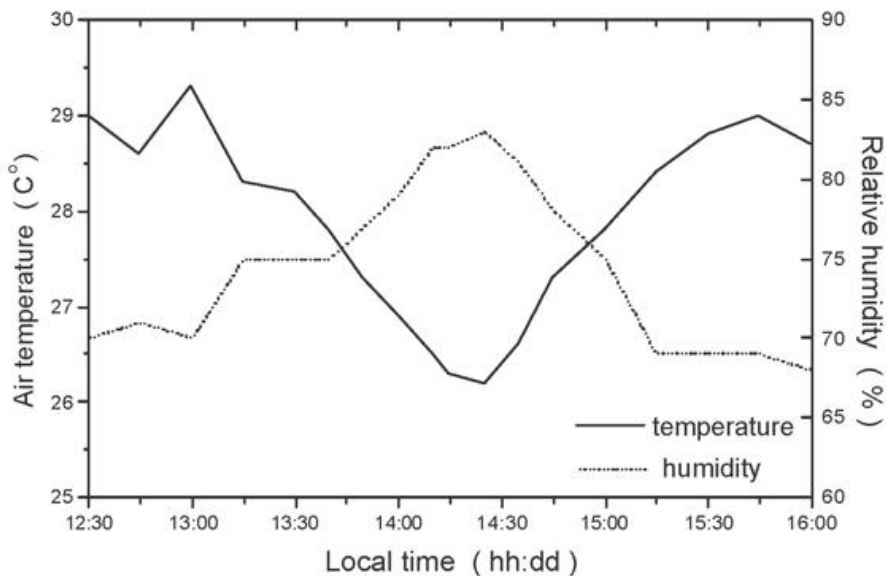
Fig. 2: Annual relative frequencies of the humidity types of the DWD objective weather type classification 1980 - 1999. Lines are linear trends of these frequencies.

The Solar Eclipse effects in Bulgaria

By: Bulgarian National Institute for Meteorology and Hydrology

Surface temperature and relative humidity variation during the Solar eclipse on 11.08.1999 recorded by the Bulgarian NIMH team in Shabla (on the North Black Sea coast).

The partial eclipse began at 12h 46min LT and closed at 15h 33min LT. The full eclipse began at 14h 11min LT and lasted 2min and 27sec.



The SAF on Climate Monitoring

A European Initiative to Support the Use of Satellite Data for Climatological Applications

EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites, developed the idea of decentralised Satellite Application Facilities (SAFs) for the use of satellite data, especially those from EUMETSAT's MSG (METEOSAT Second Generation) and EPS (European Polar System).

Climatological applications are one of the areas, that will make profit from the use of satellite data. Therefore, a SAF on Climate Monitoring was established as an element of the distributed EUMETSAT ground segment. The SAF is hosted by Deutscher Wetterdienst (DWD) and comprises a common project effort, based on the know-how of several partner institutes.

Partners are:

- Finnish Meteorological Institute
- Royal Netherlands Meteorological Institute
- Royal Meteorological Institute of Belgium with Free University of Brussels and Royal Military Academy
- Swedish Meteorological and Hydrological Institute
- Federal Maritime and Hydrographic Agency of Germany with German Climate Computing Centre
- Deutscher Wetterdienst with GKSS Research Centre

The project started in 1999 and is designed for 5 years ending with a quasi-operational phase. The outcome of the SAF will be meteorological products, that may be used for climatological applications especially climate monitoring.

Core products are:

- cloud parameters like
 - . cloud fractional cover
 - . cloud top height
 - . cloud type
 - . cloud top temperature
- components of the surface radiation budget like
 - . surface incoming short wave radiation
 - . surface albedo
- components of the radiation budget at the top of the atmosphere like
 - . incoming solar radiative flux
 - . reflected solar radiative flux
 - . emitted thermal radiative flux
- atmospheric humidity parameters...like
 - . vertical profiles
 - . precipitable water
- and others.

These products will be provided in an area covering Europe and parts of adjacent seas. The horizontal resolution will vary from 15 - 50 km on a time scale between 1 hour up to monthly means, depending on the specific parameter. The products will be distributed to any interested party, be it scientific, administrative, commercial, or else.

DWD itself will be a user of SAF products. A coupled project, financed exclusively by DWD, started simultaneously to generate climate monitoring products using satellite data, together with data from other sources, like the traditional synoptic and climatological networks as well as output from NWP (numerical weather prediction)-models. The outcome of these activities will be maps, diagrams, tables, and interpretations, monitoring climate on a monthly and yearly basis of an area to be defined, starting with central Europe.

More information see:

http://www.dwd.de/research/pos_info.htm

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