Annual precipitation for Sweden as a whole was not exceptional, but large regional deviations from the long-term mean occurred. In southern Sweden, several stations reported the rainiest summer since records began, and some records for monthly and annual precipitation were broken. Norwegian annual precipitation was about 15% above normal, making 2007 the fifth wettest year since 1900. Considerable positive deviations occurred in the southern part of Norway's west coast where annual precipitation in 2007 exceeded the long-term mean by 25%–50%. However, central parts of the west coast had less than 80% of normal rainfall in 2007 (Fig. 6.42a). In contrast to Sweden and Denmark, the wettest seasons (relative to normals) in Norway were winter and spring with seasonal precipitation amounts 40%–50% above the normal value. Annual precipitation amounts in Finland were close to or slightly above normal. However, large regional precipitation deviations occurred during the summer season when the southeastern part of the country received 383 mm, 50% more than usual. Due to higher-than-normal winter temperatures, only the northern and eastern parts of Finland had persistent snow cover.

(iii) Atmospheric circulation

Large-scale atmospheric circulation over northern Europe and the North Atlantic control the regional temperature and precipitation patterns. Using Lamb's (1950) synoptic weather typing, the impact of the large-scale atmospheric circulation on the surface weather conditions in this region has been estimated (e.g., Chen 2000). In 2007, the annual frequencies of C days, days with mixed directional and cyclonic flow conditions (CNW, CW, and CE), and W and NW days were higher than the 1961–90 mean. These conditions contributed to the warmer-than-normal conditions in 2007, especially in winter when the frequency of A days, often associated with cold weather conditions, were about 40% lower than normal. In the summer season, C days as well as days with mixed directional and cyclonic flow conditions occurred more frequently at the expense of A days. The seasonal flow conditions were thus consistent with the warmer weather in winter and wetter conditions prevailing in summer in extended parts of Fennoscandia.

(iv) Notable events

On 14 January a severe winter storm named "Per" brought unusually strong winds to coastal areas of Sweden and Norway. In late August, the eastern coast of Sweden was hit by a storm with winds as high as 35 m s^{-1} at the station of Örskär. The storm was the first in August in Swedish coastal areas since 1975. Kiruna, the northernmost city of Sweden, reported a snow depth of 2 cm on 30 August, the first measurable snow depth in August at any Swedish station since 1994. December was very stormy in Iceland, causing interrupted air and land communication on several occasions.

4) Iberia—R. M. Trigo, C. C. Gouveia, R. García-Herrera, A. Obregón, P. Bissolli, J. J. Kennedy, D. E. Parker, and O. Pires

(i) Temperature

On the Iberian Peninsula, warmer-than-average seasonal temperatures occurred in winter (+0.75°C), spring (+0.63°C), and fall (+0.19°C). Only the summer season was cooler than average, –0.19°C below the 1971–2000 mean. For the year as a whole the eastern half of Iberia was generally warmer than average while the western half was near average. The annual temperature averaged over the Spanish mainland and the Balearic Islands was 0.4°C above the 1971–2000 mean. The annual temperature was also above average for Portugal (0.2°C above the 1961–90 mean).

February was a particularly warm month throughout Iberia, ranking as the fourth warmest in Spain. During spring, slight negative anomalies in the 500-hPa geopotential height over northern Africa (not shown) reflected the passage of several low pressure systems that induced relatively high precipitation values over Spain and northern Africa in spring (Fig. 6.49, upper right). Summer was characterized by colder-than-normal temperatures and negative 500-hPa geopotential height anomalies in northern Iberia and adjacent Atlantic areas. These anomalies were associated with summer storms that affected the western and northern sectors of Iberia, particularly in July and August. By contrast, positive 500-hPa geopotential height anomalies were present over the Atlantic region in autumn with a large region of maximum values (above 100 gpm) located west of the British Islands. This pattern contributed to a highly asymmetric 850-hPa temperature anomaly field over Iberia. While the western sector was considerably warmer than normal, the eastern provinces were under the influence of cold air advection.

(ii) Precipitation

Drier-than-average conditions affected the Iberian Peninsula during the 2006–07 winter (DJF), with most of the central, southern, and eastern sectors of Iberia receiving less than 60% of 1961–90 average precipitation (Fig. 6.49, upper left). The winter dryness was consistent with positive SLP anomalies over southwestern Europe and northern Africa, a

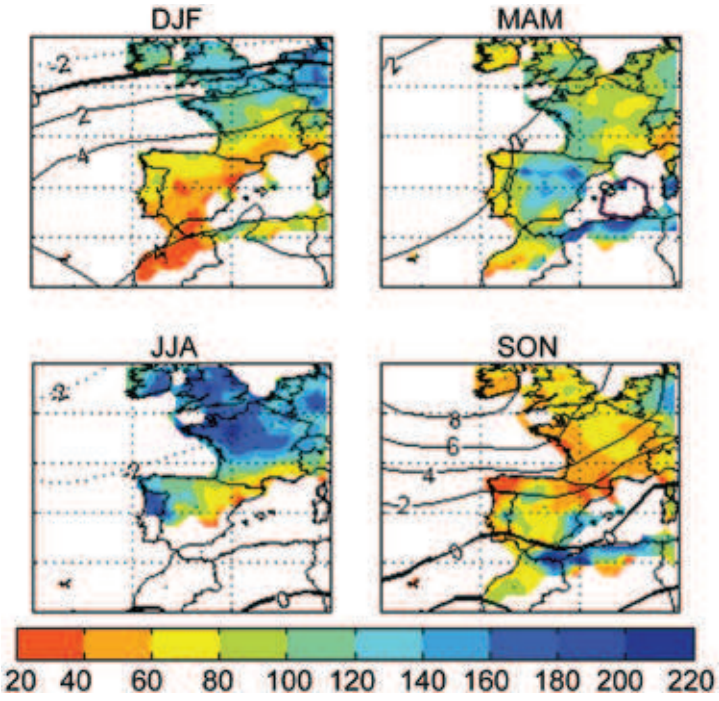

FIG. 6.49. Seasonal anomalies of sea level pressure (contour, hPa) using data from NCAR–NCEP reanalyses. The colored shading represents percentage of accumulated seasonal precipitation compared with climatology using the monthly GPCC precipitation dataset. All climatological averages are computed for the 1961–90 period. Only areas with seasonal rainfall normals above 30 mm are shown. Negative anomalies are dotted while the zero line is bold.

feature that has been shown to limit the progression of Atlantic low pressure systems into southern Europe (Garcia-Herrera et al. 2007). Precipitation was generally above average across Spain and below average in Portugal during spring (Fig. 6.49, upper right). During summer, precipitation totals were above (below) normal in western (eastern) Iberia (Fig. 6.49, lower left). Positive SLP anomalies were predominant during autumn over western Europe, promoting widespread dry conditions over southwestern Europe, with several sectors of northwestern and northeastern Iberia receiving less than 40% of the seasonal average (Fig. 6.49, lower right). December was extraordinarily dry in the northwest with precipitation in most of Portugal and adjacent Spanish regions below the 10th percentile of the 1961–90 distribution. Most of Portugal and also parts of Spain received less than 20% of the normal precipitation.

Summer is a climatologically dry time of year on the Iberian Peninsula. Despite a wetter-than-average summer in western Iberia, the absolute precipitation totals were relatively low. By contrast, the spring and fall seasons are climatologically wetter seasons, and they are the wettest seasons of the year in northern and eastern sectors of Iberia (Trigo and Palutikof 2001). With an anomalously dry winter, spring, and autumn, Iberia received only 75% of annual average rainfall leading to moderate-to-severe drought in several highly populated coastal regions. This was the case for western Iberia, including Portugal and Galicia (Espirito-Santo et al. 2008), as well as Spain's northeastern province of Catalonia. Vigo received only 1038 mm of rainfall (54.4% of the 1971–2000 average), which is the lowest since observations began in 1951. Santiago de Compostela received 58.7% of the annual average precipitation, ranking 2007 as the third driest year since 1944. Overall, Spain received only 80% of the 1971–2000 mean rainfall in 2007. In Portugal, many parts of the country received rainfall amounts below 80%, and for the country as a whole it was the second driest year (behind 2005) since 1931.

(iii) Notable events

On 28 January a rare snowfall occurred in coastal and low altitude regions of Portugal for the second consecutive year. On 21 September, Andalucía (southern Spain) was hit by thunderstorms with severe hail and rainfall producing floods and crop damage. The region around Valencia was also affected by torrential rainfall on 11–12 October. Two-day precipitation totals exceeded 400 mm in the mountainous regions of the Marina Alta Province, more than 50% of the annual average. In Valencia, 170 mm was registered on 11 October alone, making this the second wettest day since records began.

April was exceptionally warm in northern Spain, and in several locations in northeastern parts of the country it was the warmest April on record. A new national record for April daily maximum temperature was set in Oviedo (28.3°C). The month of May was extremely hot for the entire Mediterranean coastal region, with several stations breaking monthly mean temperature (Murcia and Alicante) and monthly maximum temperature records (Valencia, Murcia, Alicante, and Reus). June was also extremely hot throughout the Mediterranean coast and the nearby Balearic Islands, with monthly records broken at several stations in Catalonia and Valencia Provinces. In contrast, for the first time since 1997, there was not a single recorded heat wave (defined as five consecutive

days that exceed the average maximum temperature by 5°C based on the 1961–90 base period) during the summer in Portugal. New records for the lowest mean temperature in November were set in Murcia and Alicante. A new record for the lowest all-time daily minimum temperature in Portugal was set on 18 November in Mirandela (–10.9°C).

5) Mediterranean, Eastern, and Southeastern Europe—A. Obregón, P. Bissolli, J. J. Kennedy, D. E. Parker, A. Busuioc, T. Cegnar, T. Colombo, S. Djordjevic, P. Hechler, J. Karkozas, Z. Katusin, M. Kulbida, I. Lukac, and V. Pavan

(i) Temperature

Parts of Romania and Bulgaria exceeded the 98th percentile of annual temperature in 2007, and anomalies exceeded +2°C in Ukraine, Moldova, and eastern parts of Romania (Fig. 6.41). The winter was extraordinarily warm in the Baltic States, mainly due to an exceptionally warm January (+6.3°C averaged over Lithuania; +4.6°C in Tallinn, Estonia). Romania, Croatia, and Slovenia had their warmest winters on record. In Romania, it was the warmest January on record with local anomalies up to +9°C. There was a record-breaking warm January in Italy, and farmers were surprised by the early flowering of many species of fruit trees. A record January high maximum temperature of 21.3°C was recorded on 21 January in Bologna, where records began in 1948. This warmth was associated with a strong alpine foehn event during the passage of the storm "Kyrill" over central Europe (see section 6g2 above).

In Slovenia and parts of Croatia spring season anomalies exceeded +3°C making it the warmest spring in many regions. Italy and Slovenia, in common with other areas of Europe, experienced their warmest April ever (Fig. 6.45). During summer, exceptional warmth was widespread, with mean air temperatures exceeding the 90th percentile. In northeast Romania, Moldova, and southern Ukraine, departures from normal reached or exceeded +3°C. Extreme heat waves affected much of southeastern Europe in the last 10 days of June and during mid- to late July with many places registering their highest recorded maximum temperatures (Table 6.3).

The July heat wave contributed to an exceptionally warm month in southeastern Europe (Fig. 6.47). The largest anomalies were in Bulgaria (3.7°C in Sofia). The July average maximum temperature for Italy was 34.7°C, the warmest July in at least 30 yr. In Serbia and adjacent countries, temperatures in July were above the 98th percentile of the 1961–90 distribution.

During a warm spell at the end of August, the daily maximum temperature in Bosnia and Herzegovina (Mostar, 43.1°C) exceeded the temperature record set during the July heat wave. August anomalies between 2° and 3°C occurred in the Baltic States, western parts of Belarus and the Ukraine, and eastern Hungary, and anomalies exceeded +3°C in eastern parts of Belarus and Ukraine. In December, temperature anomalies exceeded +5°C in Vilnius and Tallinn, while in Romania, local monthly anomalies were as low as –4°C.

(ii) Precipitation

The northern Balkan Peninsula experienced above-average precipitation in 2007 with the largest anomalies in Romania, Serbia, and Bulgaria (e.g., 148% of average fell in Sofia). In contrast, in the Italian region of Emilia-Romagna (near Bologna), the lowest annual precipitation total since 1925 was recorded, with less than two-thirds of the normal.

Table 6.3. Record temperatures reported in Jun and Jul in southeast Europe.

Location	Date	Temperature
Froggia/Amendola, Southern Italy	25 Jun	47.0°C
Athens, Greece	26 Jun	46.2°C
Negotin, Serbia	26 Jun	41.2°C
Kiskunhalas, Hungary	20 Jul	41.9°C
Hurbanovo, Slovakia	20 Jul	40.3°C
Slobodzya, Moldova	21 Jul	41.9°C
Odessa, Ukraine	23 Jul	39.3°C
Chisinau, Moldova	23 Jul	39.4°C
Prizren, Kosovo	24 Jul	42.0°C
Demir Kapija, Macedonia	24 Jul	45.7°C
Smederevska Palanka, Serbia	24 Jul	44.9°C