

4) IBERIA—R.M. Trigo, D. Barriopedro, C.C. Gouveia, A. Obregón, P. Bissolli, J.J. Kennedy, and D.E. Parker

Countries considered in this section include: Portugal and Spain.

(i) *Temperature*

The Iberian Peninsula registered significantly above-average temperatures for 2009 (Fig. 7.29). The annual mean anomalies for Iberia generally ranged between +1°C and +2°C, with higher values in the East. Large parts of the West recorded anomalies of between 0°C and +1°C. The year started with a negative anomaly for the winter (-0.72°C), followed by a warmer-than-average spring (+1.57°C), a particularly warm summer (+1.88°C), and a relatively warm fall (+1.26°C, Fig. 7.31). Several cold spells affected Iberia in January and February. Snowfall occurred even in low-altitude coastal regions of Portugal, which is an unusual phenomenon there, and new records in the number of snow days in Spain were reached for January, e.g., in León (14 days, highest since 1938, about 800 m elevation) and Ávila (11 days, highest for about 20 years, 1100 m elevation). The following seasons were generally characterized by high values of 500-hPa geopotential height, with maximum anomalies located north of Iberia (spring) and over eastern (summer) and western (autumn) Iberia.

It was the third warmest year in Spain since 1961 (anomaly +1.25°C relative to 1971–2000). The largest anomalies were observed in the central and southern regions, and in the northwestern Iberian Peninsula. The lowest deviations were restricted to the Balearic Islands. Temperature departures in Portugal were highest in the North (+0.9°C, 1971–2000 base) but generally lower than those anomalies in Spain (+0.5°C averaged over whole mainland Portugal). The warmest months of 2009 in Spain (relative to normal) were May, June, October, and November, when mean temperatures were more than 2°C above average. Overall, in Portugal the warmest months (relative to normal) were March, May, and October.

Winter 2008/09 temperatures were slightly below the long-term average. In contrast, much of the rest of the year was exceptionally warm (Fig. 7.32). Temperature anomalies in spring exceeded +2°C in the central Peninsula, while summer brought record mean temperatures (for the last 50 years) to many stations in Catalonia and to northern and central parts of the Peninsula. The summer and autumn anomalies for Spain including the Balearic Islands were +1.9°C and +1.7°C, respectively, making both seasons the third warmest on record. In November, some stations in

southern and eastern Spain reported record-breaking monthly mean temperatures at stations with long histories (e.g., Valencia, with observations dating back 141 years.)

(ii) *Precipitation*

Iberia experienced, on average, near-normal conditions during 2009, with only local sectors of central and southern Iberia receiving less than 80% of the climatological average (Fig. 7.30). Dry episodes are relatively common in Iberia and, regarding the duration and intensity of dry periods in this context, 2009 can be classified as a moderately dry year, particularly when compared with exceptional dry years such as 2005. Nevertheless, all seasons recorded lower-than-average precipitation for the aggregated area of Iberia (Fig. 7.33), particularly spring, summer, and autumn, but December 2009 was an exceptionally wet month.

May was especially dry (40% of normal), with some stations in northeastern Spain recording new historical minima (as low as 1.1 mm) in a series of up to 130 years. June showed a remarkable dipole pattern over Iberia. While the eastern half of the Peninsula, particularly the Mediterranean coast, was dry, Galicia and much of Portugal were quite wet, with the impact even discernible in the summer (JJA) average (Fig. 7.33, JJA). Rainfall anomalies exceeded 150% along the Atlantic coast. Monthly mean anomalies for June in Lisbon reached nearly 300% (59 mm), although June is a relatively dry month and hence moderate values of precipitation can result in a large percentage anomaly.

Averaged across Iberia, autumn seasonal mean deficits were similar to spring and summer; though some regions, like the southern Mediterranean coast, were much wetter than normal. The year closed with considerably wetter-than-average conditions in much of Iberia during December 2009. In southeast Spain, December precipitation was more than twice normal.

(iii) *Notable events*

On 24 January, an exceptional storm hit northern Spain with strongest gusts reaching 190 km hr⁻¹. It was the worst storm in this region since 1999 (see sidebar).

On 27–29 September, heavy precipitation was recorded at a number of locations on the Spanish southeastern coast. Although such convective episodes are typical for that time of the year, the event of 27–29 September significantly contributed to the very high monthly totals, which broke records at some locations in southeastern Iberia (e.g., Alicante with 309 mm; records commenced in 1939) and the Balearic Islands (e.g., Palma, with 222 mm; series commenced in 1951).

EXCEPTIONAL STORM STRIKES NORTHERN IBERIA AND SOUTHERN FRANCE—R.M. TRIGO, D. BARRIOPEDRO, C.C. GOUVEIA, A. OBREGÓN, P. BISSOLLI, J.J. KENNEDY, AND D.E. PARKER

An exceptional North Atlantic storm swept through northern Iberia and southern France on 23–24 January 2009. The storm (labeled Klaus by the German Weather Services, DWD) developed off Bermuda on 20 January and crossed the Atlantic, reaching the Bay of Biscay in the early hours of the 23rd, where it deepened further (Liberato et al. manuscript submitted to *Weather*). The strongest winds induced by Klaus were felt in northern Spain, including the large populated cities of Santander, Bilbao, and Barcelona (Fig. 7.36). But it was in southern France (namely in the cities of Bordeaux, Narbonne, and Perpignan) that the wind gusts surpassed many previous records. The highest level of wind warning possible was issued by Météo France, though sadly at least 20 fatalities occurred that were a direct consequence of the storm. More than one million homes suffered power cuts as trees and power lines were downed, while road and rail links were blocked and airports closed. Klaus was considered the most damaging wind storm to affect northern Iberia, southern France, and the western Mediterranean since the storm Martin in late December 1999, which killed 88 people and uprooted millions of trees (Liberato et al. manuscript submitted to *Weather*).

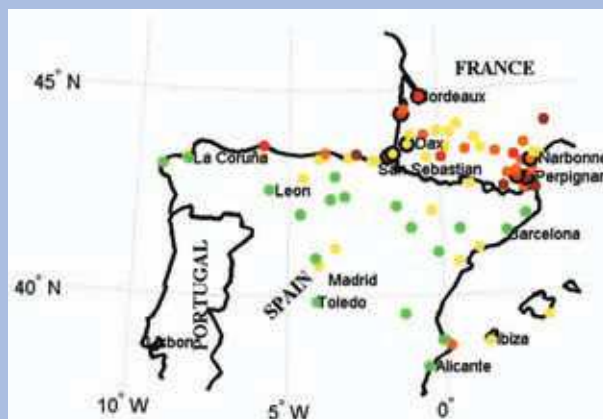


FIG. 7.36. Maximum wind gusts recorded in Spain and southern France (on either 23 or 24 January 2009). Green ($100\text{--}120\text{ km hr}^{-1}$), yellow ($120\text{--}140\text{ km hr}^{-1}$), orange ($140\text{--}160\text{ km hr}^{-1}$), red ($160\text{--}180\text{ km hr}^{-1}$), and brown ($180\text{--}200\text{ km hr}^{-1}$). Stations which set new wind gust records are highlighted with a solid circle around the color circle.

5) MEDITERRANEAN, ITALIAN, AND BALKAN PENINSULAS—A. Obregón, P. Bissolli, J. J. Kennedy, D. E. Parker, and S. Sensoy

Countries considered in this section include: Italy, Malta, Slovenia, Croatia, Serbia, Montenegro, Bosnia and Herzegovina, Albania, Macedonia, Greece, Bulgaria, and Turkey.

(i) Temperature

Much of Southeastern Europe was $1^{\circ}\text{C}\text{--}2^{\circ}\text{C}$ warmer than average during 2009 (Fig. 7.29), exceeding anomalies of $+2^{\circ}\text{C}$ over eastern Slovenia and $+2.5^{\circ}\text{C}$ in northeastern Italy and western Slovenia. Throughout Croatia, very high annual temperatures prevailed, exceeding the 98th percentile of the 1961–90 distribution over most regions. In Zagreb, it tied with 2008 as the third warmest year since 1862. In Turkey, the 2009 mean temperature was 0.9°C above the 1971–2000 average.

Winter temperatures were near normal over most of the region (Fig. 7.32a). Negative anomalies were observed over the western Mediterranean, Sicily, Sardinia, and in parts of Italy. The largest positive anomalies were recorded in Bulgaria and Montene-

gro, where many locations in the East recorded their warmest winter on record.

Spring and summer were exceptionally warm except in Turkey, which was colder than normal (Fig. 7.32b,c). April was particularly warm in Serbia and Croatia (Fig. 7.34). May was the third warmest in the last two centuries in Italy, mainly due to a heat wave at the end of the month. Another very strong heat wave in July brought temperatures of $40^{\circ}\text{C}\text{--}45^{\circ}\text{C}$ to various places in Italy. The official peak value was 45.0°C in Decimomannu, Sardinia, a new local record. In Mostar (Bosnia and Herzegovina), it was the warmest summer on record. September was particularly warm in Turkey, with maximum and minimum temperature records broken in a number of locations.

In Italy, December was a month of strong contrasts. A cold spell between 18–23 December saw a number of records broken in northern Italy, with temperatures falling below -15°C in a number of locations. Only days later, on 25–30 December record high temperatures were recorded across central and southern Italy, with temperatures exceeding 25°C . In Bulgaria, several stations registered record high temperatures on Christmas Day (e.g., 21.2°C in Vratsa). December mean temperature was well above normal