ber to December, temperatures were over 3°C above normal in far western Amazonia. Air temperatures in Bolivia and northern Paraguay were 1°–4°C below normal from September to November.

iv) Tropical South America West of the Andes—R. Martínez[51]

As in northern South America, rainfall in Ecuador and Peru was strongly influenced by SST over the Niño-1+2 region during 2005. Despite weak warming in the tropical Pacific, cold coastal SST anomalies led to negative rainfall anomalies along the Ecuadorian coast. Mean temperature also was below normal during 2005. In November 2005, a strong frost caused significant damage in the central and southern highland of Ecuador. In Peru, rainfall was below normal along the central and southern highlands, continuing several years of drought in this region. Bolivia also experienced drier-than-normal conditions in 2005, except for October and November when intense rains generated flooding and damage. The mean temperature in Bolivia was above normal across most of the country.

v) Southern South America—M. Bidegain[7] and M. Rusticucci[78]

Annual precipitation anomalies over southern South America show light deficits over the east and surplus over central Chile and western and southern Argentina. Above-normal precipitation for several months contributed to the positive anomalies in these regions. A series of intense summer (June–August) precipitation events also contributed, with some local anomalies exceeding 700% of the normal. On 26 June, 162.4 mm of rain fell over Concepción, Chile, generating landslides that killed 5 and injured 4,800. Between 26 and 28 August, 120 mm of rain fell in 48 h in Santiago, Chile, resulting in 1,153 injured, 755 houses damaged, and an estimated economic cost of $10 million USD.

The regional core of negative precipitation anomalies was in the Chaco region and southern Paraguay, where intense drought prevailed to spring 2005. Precipitation deficits produced livestock losses and reduced water levels on the Uruguay River, impacting hydroelectric generation. Strong negative October–December rainfall anomalies dominated the southern part of the region, affecting agriculture in this productive region. In southern Brazil, seasonal (December 2004–March 2005) rainfall 100–500 mm below normal produced intense drought and heavy agricultural losses. The southern state of Rio Grande do Sul was the most affected, and while May rainfall alleviated the drought, it produced flooding in some cities. Damage attributed to the drought of 2005 in southern Brazil was considerable: 2 million people were affected by water shortages, 13 million tons of agricultural products were lost, and economic losses were on the order of $3 billion USD.

Annual air temperature anomalies were generally near normal, with eastern regions above normal and central and western region slightly below normal. Uruguay experienced temperatures above the normal (up to +1.2°C), especially near the Brazilian border. From January to August most monthly temperatures were above normal, with May–August having the largest anomalies. June temperature broke records (for the 1961–2004 period) over northeastern Argentina, and winter was 2°C warmer than normal in Uruguay. In contrast, cold air advection in September affected the eastern part of the region. October–December temperature anomalies were up to 3°C below normal, with early December frosts, including a few intense frosts in the Andes that killed thousands of sheep. Annual air temperatures in Chile were slightly above normal in the central region, and slightly below normal in the south. April, May, and June temperatures were below normal, especially in southern Chile. The week of 26 June, a severe cold air outbreak between 34° and 36°S left 30,000 injured and affected 12,000 homes.

On 23–24 August 2005, an exceptionally strong midlatitude cyclone occurred over Rio de la Plata and southern Uruguay. The gale was characterized by unforced rapid deepening to a near–record (locally) low mean sea level pressure, very high winds, and anomalous cold surface temperatures. High winds contributed to extensive damage and 10 deaths along the Uruguayan riverside.

f. Asia

i) Russia—O. N. Bulygina,[11] N. N. Korshunova,[40] and V. N. Razuvaev[72]

(i) Temperature

Russia experienced very warm conditions in 2005. The mean annual air temperature anomaly relative to the period of record (1936–2005) was +1.6°C, which is the second highest value since 1936 (Fig. 6.19).

The year began with January temperatures above normal across all of Russia, although very cold weather was observed in places. Northeast European Russia experienced particularly warm conditions, with mean monthly temperature anomalies exceeding +8°C. Anomalies reached +7°C over central regions. Moscow's January 2005 temperature ranked third highest on record, with record maximum daily

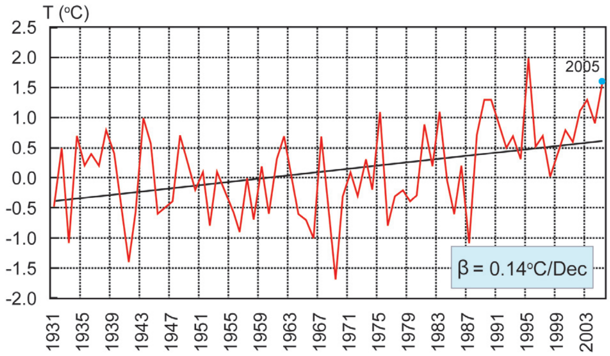

FIG. 6.19. Departures of mean annual air temperatures (red) over the Russian territory for the period 1931–2005. A linear trend of +0.14°C decade^{-1} (black) is also shown.

air temperatures observed on five days (e.g., 5.2°C on the 9th). February temperatures in north European Russia and western Siberia were up to 10°C above normal.

Interestingly, January and February air temperatures in the north of Asian Russia were often higher than those to the south. At Turukhansk, the 12 January mean air temperature was –5.5°C, which is 21.5°C above normal. In contrast, at the end of January the Novosibirsk and Kemerovo regions experienced temperatures as low as –38°C, and temperatures in the Republic of Altai reached –47°C. Particularly strong February frosts occurred between the 15th and 18th in Altai (–40° to –43°C), and from the 1st to the 10th in Trans-Baikal (–38° to –44°C), while true "Siberian" frosts (–35° to –40°C) were recorded during 14–19 February in the Krasnoyarsk Territory and Khakasia (south-central Siberia). The Republic of Tuva experienced its most severe and persistent frosts in the past 20 yr, as temperatures fell to –48°C in the Tuva hollow.

March brought bitter cold across much of European Russia, with record cold mean monthly temperature anomalies (–5° to –6°C) set in several northeastern areas, and colder-than-normal (–3° to –4°C anomaly) conditions in central and western regions. However, April countered with positive temperature anomalies over most of Russia. Western parts of the Sakha Republic (northeast Siberia) were particularly warm, with mean monthly anomalies from +7° to +8°C. Anomalous warmth continued into May, with the mean May temperature for Russia tying the record set in 1943. May 2005 was the hottest May in the 105-yr temperature record for the Ural Federal District.

During the first 20 days of June, central and southern regions of European Russia recorded anomalously cold air temperatures (0° to –2°C) as a result of frequent cold air intrusion. Concurrently, temperatures ran 1° to 2°C above normal across most of the Russian Far East. In early July, western and southern-central regions of Siberia experienced a heat wave, with diurnal temperatures climbing to 39°C in places.

A strong anticyclone centered over European Russia caused very dry and hot weather in August. The Novosibirsk region and Altai in western Siberia experienced mid-August diurnal temperatures between 28° and 38°C. At 40°C, Zmeinogorsk exceeded the previous August maximum temperature record by 2°C. For the whole of Russia, summer 2005 was one of the warmest on record.

With a temperature anomaly of +2.7°C, autumn 2005 was the hottest autumn on record for Russia (Fig. 6.20). While September was warm, eastern Siberia experienced its warmest October in the past 65 yr, with October temperatures 2°–5°C above normal. Record November temperatures were also reported at several meteorological stations in northeastern European Russia and in the southeast of the Sakha Republic as two large heat domes formed over those regions (Fig. 6.20). Temperatures near the centers of these areas of heat were 9° and 11°C above normal, respectively.

The warm weather over European Russia and the Sakha Republic persisted into December, with monthly temperatures being 1°–4°C above normal. However, December temperatures were 4°–5°C below normal in southern Siberia (Krasnoyarsk Territory and Irkutsk region) as a cold pool formed in the Siberian anticyclone zone following the warm autumn.

(ii) Precipitation

The warm winter temperatures also led to above-normal January precipitation in places. Moscow reported a new record January precipitation total of 98 mm (232% of monthly average). Heavy March precipitation was recorded in the eastern regions of European Russia and in the Urals, in some regions exceeding normal values threefold. Frequent March snowstorms with heavy snow were observed across European Russia (from the Nenets Autonomous District to northern Caucasia). The Taimyr Peninsula experienced strong winter blizzards with heavy snow and winds exceeding 25 m s^{-1}. In the east, Trans-Baikal, Sakhalin, and Kamchatka were repeatedly attacked by strong cyclones that brought heavy snow and blizzard conditions. March precipitation in these regions was more than double that of normal amounts.

Heavy April precipitation (200% to > 300% of normal) was recorded in central and southern regions of

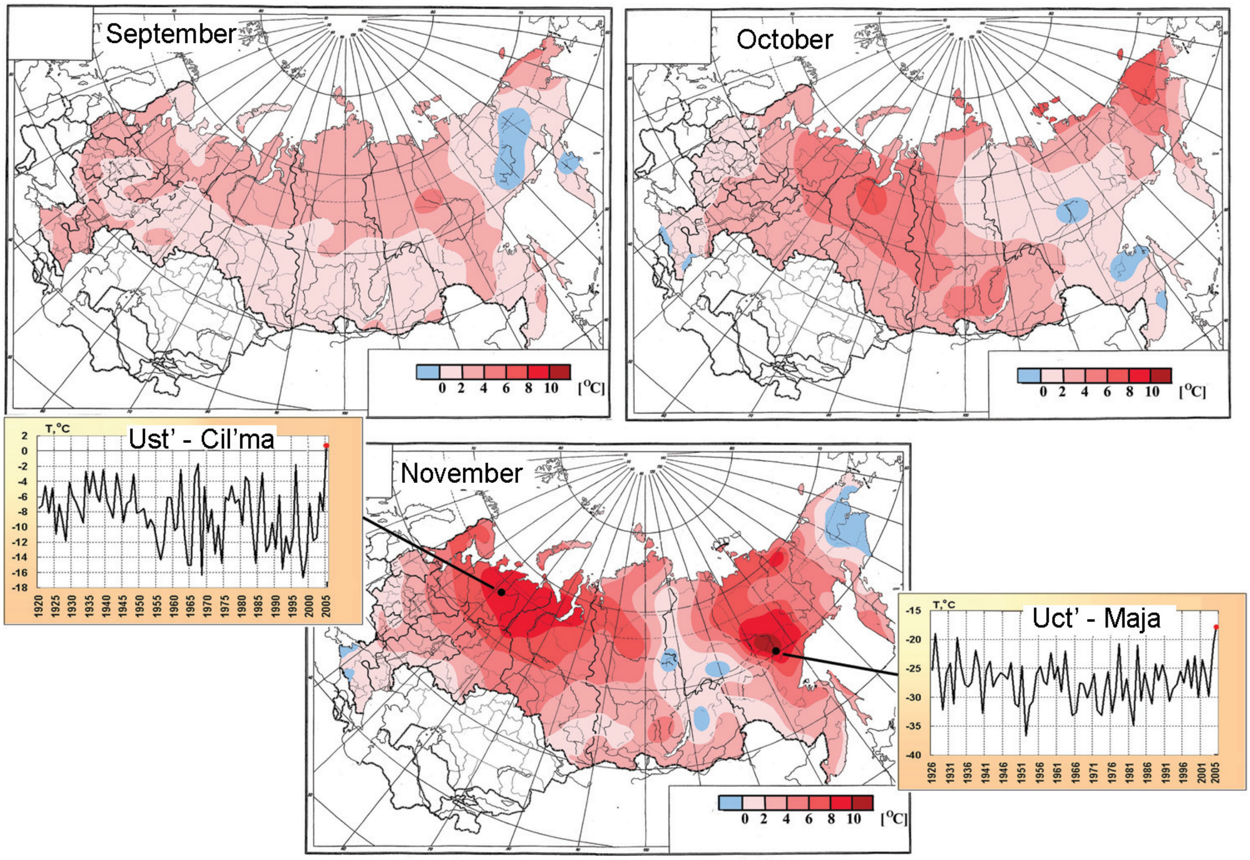

Fig. 6.20. Russian air temperature anomalies (°C) in autumn 2005. Insets show November mean monthly air temperatures at meteorological stations Ust'-Cil'ma (1920–2005) and Uct'-Maja (1926–2005).

Siberia (Krasnoyarsk Territory, Khakasia, Cis-Baikal, and Trans-Baikal). From 12 to 16 days of precipitation fell in Khabarovsk Territory and the Amur region, more than double the normal frequency and totaling over 200% of the normal precipitation for the month. Wet conditions continued into May in Khabarovsk, Maritime Territories, and Sakhalin, resulting in high river levels.

Summer precipitation across Russia was often accompanied by severe thunderstorms with hail and wind squalls. Hail to 35 mm was recorded in the Krasnodar Territory. In early June, the Arkhara River (Amur region) flooded to a record June level of 4.1 m after a 2-day, 100-mm rainfall. However, the hot June was accompanied by precipitation deficits over western Siberia (20%–30% of monthly normals). July precipitation in European Russia was inconsistent, with heavy thunderstorms in places and precipitation deficits in others. August precipitation was just 8%–30% of normal across European Russia, although the Kaliningrad region in the far west received over 300% of normal monthly precipitation.

Precipitation deficits continued into September. Moscow experienced one of its driest Septembers on record (12.2 mm, 18% of normal). With the high temperatures, fire hazard increased over much of European Russia, and several peat bogs caught fire. Near-normal precipitation returned to Russia by December, with the exception of the south of the Central Federal District, where around 200% of monthly normal snow fell.

II) China—F. Ren[73] and G. Gao[23]

(i) Temperature

In 2005, the annual mean temperature of China was 0.6°C above the 1971–2000 mean (Fig. 6.21). It was the ninth consecutive year of warmer-than-normal temperature since 1997. Regionally, temperatures were above or near normal across most of China, with 1°–2°C above normal in the middle Tibetan Plateau and eastern Xinjiang.

The 2004/05 winter (December–February) mean temperature was near normal for China, but it ranked the third lowest since the 1986/87 winter. In mid-February, rare icing events occurred in some provinces

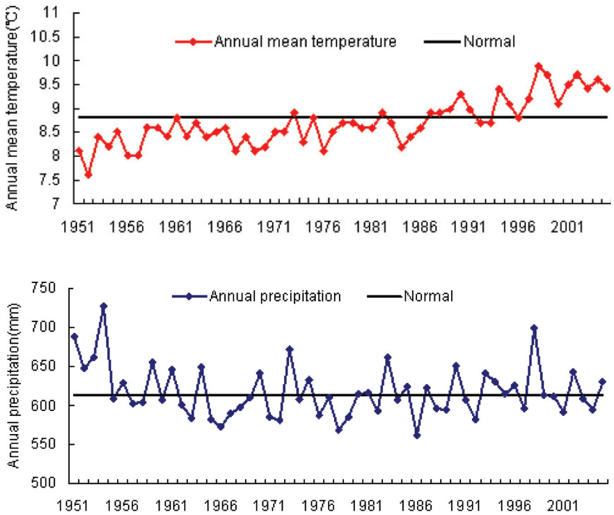

Fig. 6.21. Mean annual (top) temperature (°C) and (bottom) precipitation (mm) averaged over China relative to the 1971–2000 mean.

in southern China (e.g., Hunan, Hubei, Guizhou). In Hunan Province, the power grid was the most heavily affected by icing since 1954.

Summer seasonal mean temperature tied 2000 and 2001 as the highest ranked since 1951. Heat waves occurred frequently in central-eastern China and Xinjiang. Southeastern China experienced 5–15 days more than normal (20–40 days) with maximum temperatures at or above 35°C. Seasonal extreme daily maximum temperatures were 38°–42°C in North China, western Huanghuai Region, and South China, while records (1951–2005) of seasonal extreme daily maximum temperature were broken in parts of Hebei, Shanxi, Shandong, Zhejiang, and Inner Mongolia.

China also experienced a warm autumn, and the seasonal mean temperature ranks second in the historical record (1951–2005). In southeastern China, heat waves returned during the middle of September, and daily maximum temperatures soared to 35°–39°C.

(ii) Precipitation

In 2005, annual precipitation was 17.7 mm above the 1971–2000 mean across China (Fig. 6.21). Regionally, precipitation was 30%–100% above normal in the Huanghuai region, southern and northern Xinjiang, Qinghai, northwestern Tibet, and the southeast coast, and 30%–80% below normal in northern Heilongjiang, the middle of Inner Mongolia, and northern Ningxia (Fig. 6.22).

Regional and short-term drought was a major characteristic in 2005. In southern South China, precipitation was only 300–600 mm from September 2004 to May 2005, or about 30%–80% below normal, resulting in severe persistent drought. From April to May, rare spring drought occurred in Yunnan Province as a result of long-term rainfall deficiency. Early summer drought occurred in middle and lower reaches of the Yangtze River due to a delay in the onset and shortened duration of the plum rain season generating below-normal precipitation. Summer–autumn drought occurred in northeast part of northwest China and Inner Mongolia, and autumn drought affected Hunan and western South China.

(iii) Notable events

An above-normal eight tropical storms or typhoons made landfall in China, of which six (Haitang, Matsa, Talim, Khanun, Damrey, and Longwang) were severe, with winds over 162 km h^{-1} (see section 4c). Heavy rain and high winds generated mudflows and widespread flooding. About 92 million people were affected (386 dead), and economic losses of over 82 billion yuan Renminbi (RMB; $10 billion USD) were exceeded only by losses in the 1996 typhoon season.

From 17 to 25 June, consecutive heavy rainstorms impacted South China with 300–600 mm of rain falling in parts of Fujian, Guangdong and Guangxi Provinces. The Xijiang River in Guangxi and the Minjiang River in Fujian exceeded flood stage. About 21 million people were affected by the floods—171 people lost their lives and direct economic loss was over 18 billion RMB ($2.2 billion USD).

During early and middle July, heavy rain and flooding occurred in the upper reaches of the Huaihe River Basin. Between late September and early October heavy flooding occurred in the Hanjiang River and the Weihe River as the result of frequent and

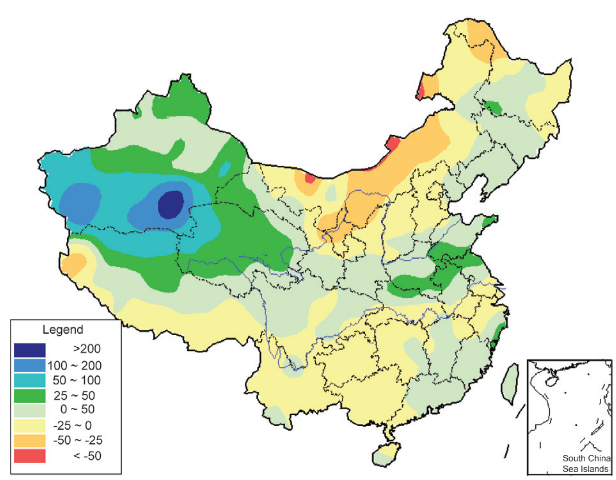

Fig. 6.22. Precipitation anomalies (%) across China (1971–2000 base).

widespread rainfall in the southeast part of northwest China and the Huanghuai region. About 5.52 million people were affected, with 14 dead in Shanxi, Hubei, and Gansu Provinces and 2.5 billion RMB ($311 million USD) of direct economic loss.

Although fewer dust storms affected China than in 2004, and 2005 had the lowest number since 1954, 13 storms occurred. The most widespread occurred from 16 to 21 April, affecting 12 provinces in northern China, while the most intense storm occurred on 27–28 April, impacting nine northern provinces or regions, including Beijing.

iii) Southeast Asia—F. Ren[73] and G. Gao[23]

(i) East Asian monsoon

Onset commenced over the South China Sea (SCS) in the sixth pentad of May, about two pentads later than normal. Stronger-than-normal southwesterly flow advanced to and persisted over South China until the fourth pentad of June. In the last 10 days of June, the monsoon advanced to the region between the Yellow and Huaihe Rivers. In mid-August, rapid retreat occurred to around 30°N where it remained until mid-September. In the sixth pentad of September the warm and humid air had withdrawn from East Asia, and wind direction in the SCS shifted from the southwest to northeast, signifying a near-normal closing date to the East Asian summer monsoon.

The SCS summer monsoon index (–1.42) was weaker than normal. Intensity of the SCS monsoon also was weaker than normal during summer except for the periods from the sixth pentad of May to the third pentad of June and from the second pentad of August to the third pentad of August (Fig. 6.23). Precipitation was above normal in most of South China in June and in the Upper Huaihe River from July to September.

(ii) Temperature

Annual air temperature anomalies were generally 0.5°–1°C above the 1971–2000 mean. However, annual temperatures over the SCS were near to slightly below normal (Fig. 6.24). Seasonal mean surface air temperatures were above average in most of southeast Asia during December 2004–February 2005, with anomalies exceeding 1°C in the northern and southeastern Indo–China Peninsula. Generally, temperatures were close to normal across southeast Asia through the remainder of the year.

(iii) Precipitation

Precipitation was generally below normal across most of continental Southeast Asia in 2005. Northern and western Myanmar, southern Vietnam, and portions of Malaysia observed annual anomalies more than 400 mm below normal. The Philippines, western Thailand, and the northern Malay Peninsula received above-normal precipitation, with northeastern Malaysia, central Vietnam, and Mindanao all receiving over 400 mm above normal for the year (Fig. 6.24).

December 2004–February 2005 rainfall was below average over most of Southeast Asia, and more than 80% below normal in the western Indo–China Peninsula. March–May rainfall totals were well below normal in the northern Indo–China Peninsula and close to normal over the remainder of Southeast Asia. In April, Thailand experienced its worst drought in seven years. June–August precipitation was close to normal, though heavy rainfall caused flooding in northern Thailand. In Myanmar, heavy monsoon-related rainfall affected the southern coastal areas during the second week of September. Otherwise, September–November rainfall was near normal.

(iv) Notable events

In Indonesia, heavy January rains hampered tsunami (December 2004) relief efforts, and continued heavy rain in February generated landsides that left 61 dead and 90 missing. On 9 June, continuous heavy rain brought mudslides with 12 deaths and 11 missing in northern Vietnam. In West Sumatra, Indonesia, heavy rainfall produced landslides near Padang on 2 September. There were 16 fatalities and at least 10 injuries. Heavy October rains across central Vietnam produced flooding with at least 67 fatalities. The most severely affected area was Binh Dinh Province, where 3,200 houses were damaged and most of the fatalities occurred.

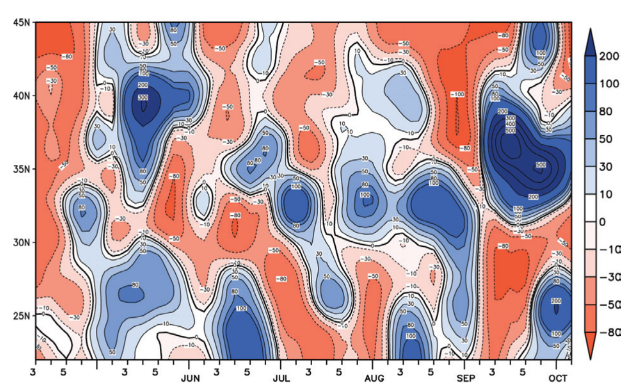

Fig. 6.23. Time–latitude cross section of pentad precipitation anomalies (%) for 110°–120°E. [Source: National Climate Center (NCC) China Meteorological Administration (CMA)]

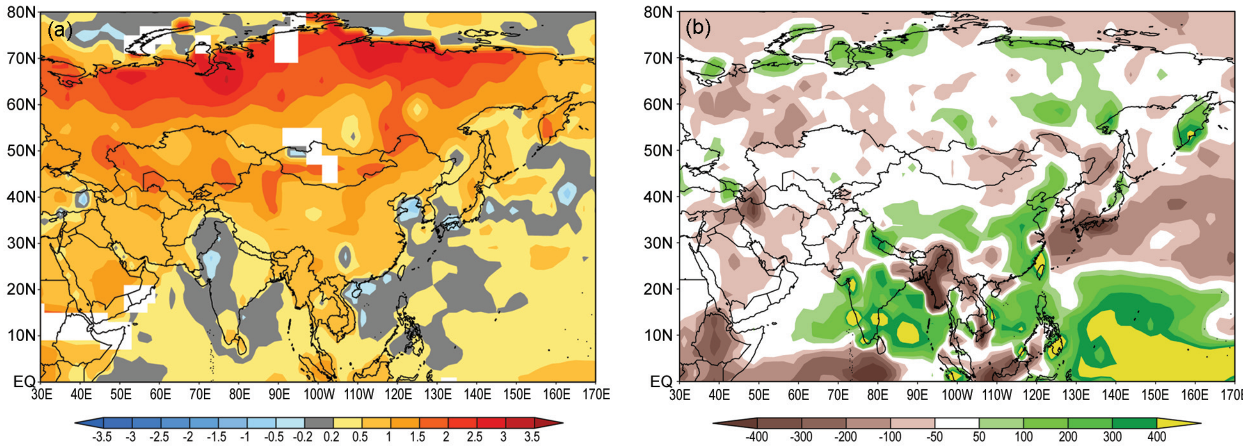

Fig. 6.24. Asian 2005 annual (left) temperature anomalies (°C; 1971–2000 base), and (right) precipitation anomalies (mm; 1979–2000 base) from CAMS–OPI.

iv) India and Southern Asia—M. Rajeevan[71] and K. R. Kumar[42]

(i) Temperature

This year was marked by extreme weather all across South Asia, both in terms of temperature and precipitation. At the beginning of the year, parts of Afghanistan and adjoining Pakistan experienced extreme cold weather, with temperatures more than 5°C below normal in February. Severe cold also prevailed over northern India and adjoining regions in late February. During the postmonsoon season and toward the end of the year, heavy snow and extreme low temperatures occurred over northern parts of South Asia, causing several casualties and seriously affecting the rescue and rehabilitation work in Pakistan following the destructive earthquake of 8 October.

On the other extreme, May and June brought scorching heat waves, with maximum temperatures around 45°–50°C in India, Pakistan, and Bangladesh. Delayed southwest monsoon rains allowed the heat to persist into June, claiming at least 400 lives in India. An anomalous anticyclone and northwesterly winds created a severe heat wave over central and northeastern India, with maximum temperatures 6°–8°C above normal.

(ii) Precipitation

During the third week of February, sections of northern Pakistan and neighboring areas of northern India received heavy snowfall, described as the worst in two decades. Snowfall accumulations reached almost 2 m in some parts of Jammu and Kashmir in India. In Pakistan, heavy rains in the south and snow in the north triggered flooding and avalanches, causing the extensive loss of life and property. Heavy rains in March also caused flooding in parts of western Pakistan and Afghanistan; Balochistan Province was the worst affected. Over Pakistan, the 2005 January–March seasonal rainfall was 121% of its long-term average.

(a) South Asian Summer monsoon

The summer monsoon this year was marked by unprecedented heavy rains and extensive flooding in parts of western and southern India, affecting more than 20 million people and resulting in more than 1,800 deaths. Rainfall activity in Nepal and Bangladesh was, however, below normal. Central and southern parts of India received excess rainfall during the season (Fig. 6.25). While northwest India received normal rainfall, seasonal rainfall over

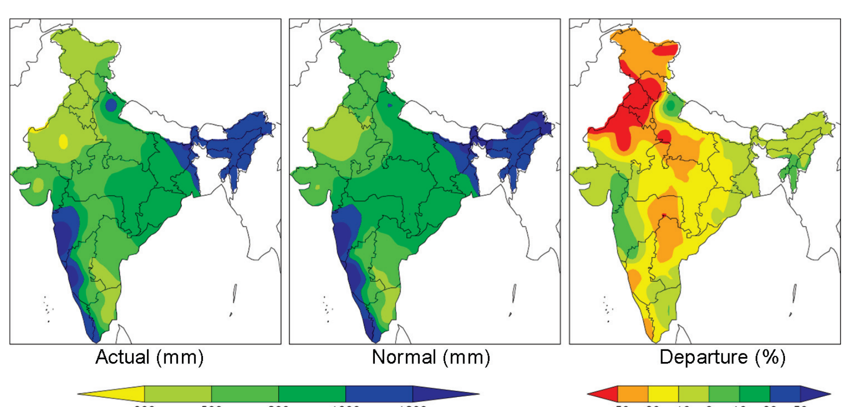

Fig. 6.25. June–September precipitation (mm) over India in 2005: (left) actual; (center) normal; and (right) percentage anomaly.

northeastern parts of India was below normal by more than 20%.

Onset of the 2005 southwest monsoon was delayed to 5 June, when it arrived over the south peninsula and northeastern parts of India. Despite unfavorable synoptic conditions, the monsoon advanced more quickly over northwestern India and Pakistan, covering the entire subcontinent by 30 June, 15 days ahead of the normal.

Countering declining trends of recent years, 12 low pressure systems formed (the most since 1998), of which five developed into monsoon depressions and one into a cyclonic storm (the first in September since 1997). The storm tracked from the Bay of Bengal across central India and the Gangetic Plains, resulting in widespread flooding.

While the spatial distribution of rainfall this season was normal, it was intermittent. There were prolonged dry spells in June and August, though excess rainfall in July and September ultimately helped the season end with near-normal rainfall. Due to the late onset and sluggish advance of the monsoon, rainfall during much of June was limited. In August, monsoonal rainfall was 27% below normal over India. Precipitation deficits lead to moderate drought for 25% of India's meteorological districts (2% severe drought). For the season, average rainfall over India was near normal (–1%).

(b) *Northeast monsoon*

Heavy rainfall continued unabated in southeastern parts of India and Sri Lanka during the northeast monsoon season of October–December. Five low pressure systems (four depressions and one cyclonic storm) affected southern parts of India and Sri Lanka. In India, Tamil Nadu and Andhra Pradesh were the most affected states. The northeast monsoon seasonal rainfall over south India was 165% of normal, the highest since 1901. Associated flooding affected more than 3 million people, with at least 300 fatalities and considerable socioeconomic impact. In Sri Lanka, approximately 29,000 families in 10 districts were affected and at least six deaths were reported.

(iii) Notable events

The most notable event of 2005 occurred on 27 July, when Mumbai (Bombay) received its greatest-ever recorded 24-h rainfall of 944.2 mm (most of it in just 6 h, between 1430 and 2030 local time) at Santacruz, an observatory at the airport (Fig. 6.26). The previous record of 575.6 mm was set at Colaba on 5 July 1974. Interestingly, in the 2005 event Colaba, just 20 km from Santacruz, recorded only 73.4 mm of rain. This localized event was confined to a region of a 20–30 km radius. Although a warning for regionally heavy rainfall had been issued, torrential rain severely disrupted life in the city, with numerous fatalities, heavy damage, and large economic losses.

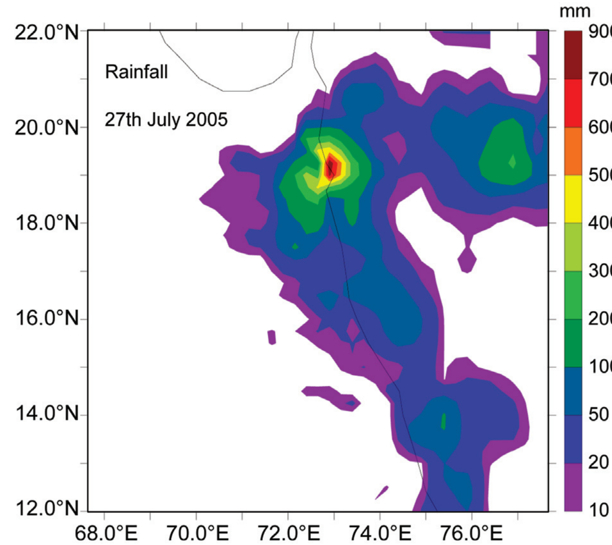

Fig. 6.26. Rainfall totals (mm) on 27 July around Mumbai, India.

v) Southwestern Asia—F. Rahimzadeh,[70] M. Khoshkam,[41] and E. K. Grover-Kopec[31]

(i) Temperature

All of southwest Asia experienced above-normal temperature in 2005, with annual temperature anomalies of 0.5°–2°C. North and northeastern Iran were 3°C warmer than normal for the year. Despite these positive 12-month departures, the northern half of the region experienced cooler-than-normal conditions during February, when mean temperatures ranged from 5°C in western Turkmenistan to –18°C in the highlands of Tajikistan and Kyrgyzstan. Temperatures were 1°–6°C below normal in these areas. Northern Iran experienced winter temperatures 3°C below normal. Northern Afghanistan, where hypothermia and other cold-related illnesses claimed more than 100 deaths, recorded temperatures of 1°–2°C below normal during February.

In contrast, temperatures were above the 90th percentile across the central portion of Southwest Asia during March (2°–7°C above the long-term average; Fig. 6.27). Afghanistan, Kyrgyzstan, Tajikistan, and Pakistan experienced temperatures 1°–2°C above normal in June. Spring temperatures in Iran were split between cooler-than-average conditions in areas of the east, center, and northeast of the country, and warmer-than-normal conditions elsewhere.

Seasonal mean temperatures in southern Iran were 10°–35°C.

Most of Iran saw positive summer temperature anomalies exceeding 2°C. A heat wave that affected Iran in July produced monthly anomalies up to 4°C above normal. Autumn remained on average 2°C above normal across Iran, although cooler-than-normal conditions were observed over the Persian Gulf.

(ii) Precipitation

Southwest Asia generally receives most of its annual precipitation from extratropical disturbances traveling eastward from the Mediterranean Sea between November and April. From July through August, the South Asian monsoon generally brings precipitation to southeastern Afghanistan, but tends to suppress summer precipitation in areas farther north and west.

Annual precipitation accumulations were slightly below normal across the majority of the region during 2005, and most of these negative annual anomalies were 25–75 mm below normal (Fig. 6.27). These departures were modest, however, and generally accounted for less than 25% of normal annual precipitation (i.e., 2005 annual totals were about 75%–100% of normal). A few areas received above-average precipitation during 2005, including portions of southern Afghanistan, western and northern Pakistan, and south-central Kazakhstan. However, these departures were also relatively small (10–50 mm) compared to long-term mean accumulations.

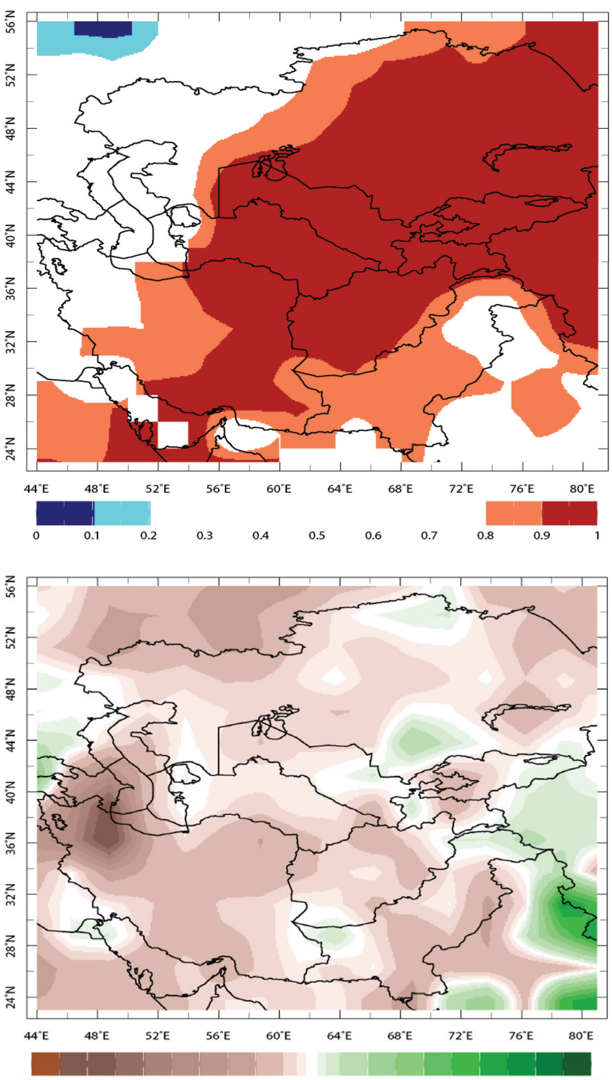

Fig. 6.27. Annual average (top) temperature deciles and (bottom) precipitation anomalies (mm; 1971–2000 base) for southwest Asia.

Despite the relative precipitation deficits across Southwest Asia, portions of the region experienced record snow amounts during January and February. As much as 200 cm of snow fell in just 2 weeks in parts of Tajikistan, contributing to more than 475 avalanches in the mountainous country. Similar impacts were reported in northeastern Afghanistan where avalanches claimed approximately 160 lives. The heavy snowfall in January and February, and above-average precipitation in late 2004 (Levinson 2005), contributed to a healthy snowpack in the highland areas of Southwest Asia, which is responsible for providing most of the region's water supply later in the year.

The 2004/05 winter was also wetter than normal across most of Iran, averaging 154.1 mm, or 14% above 2004 levels and 24% above the long-term mean. The largest anomalies were in southeast Iran, where some locations received up to 3.5 times the normal seasonal amounts. Also, early winter snow alleviated a 7-yr drought in the region. Tehran experienced record February snowfall, and in northern Iran, heavy late-February snow damaged or destroyed over 7,000 homes.

Unfortunately, abnormally warm conditions in March hastened the melting of the highland snowpack and swelled rivers across the region. Heavy rainfall in central and western Afghanistan during March exacerbated conditions and caused extensive flooding in those areas. The June heat wave melted remaining snowpacks in Afghanistan, Kyrgyzstan, Tajikistan, and Pakistan. Pakistan's northern provinces in were extremely hard hit by the resulting flooding. More than 460,000 people were affected and nearly 1 million ha of crops suffered damage.

Although spring is generally the rainy season for Iran, and wetter-than-average (100%–200%) spring conditions prevailed over northern Iran, it was much drier than normal (0%–10%) across southern areas, and also (50% of normal) in central regions. Overall, spring precipitation in Iran was just 42% of the normal. Summer precipitation in Iran was 20% below normal, with especially dry conditions in the west half of the country. However, heavy rains in the east did result in flooding. Below-normal precipitation continued into the autumn across much of Iran. Autumn precipitation in Iran was 37% below the long-term mean, and some parts in the east received just 0%–25% of the normal seasonal precipitation due to the delayed onset of late-season precipitation.

g. *Europe*

1) Overview—J. J. Kennedy[38]

The annual surface temperature anomaly (Brohan et al. 2006) averaged over Europe in 2005 was 0.71 ±0.07°C above the 1961–90 average (Fig. 6.28). Only a small area extending north from Greece had annual temperatures below average (Fig. 6.29), and that was only by around 0.1°C. Annual average temperatures in the United Kingdom and northern Norway and Finland were above the 90th percentile of occurrence according to statistics based on the period 1961–90 (all European temperature and precipitation percentiles herein refer to this period).

Temperatures during the first three months of 2005 were significantly (meaning in the upper or lower decile of the distribution) below average in southern Europe, through Spain and the Mediterranean and into Italy. In the same period, above-average temperatures observed in the north and east exceeded the 90th percentile only over Scotland. Between April and June, temperatures were above average in all areas and significantly above normal over much of Europe west of 15°E and south of 55°N.

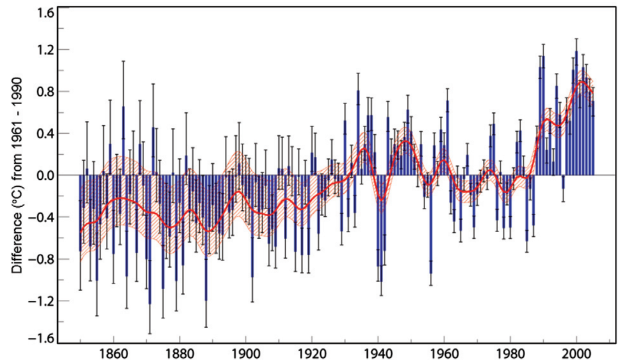

Fig. 6.28. European average temperature anomalies (°C; relative to 1961–90 mean) 1850–2005. Blue bars show the annual values with uncertainties represented by the black bars. The red curves show the annual anomalies and uncertainties after smoothing with a 21-term binomial filter. [Source: Brohan et al. 2006]

Temperatures in Spain and France exceeded the 98th percentile. From July to September temperatures once again were above average in most areas, although temperatures were close to average in southeastern Europe. Scandinavia and Eastern Europe were significantly above normal. Cooler conditions in southeastern and central Europe coincided with the largest regional rainfall totals for the season. October–December brought a north–south split, with much of the Mediterranean and southern Europe experiencing below-average temperatures, while in the north temperatures were generally above average with areas of the United Kingdom and Scandinavia significantly above average.

Total precipitation (Rudolf et al. 1994, 2005; Rudolf and Schneider 2005; Beck et al. 2005) between January and November 2005 (Fig. 6.29) was below

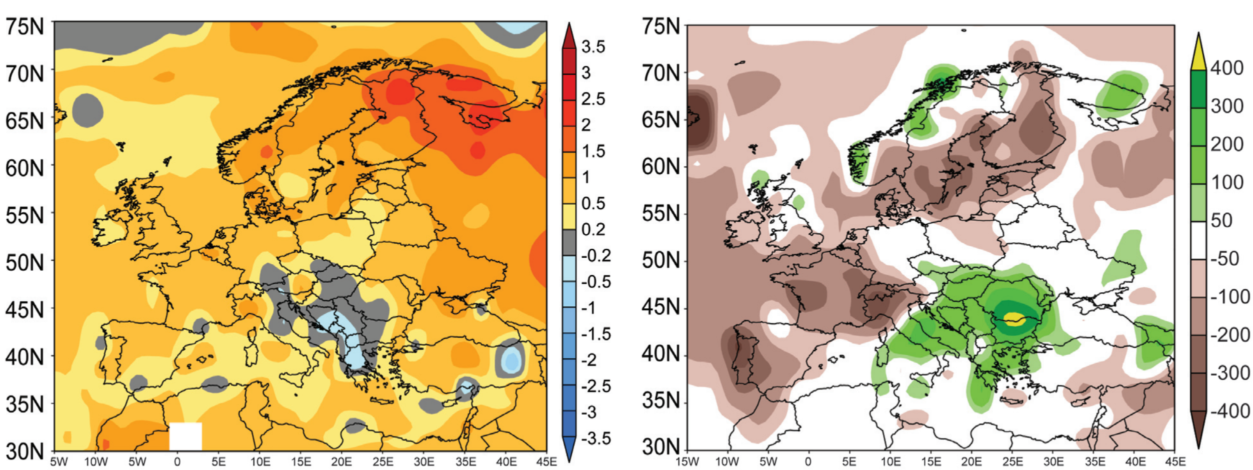

Fig. 6.29. European 2005 annual (left) temperature anomalies (°C; 1971–2000 base), and (right) precipitation anomalies (mm; 1979–2000 base) from CAMS–OPI.