is that along the lower portion of the Colorado and Gila rivers in Arizona and the adjacent part of California.

An excellent illustrative example of the suddenness and severity of the “ cold waves ” which occasionally pass over the country is afforded by the facts gathered by the Signal Service in regard to an occurrence of this kind in January 1886.

The barometer was high from the Rocky Mountain region to the Pacific coast on the 2d, and from that date to the 5th a slow north-easterly movement of this high area was observed; after the 5th there was an apparent increase of this high area from the region of the Saskatchewan valley and Manitoba. On the afternoon of the 6th the observers in Wyoming, Colorado, Nebraska, Kansas, and Missouri were warned of the approach of a “cold wave,” accompanied by a “ norther,” and of a probable fall of temperature of 20° to 25° in the next twenty four hours. The centre of greatest barometric pressure remained north of Dakota from the 6th to the 12th, but the cold wave had reached the Gulf coast and Florida before that date, causing in many places a lower temperature than has been observed in many years, and in some a lower one than had ever before been known. In Kansas many persons were frozen to death, and the loss of stock was very great; at Dodge City the wind blew with a velocity of 40 miles an hour, the thermometer averaging during the day 10° below zero. In Mahaska county, Iowa, from the 7th to the 11th twenty persons perished with the cold, and much stock was lost. Similar reports came from other parts of Iowa. In Memphis, Tennessee, the thermometer fell to 8° below zero. In Nashville, from the 9th to the 10th, the cold was the severest on record. In New Orleans the cold wave struck the city at 3 a.m. on the 8th, and the thermometer stood at 15°∙2 on the morning of the 9th. At Indianola, Texas, the coldest weather experienced for several years occurred from the 8th to the 13th ; on the 12th snow fell to the depth of 3 inches. At Galveston the cold was the greatest ever known, the mercury falling to 11°, being a fall of 54° in less than eighteen hours. A heavy snowstorm set in on the morning of the 12th, covering the ground to the depth of 6 inches, and causing much loss and suffering. At Mobile, Alabama, the minimum on the morning of the 9th was 11°, and at Montgomery, 5°∙4. In Florida the cold was very severe ; ponds were frozen over, and much fruit frozen on the trees. At Atlanta, Georgia, the mercury fell to 2°∙4 below zero. At Savannah it stood at 12°, the lowest ever recorded at that place. At Charleston, S.C., it stood at 10°∙5; ice 3 inches thick formed on the ponds. On the morning of the 11th, the curve uniting points of which the temperature was zero ran from Dakota south nearly to Arkansas, thence across to the Atlantic, passing south of Knoxville, and up the coast to Nova Scotia. On the St Lawrence and beyond it to the north-west, the mercury stood at from 10° to 30° below zero. This cold wave was remarkable, not only for its severity, but because it extended so far to the south and caused so much damage. The whole country east of the Rocky Mountains was brought under its influence. Of the rapidity of its progress an idea can be. formed from the statement that the first warning was issued from the Signal Office at 12h. 2m., January 7th, for the extreme north-west, and that for New England just two days later. This area of high barometer moved east­ward, after the 12th, to the Atlantic coast, following the coast-line, passing over Nova Scotia, and disappearing to the eastward on the 16th.

It appears from Prof. Loomis’s working over of the records of the Signal Service that throughout the greater part of the United States there is occasionally observed a difference of as much as 40° between the maximum and minimum of the same day, and that there are a few places where such changes are remarkably frequent. These places seem to be all west of the 95th meridian, and at or near the base of the Rocky Mountains. Thus, in 1874 there were thirty-eight stations at which a difference of 40o on the same day between the maximum and minimum temperature was observed. At Colorado Springs (5935 feet) this happened fifty-six times, at Denver (5135 feet) forty-five times, and at Cheyenne thirty-three times ; at seventeen stations it happened only once. At Denver, 15th January 1875, the thermometer fell 48o in one hour; and an observer “who is pronounced perfectly reliable” reported a fall in temperature at that place of 36o in five minutes. These changes of temperature felt at Denver were the concomitants of a considerable storm, which came from the north-west, and whose centre passed about 250 miles east of that place.

The occasional occurrence of "hot waves” which sweep over large areas of country, raising the temperature much above its normal height, is one of the most striking and most disagreeable features of the climate of the country, and especially of its northern and north-eastern portions. There is rarely a year in which one or more of these abnormal occurrences are not observed ; and, although they do not usually last more than two or three days, they are sometimes prolonged for a month or more, in a succession of heated periods with little or no interval between them. Thus, for example, in July 1885 the thermometer at West Las Animas, Colorado, rose on the 15th to 105o∙2 ; at Albany, N.Y., on the 17th, to 96o∙6 ; at New London, Conn., on the 18th, to 92o∙4; in New York city, on the 21st, to 95°∙9 ; in Baltimore, Md., on the 20th and 21st, to 98°∙3 and 98°∙7 ; at Dubuque, Iowa, on the 20th, outdoor work was suspended on account of the intense heat. Again, a little later, in Dayton, Washington Territory, on the 28th of the same month, the temperature rose to 102°∙6 ; at Milwaukee, Wis., on the 28th, to 92o∙8 ; at Fort Sully, Dakota, on the 29th, to 104°∙5 ; at Yankton, Dakota, on the 30th, to 100°∙7 ; at Dubuque, Iowa, on the 30th, to 97°'1; at Des Moines, Iowa, on the 30th, to 100°∙1. All through the country many cases of sun­stroke occurred, eighteen fatal cases having been recorded in Balti­more during the week ending with the 25th.

The prevailing winds, as in other regions lying in the latitude of the return trades, are westerly. The extreme southern part of the country is just on the border line where the influence of the causes by which the trade-winds are originated cease to be felt. In the autumn, however, in the southern Atlantic States there is some approach to the conditions of the trade-wind region. At that season the winds in Florida and along the northern edge of the Gulf are decidedly north-easterly as far as 33° N. lat. Farther south the Florida Keys and the northern Bahamas belong, to a certain extent, to the trade-wind region.

Along the whole extent of the Atlantic coast region westerly winds predominate during the entire year, but they are chiefly south-westerly in summer and north-westerly in winter. In the following table (V.) the direction of the summer and winter winds is given in percentages of the total amount, for the districts named :—

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Su | mm | er |  |  |  |  |  |  | Win | ter. | . |  |  |
|  | N. | N.E. | E. | S.E. | S. | S.W. | W. | N.W. | N. | N.E. | E. | S.E. | S. | S.W. | W. | N.W. |
| New England  Middle Atlantic States—New York | 5 | 10 | 8 | 10 | 12 | 24 | 14 | 16 | 9 | 11 | 4 | 7 | 7 | 14 | 15 | 33 |
| to North-east Virginia | 8 | 10 | 6 | 11 | 14 | 19 | 16 | 15 | 9 | 12 | 5 | 6 | 7 | 14 | 19 | 28 |
| South Atlantic States—South-east Virginia to Georgia | 7 | 12 | 8 | 12 | 17 | 26 | 11 | 8 | 13 | 13 | 7 | 6 | 11 | 18 | 14 | 17 |

In the region between the Mississippi and the Appalachians, south­ward as far as the Cumberland range and north to Lakes Michigan and Huron, south-westerly and westerly winds prevail during both summer and winter. There is an extensive region in the south­west of the United States, embracing an area equal to about one- third of the whole country, in which the winds of summer are chiefly southerly, varying between south-east and south-west, while in the winter they are mostly north and north-west. This region extends from the extreme south-east of California, through Arizona, New Mexico, southern Utah, Texas, Arkansas, eastern Colorado, eastern Wyoming, Kansas, and Nebraska, to Missouri. Farther north, in Wisconsin, Minnesota, and northern Michigan, south winds prevail in the summer, but in winter there is no such marked predominance of northerly and north-westerly winds as in the region to the south-west. The influence of Lake Superior is clearly indicated in northern Wisconsin, where the prevailing winds in summer are from the lake and in winter from the land. On the Pacific coast the winds have a decidedly westerly character; but in the winter this preponderance is much less marked than in summer. On the coast of Washington Territory south-east is the prevailing direction, these winds being probably the south-west winds of the Pacific coast deflected by the mountains which lie close upon the ocean. In the interior of Washington Territory south-west is the prevailing direction in both summer and winter. On the California coast the winds are very strong and steady from the north-west in the summer, but more to the south-west in winter. In summer the intensely heated plateau to the east draws the air from the Pacific, which blows with violence through every depression in the coast ranges towards the heated land-mass. There is no “ wind-gap ” in the Coast ranges from the Columbia river to Santa Barbara so deeply and widely cut as that of the Golden Gate at San Francisco. At this point the cool winds from the sea find entrance to the Great Valley of the Sacramento and San Joaquin, and the mass of air thus set in motion spreads itself out fan-like after passing through the Gate, so that the prevailing winds in those valleys are in summer always from the Bay of San Francisco towards the mountains. The hotter the weather in the interior the more violent is the wind at San Francisco. But this condition is limited to the daytime. At night the rapid cooling of the higher plateau checks or stops altogether the indraught of air, and an almost entire calm prevails at San Francisco, while the cool air flows in a gentle breeze down the slopes of the mountains, in a reverse direction from that which it had during the daytime. In the winter the westerly direction of the winds in this region is still greatly predominant, but the prevailing westerly current of air is not intensified in its motion as it is during the summer. Over the plateau and mountain region included between the Sierra Nevada and the Rocky Mountains the surface winds are irregular, being governed by the topography of the country ; but the upper currents are, in general, from the west. In the southern part of this region, in the valley of the Gila and the lower Colorado, there is a large area which is intensely heated in summer, and towards which the winds blow from the lower region to the south, and especially from the Gulf of California. Here the predominance of southerly winds in summer is very great ; but the mountain ranges to the west have so declined in height in this southern region that westerly winds are nearly or quite as common as northerly ones. Farther east and north-east, as has been seen, the preponderance of northerly winds in winter is very great.

In reference to precipitation the territory of the United States may be divided into two nearly equal portions by the meridian of 100°, the region to the east of that meridian being one of sufficient and pretty regularly distributed rainfall, while that to the west is irregularly and insufficiently supplied, with the exception of a narrow belt on the Pacific coast, over a part of which the precipita­tion is irregular, but fairly sufficient, while another portion is very abundantly supplied with moisture.

Regions of less than 20 inches of precipitation must be essentially