WEATHER AND CIRCULATION OF MAY 1974

Cold in the North, Warm in the South

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1. Mean circulation

The mean 700-mb flow at middle latitudes was relatively fast with waves of low amplitude in most of the Northern Hemisphere during May 1974 (Figs. 1, 2, and 3). In western portions this was the fifth consecutive month with a stronger than normal zonal westerlies index.

As was the case in April (Wagner, 1974), blocking ridges were prominent at high latitudes over both the northeastern Atlantic Ocean and northeastern Siberia; this month, strong mean ridges were also observed over Alaska and Baffin Island. The combined effect of this group of strong high-latitude ridges was to deploy a large amount of polar air to middle latitudes, strengthening the baroclinic field there. This provided an ample source of zonal available potential energy which, through conversion processes, apparently sustained the previously-noted extensive band of strong

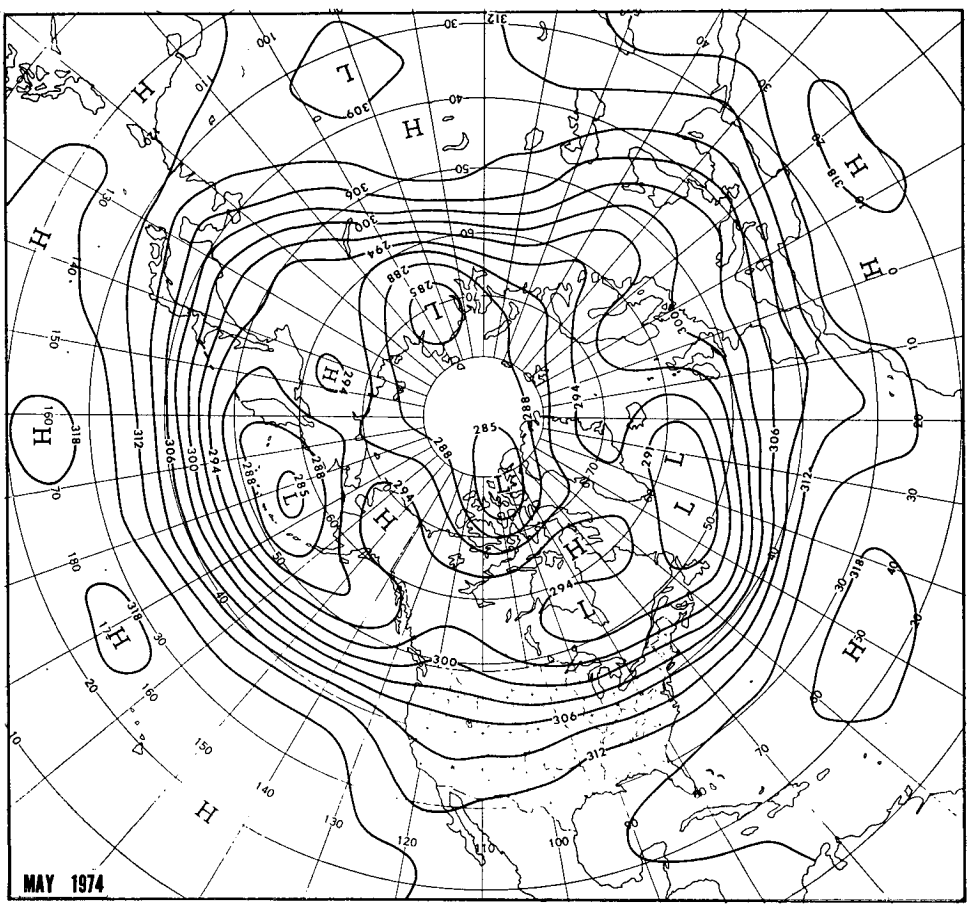


FIG. 1. Mean 700-mb height contours (dekameters) for May 1974.

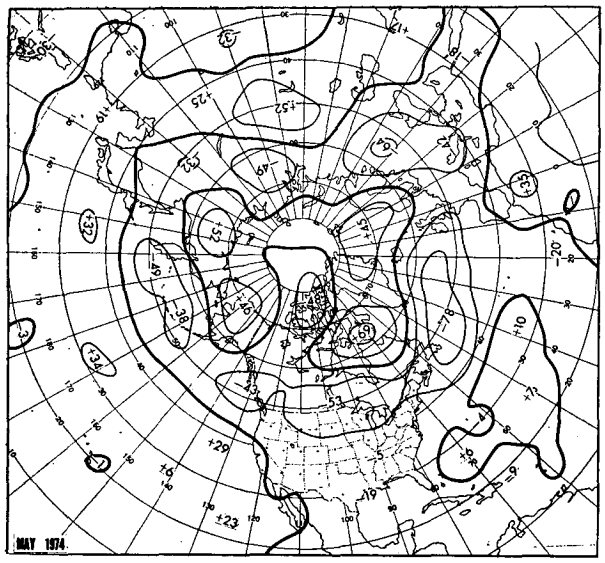


FIG. 2. Departure from normal of mean 700-mb height (m) for May 1974.

westerlies. Centers of cold air advection from the Arctic were found east of the Alaskan and northeastern Atlantic ridges.

Over much of the Northern Hemisphere, the 700-mb wave phase was similar to that of April. However, over both the Pacific Ocean and North America the westerlies shifted northward, bringing significant weather changes to North America.

2. Temperature

The zonal nature of the mean 700-mb flow was reflected in the zonality of the surface temperature

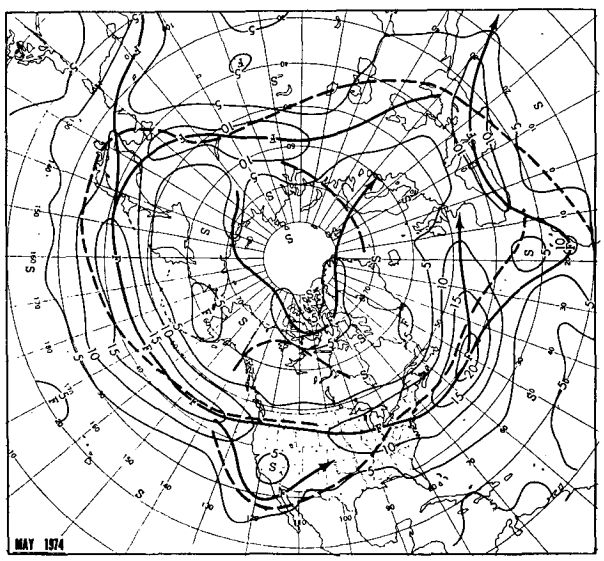


FIG. 3. Mean 700-mb geostrophic wind speed (m sec^{-1}) for May 1974. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

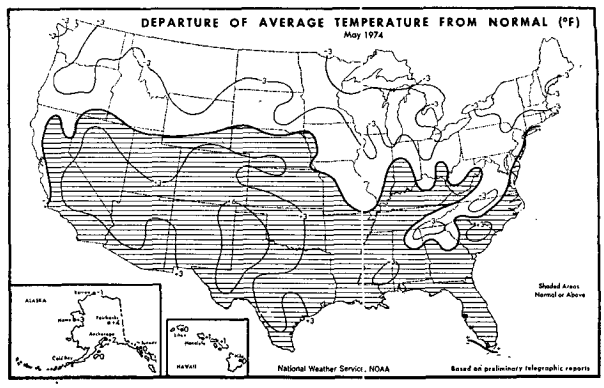


FIG. 4. Departure from normal of average surface temperature (°F) for May 1974 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1974).

anomaly pattern over the conterminous United States (Fig. 4). The fast, low-amplitude westerlies largely limited cold air intrusion to the northern portion of the United States; to the south, warm air masses predominated. This anomaly pattern was roughly out of phase with that of the previous month (Wagner, 1974). This was one of the coldest Mays of record in Montana and one of warmest in the Texas panhandle. The strong mean 700-mb ridge over Alaska gave above normal temperatures to most of that State.

3. Precipitation

Storm systems travelling in the relatively fast westerlies near the northern border of the United States brought above normal precipitation to that area (Fig. 5). Heavier precipitation than normal was also observed east of the moderately deep mean trough in the middle United States. Subnormal totals were found over most of the West, largely by-passed by storm systems, and in a rain shadow east of the central and southern Rocky Mountains. This was the driest May of record at Cheyenne and Denver and one of

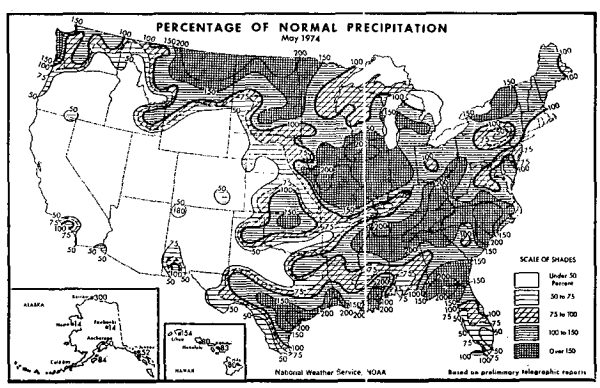
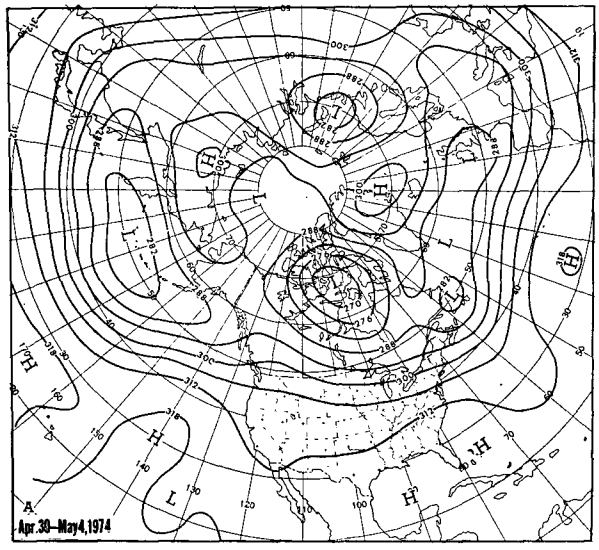


FIG. 5. Percentage of normal precipitation for May 1974 (from National Oceanic Atmospheric Administration and Statistical Reporting Service, 1974).



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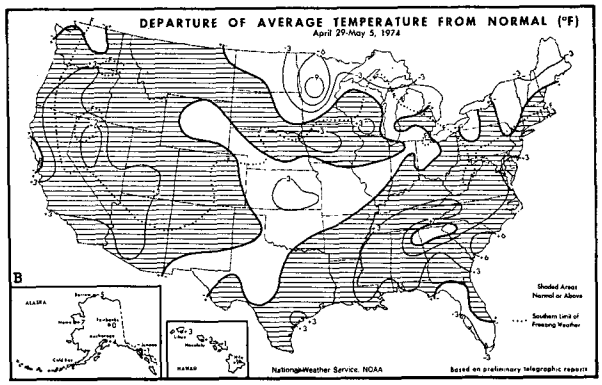

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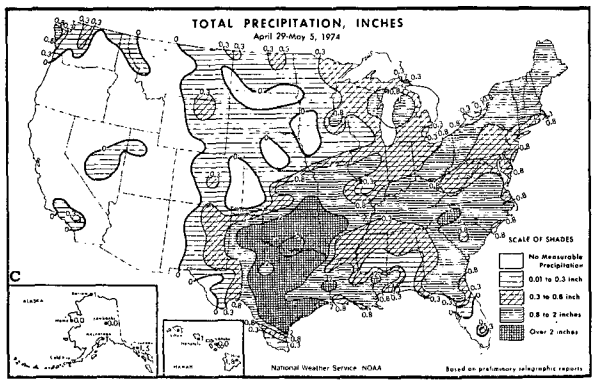

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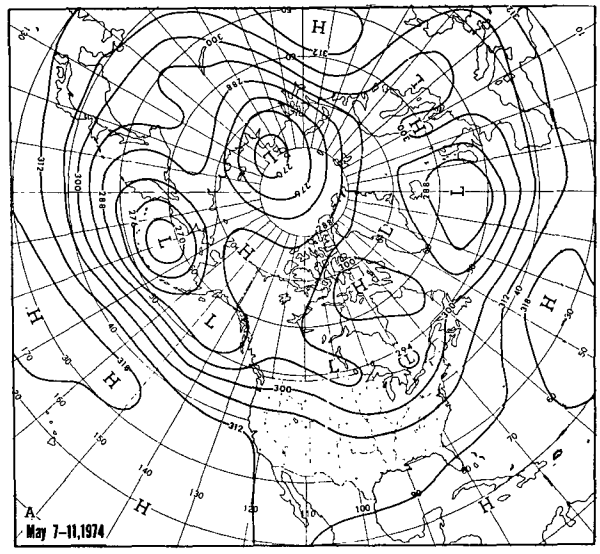
FIG. 6. (A) Mean 700-mb contours (dam) for 30 April–4 May 1974; (B) departure from normal of average surface temperature (°F); and (C) total precipitation (inches) for week of 29 April–5 May 1974 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1974).

the driest elsewhere in Wyoming and Colorado as well as in portions of the central and southern Plateau Region and the interior of northern California. Precipitation was sub-normal under the strong mean ridge that dominated Alaska.

4. Variability within the month

a. April 29–May 5

Early in the month (Fig. 6), fast 700-mb westerlies prevailed at middle latitudes from the coast of Asia



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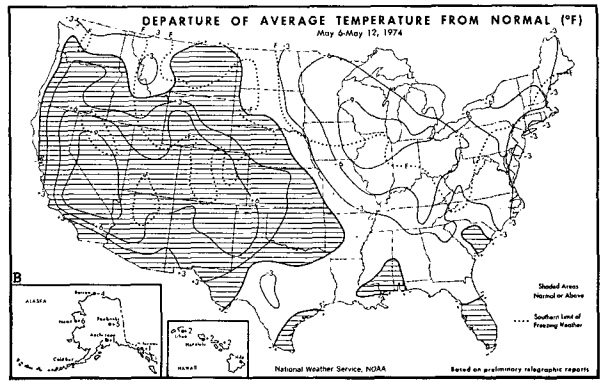

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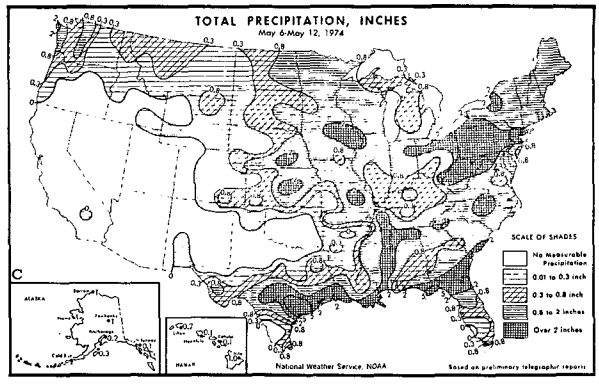

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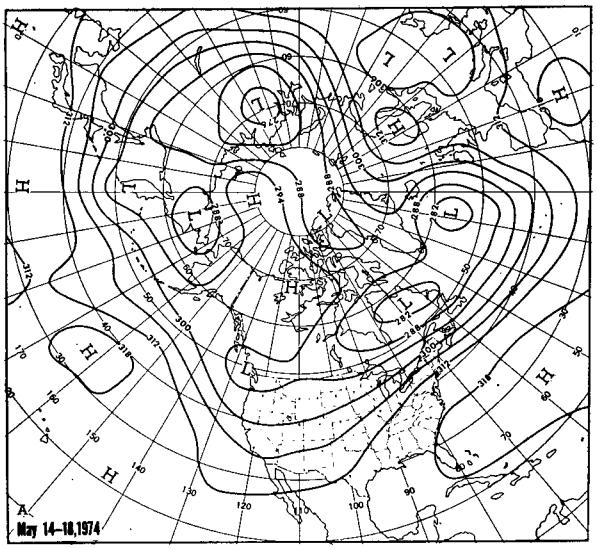
FIG. 7. Same as Fig. 6, (A) for 7–11 May 1974, (B) and (C) for week of 6–12 May 1974.



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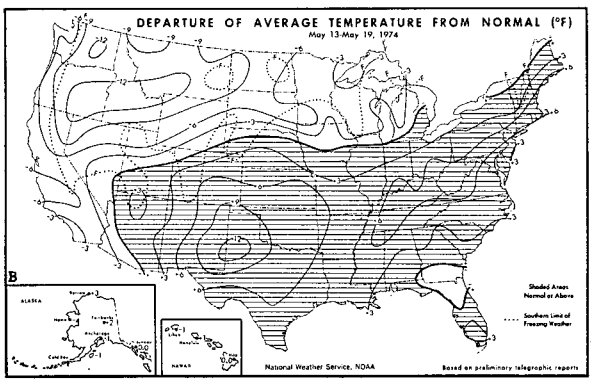

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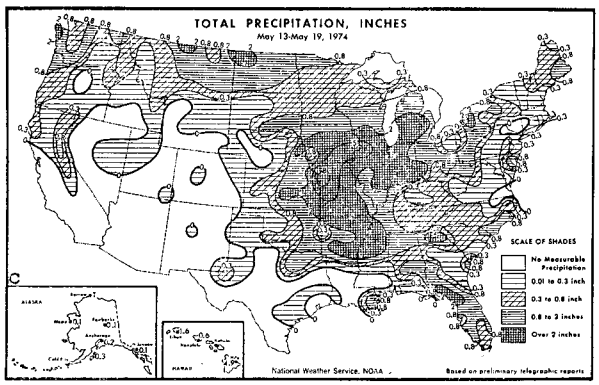

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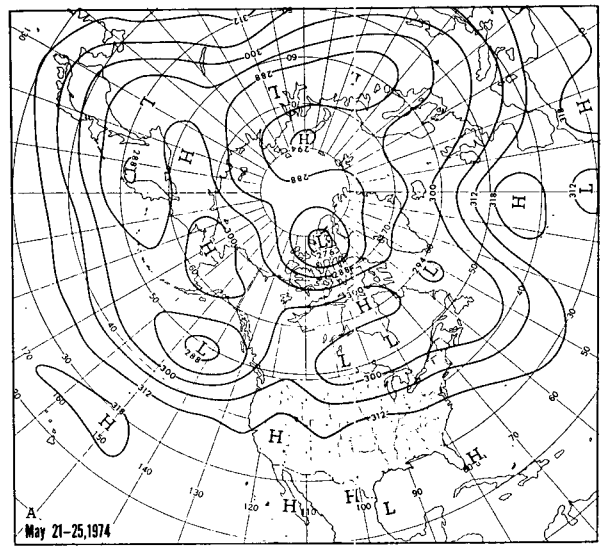
FIG. 8. Same as Fig. 6, (A) for 14–18 May 1974, (B) and (C) for week of 13–19 May 1974.

through North America to Europe and strong highs dominated the high latitudes. Temperatures in the conterminous United States generally averaged above normal; polar air was largely contained in Canada.

A deep, upper-level trough, moving slowly from the southern Plateau region in the weak westerly flow that characterized the southern half of the United States, brought substantial precipitation amounts to



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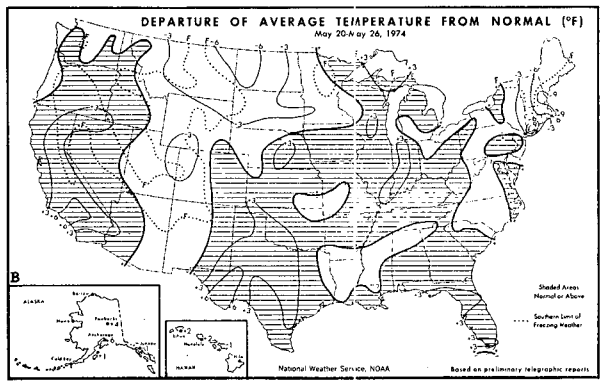

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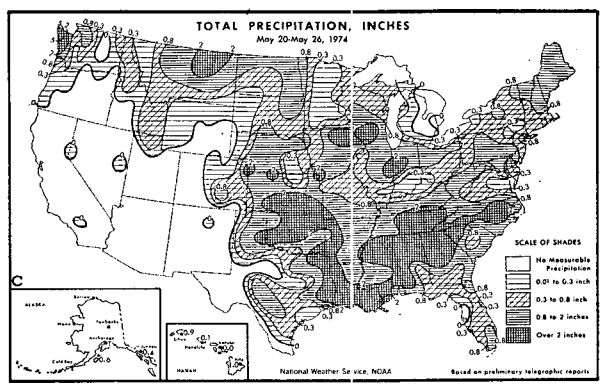

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FIG. 9. Same as Fig. 6, (A) for 21–25 May 1974, (B) and (C) for week of 20–26 May 1974.

much of the South and East. Throughout its transit of the United States, this trough was associated with only weak surface low pressure systems.

b. May 6–12

Striking circulation changes occurred over Canada this week as a retrograding blocking high replaced the previous deep low near Hudson Bay (Fig. 7). Interacting with a persisting ridge over the western states, this deflected the westerlies southward into a deep trough over the eastern United States, bringing the coldest weather of the month eastward from the Mississippi Valley. Most of the western half of the nation, however, continued quite warm.

Although much of the precipitation this week came with storm systems and fronts moving in the main belt of the westerlies, the rainfall in the Gulf Coast states resulted mostly from a closed low aloft that moved from Baja California across Texas and the Southeast. A moderately deep surface low with no associated fronts moved across the Southeast from the northern Gulf of Mexico in connection with this system.

c. May 13–19

During this week the central Pacific trough filled, the Pacific westerlies decreased markedly, and the long wave pattern over the United States retrograded, bringing a trough to the west coast and a ridge to the east coast (Fig. 8). Concurrently the blocking high retrograded from near Hudson Bay to northwest Canada.

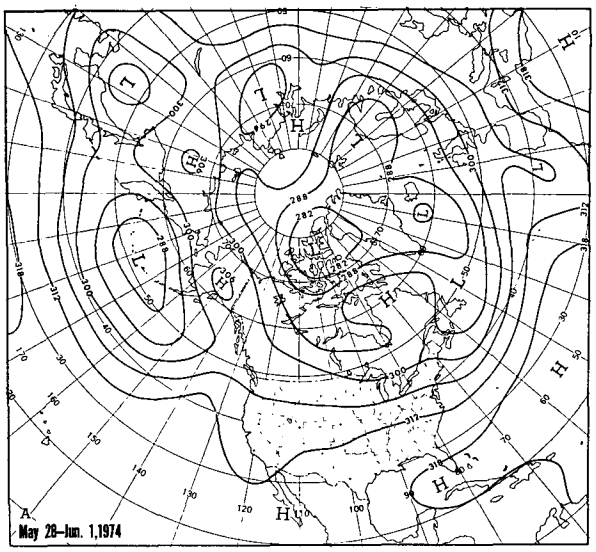
The phase reversal of the flow pattern over the United States brought a corresponding change in the temperature pattern; much of the West cooled to below normal while the East warmed to above normal. The resulting temperature pattern was one of striking contrasts. The coldest temperature for so late in the season (26F) was observed at Boise, Idaho, on May 13, while a record high temperature for May (98F) occurred on May 19 at Pueblo, Colo.

Increasing southerly wind components produced the wettest week of the month in the middle Mississippi Valley.

d. May 20–26

The mean flow pattern over the United States flattened and its waves progressed this week as a deepening trough moved into the east Pacific (Fig. 9). To the north, remnants of the blocking high progressed to Hudson Bay. Average temperatures exceeded normal at most locations; cold weather was found to the west of troughs over the northern Great Plains and Newfoundland.

A good deal of the precipitation of the week occurred in connection with the progressing and weakening long wave trough that was ejected from the West. An important adjunct, however, was an upper level low, initially over the western Gulf of Mexico. This low moved into phase with the mid-latitude trough



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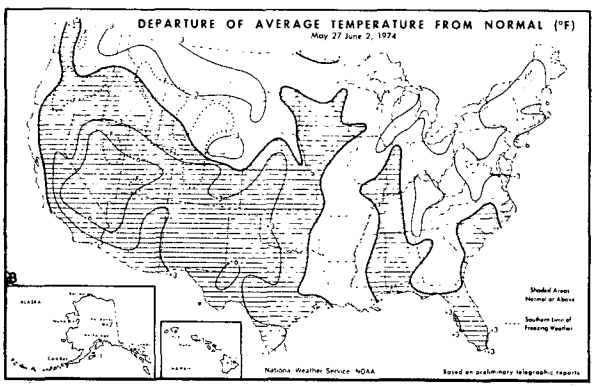

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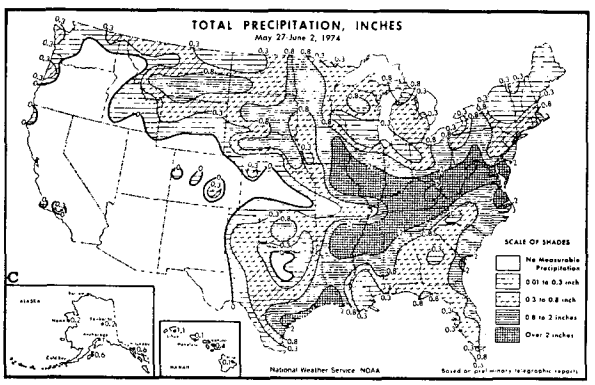

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FIG. 10. Same as Fig. 6, (A) for 28 May–1 June 1974, (B) and (C) for week of 27 May–2 June 1974.

and contributed to both moisture advection and rainfall over the South.

e. May 27–June 2

During the final week the mean flow pattern over the United States was rather ill defined (Fig. 10). Retrogression of a mean ridge from the Great Basin to the east Pacific coupled with persistence of the Hudson Bay high gave a flat flow pattern with no distinct troughs or ridges over the United States. Cold air masses travelling in the weak westerly flow affected northern and eastern portions of the country.

Precipitation was widespread east of the Rocky Mountains, accompanying transient waves in the westerlies. Some of the heaviest totals east of the Mississippi River preceded an outbreak of cold air during the latter half of the week.

REFERENCES

National Oceanic and Atmospheric Administration, U. S. Department of Commerce, and Statistical Reporting Service, U. S. Department of Agriculture, 1974: *Weekly Weather and Crop Bull.*, **61**, Nos. 19–24 (7, 14, 21 and 28 May 1974 and 4 and 11 June 1974).

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