

WEATHER AND CIRCULATION OF APRIL 1973

A Stormy Month With Widespread Flooding

A. JAMES WAGNER—National Meteorological Center, National Weather Service,
NOAA, Suitland, Md.

1. MEAN CIRCULATION

A broad, deeper-than-normal trough extending from the Great Lakes to northern Mexico was the 700-mb circulation feature that controlled much of the weather over the United States during April (figs. 1,2). The western lobe of the double trough that had prevailed over the United States during March (Taubensee 1973) weakened as 700-mb heights rose strongly just off the west coast, due to deepening of the midlatitude portion of a trough south of the Aleutians and strengthening of the ridge over the eastern Pacific (figs. 1-3).

The greatest change in circulation from March to

April was over the Atlantic and Europe, where the blocking which had been over the British Isles retrograded to a position south of Greenland and 700-mb heights fell rapidly to the east (fig. 3). The lower latitude portions of the trough, which had been over the western Atlantic, moved eastward as heights fell and the westerlies increased south of the block. Blocking was also strong on the Siberian side of the Pole, where heights averaged nearly 140 m above normal (fig. 2). Weaker areas of blocking were located over central Canada and the western Bering Sea.

The axis of maximum 700-mb wind was located near its normal April position over the Pacific, but speeds

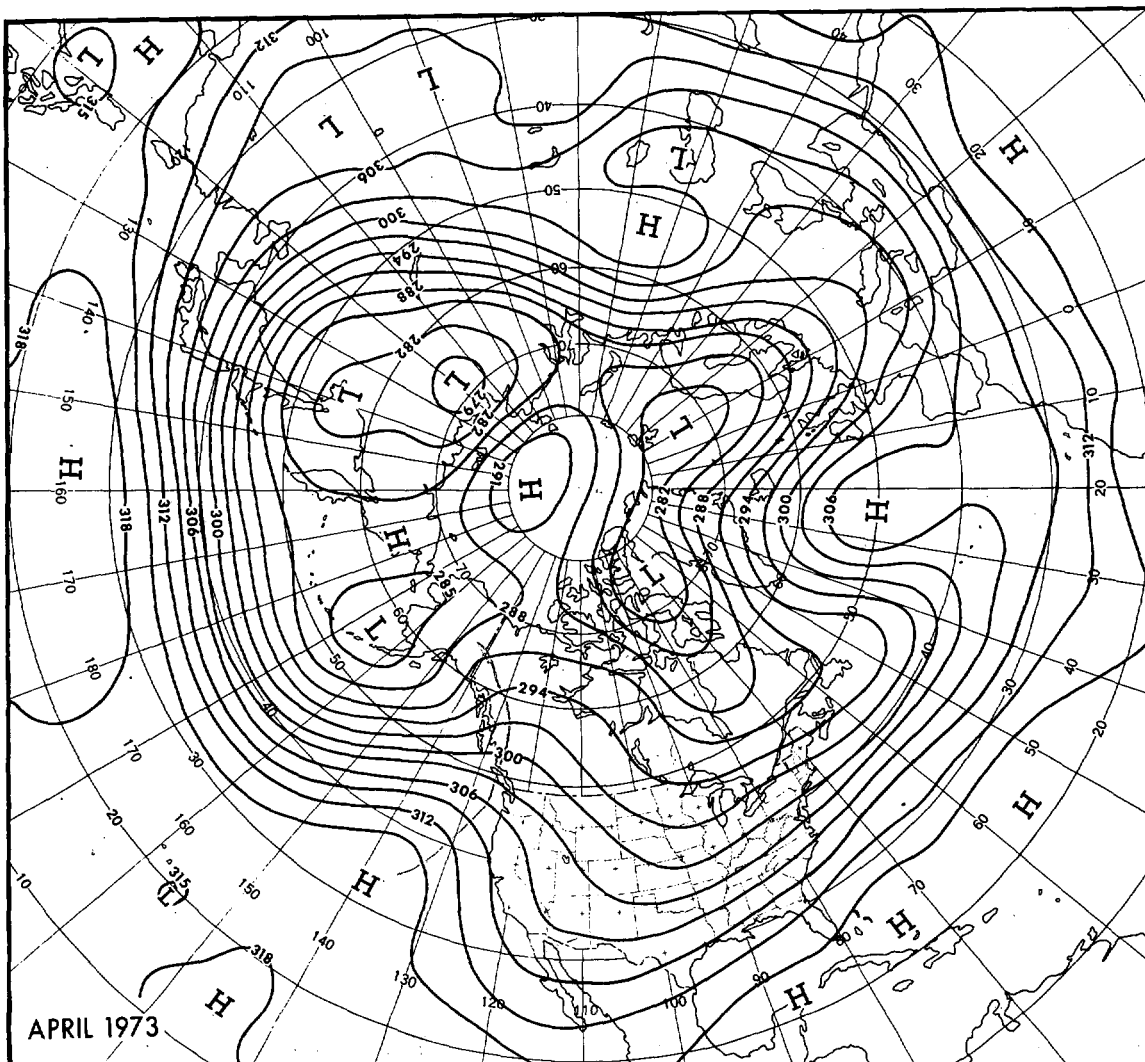


FIGURE 1.—Mean 700-mb height contours in dekameters (dam) for April 1973.

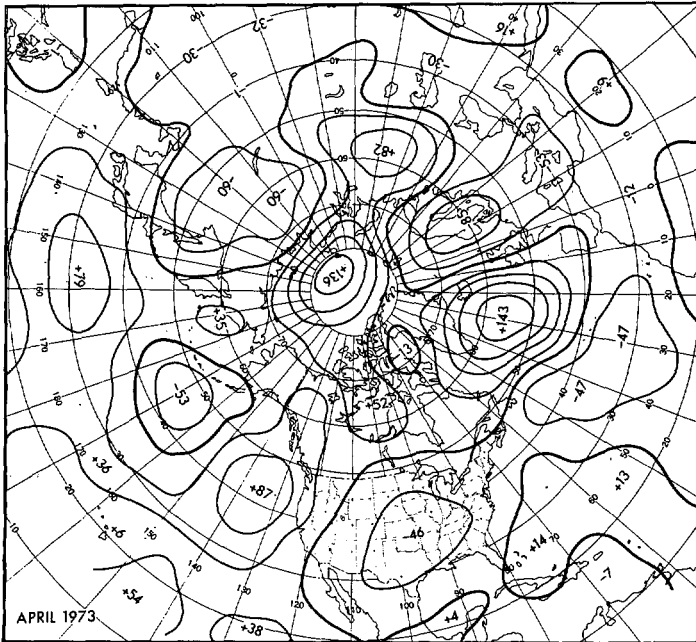


FIGURE 2.—Departure from normal of mean 700-mb height in meters (m) for April 1973.

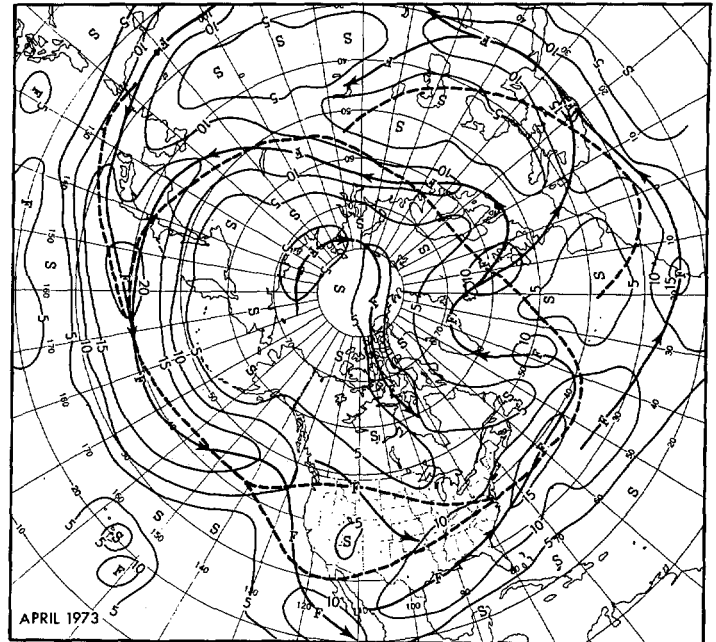


FIGURE 4.—Mean 700-mb geostrophic wind speed (m/s) for April 1973. Solid arrows show the observed axes of maximum wind speed, and dashed lines show the normal.

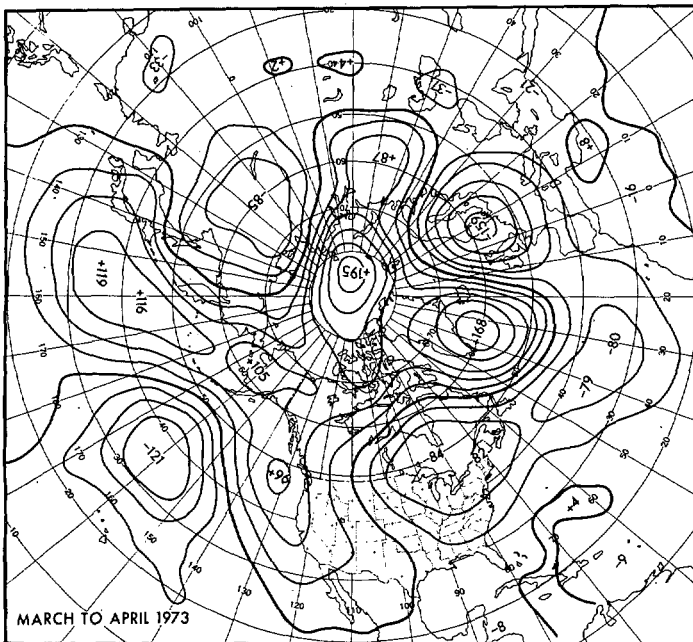


FIGURE 3.—Mean 700-mb height anomaly change (m) from March 1973 to April 1973.

were from 5 to 8 m/s above normal near the axis over much of the western and central part of the ocean (fig. 4). This was due to the combined effect of a strong subtropical High and vigorous troughs near the coast of Asia and south of the Aleutians (figs. 1, 2).

Over the United States, the southern branch of the westerlies was strongest, as much as 7 m/s above normal near the gulf coast. It was also well south of its normal position, continuing the pattern of March (fig. 4 of Taubensee 1973).

The axis of maximum 700-mb wind split into two branches over the Atlantic, with one part going north to

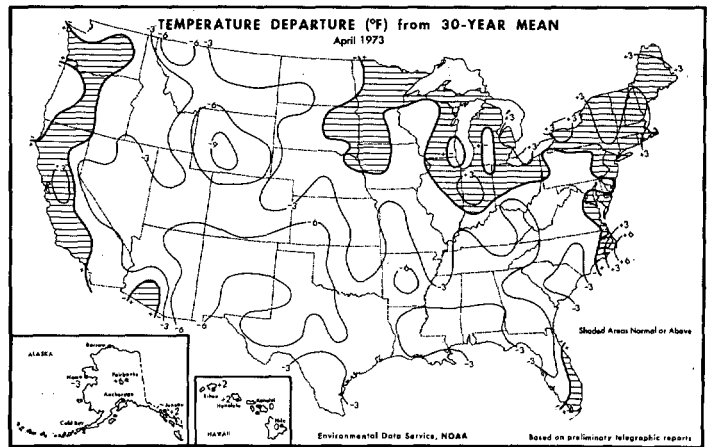


FIGURE 5.—Departure from normal of average surface temperature (°F) for April 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

Greenland over the top of the block, and the other undercutting the blocking and continuing eastward across North Africa (fig. 4). Cyclones frequently slowed and stalled over the central Atlantic without reaching either Greenland or Africa. Over Europe, where heights were below normal, both branches of the westerlies were south of normal, returning northeastward to near the normal positions over central and eastern Asia.

2. TEMPERATURE

Except for the Northeast, The Great Lakes, and portions of the west coast States, temperatures averaged below normal over most of the Nation during April (fig. 5). The deep trough in the center of the country (figs. 1, 2), which was associated with the frequent movement of relatively cold air southward to its rear and suppression

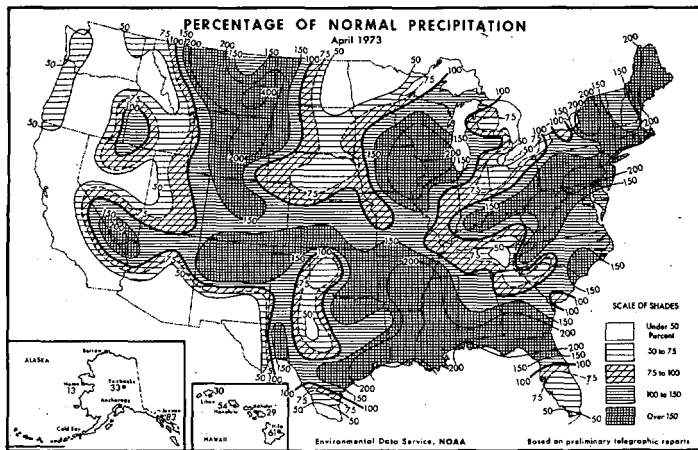


FIGURE 6.—Percentage of normal precipitation for April 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

TABLE 1.—Record and near-record precipitation totals and flood crests observed during April 1973

Station	Amount	Anomaly	Remarks
	(in.)	(in.)	
Tallahassee, Fla.	13.13	+8.49	Wettest April on record
	38.82		Wettest Jan.-Apr. on record
	53.53		Wettest Nov.-Apr. on record
Jacksonville, Fla.	11.61	+8.06	Wettest April on record
	31.50	+19.10	Total Jan.-Apr. precip.
		+10.79	Excess precip. for Jan.-Apr.
Meridian, Miss.			Wettest April on record
Little Rock, Ark.	14.20	+9.27	3d wettest April on record
Memphis, Tenn.	9.44	+4.81	Wettest April on record
Port Arthur, Tex.	15.30	+11.36	2d wettest April on record
Madison, Wis.	7.11	+4.54	Snowiest April on record
	17.4		Wettest April on record
Milwaukee, Wis.	7.31	+4.78	Do.
Syracuse, N. Y.	6.91	+3.83	Do.
Bridgeport, Conn.	8.14	+4.34	Do.
Portland, Maine	9.90	+6.17	Do.
Caribou, Maine	5.26	+2.63	Do.
Trenton, N. J.	6.61	+3.40	Wettest April since 1909
Providence, R. I.	7.16	+3.41	3d wettest April on record
Wilmington, Del.	6.57	+3.24	Do.
Harrisburg, Pa.	6.23	+3.21	Do.
Moline, Ill.	11.30	+8.13	Wettest April on record
Rockford, Ill.	9.92	+6.87	\$10 million flood damage
Cairo, Ill.	7.36	+3.29	End of mo. was 50th consecutive day with river over flood stage
St. Louis, Mo.	4.25	+0.54	Two flood crests; 2d of 43.3 ft broke previous record set in 1785
Great Falls, Mont.	17.6		Record heavy snowstorm, 19th-21st
Milford, Utah	2.28	+1.56	3d wettest April on record
Casper, Wyo.	93.3		Greatest seasonal snowfall on record
	56.3		Snowiest month on record
	27.9		Greatest single snowstorm on record, 18th-21st
Sheridan, Wyo.	37.5		3d snowiest April on record
Lander, Wyo.	66.0		Snowiest April on record
	211.7	+111.2	Seasonal snowfall over twice normal
Albuquerque, N. Mex.	8.1		Snowiest April on record
	6.6		Greatest 24-hr snowfall in April, 2d
Dubuque, Iowa	19.2		Greatest single snowstorm on record, 8th-10th

of maximum temperatures due to cloudiness and precipitation throughout the south, was the principal cause of the abnormally low temperatures.

The month averaged more than 6°F below normal in parts of the Southern Plains and along much of the Rocky Mountain area. Lander, Wyo., had its second coldest April on record, 9.1°F below normal. It was the coldest April since 1920 at Tucson, Ariz., with 6.1°F below normal, and April 5 was the latest date on record

for the first maximum reading of 80°F or higher at Yuma, Ariz.

3. PRECIPITATION

Although the temperature pattern changed from predominantly warm to predominantly cold from March to April, a large portion of the Nation continued to have record heavy precipitation and widespread flooding in April. Large portions of the central and southern Mississippi Valley, the Gulf Coast States, the northern Rocky Mountains, and western Northern Plains had more than twice their normal April precipitation (fig. 6). Several stations in these areas had record or near-record April totals (table 1) with more than 12 in. falling in some parts of the South. Much of the precipitation in the Rocky Mountains and Northern Plains fell as snow, and many new records were set for single-storm, April, and seasonal snowfall (table 1). Albuquerque, N. Mex., and Lander, Wyo., reported their snowiest April following their snowiest March (see also table 1 in Taubensee 1973).

The only portions of the Nation with noticeably dry conditions of less than half normal precipitation during April were portions of northern Minnesota and North Dakota, most of the western States, and much of central Alaska (fig. 6). Ridge conditions and above-normal 700-mb heights (figs. 1, 2) were related to the dryness in the West. As temperatures warmed, there was increasing concern about possible agricultural effects of the drought in the Pacific Northwest, which has been drier than normal for several months.

4. WEEKLY VARIABILITY

April 2-8

The violent and at times unusual weather of April 1973 was foreshadowed by the occurrence of a rare but damaging tornado in the western suburbs of the Nation's Capital on the first day of the month.

The first week of April was predominantly cold, especially over the Rocky Mountains and Southern Great Plains, where strong northerly 700-mb flow advected cold, Canadian air as far south as northern Mexico (fig. 7A). The weekly temperature anomaly pattern was quite similar to that for the month as a whole, although greatest anomalies were over the Southern Great Plains, where temperatures averaged more than 12°F below normal for the week (fig. 7B). Under the influence of strong ridging aloft, temperatures averaged a few degrees above normal along the west coast.

Precipitation continued over most of the flood-plagued Mississippi River Basin, although heaviest amounts in excess of 2 in. were confined mainly to the Southeast in a region of confluence (figs. 7A, 7C). Weekly totals of over 8 in. over northern Florida contributed to additional flooding by rivers and streams in that area.

Some of the heavy precipitation in New England and most of the precipitation over the Rocky Mountains fell as snow. Much of the area west of the Rocky Mountains had little or no precipitation, due to the strong ridge conditions aloft.

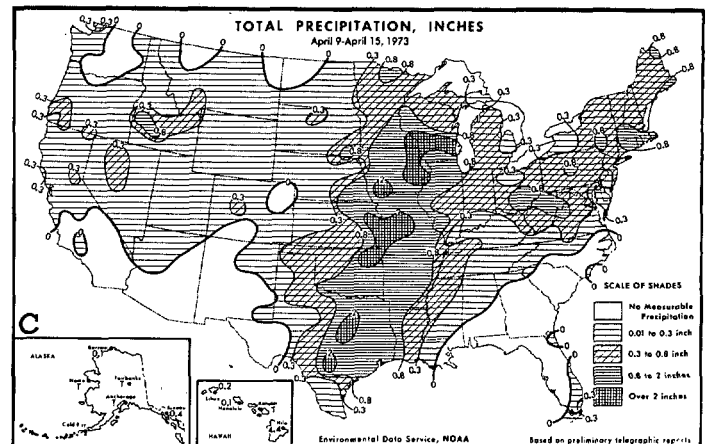
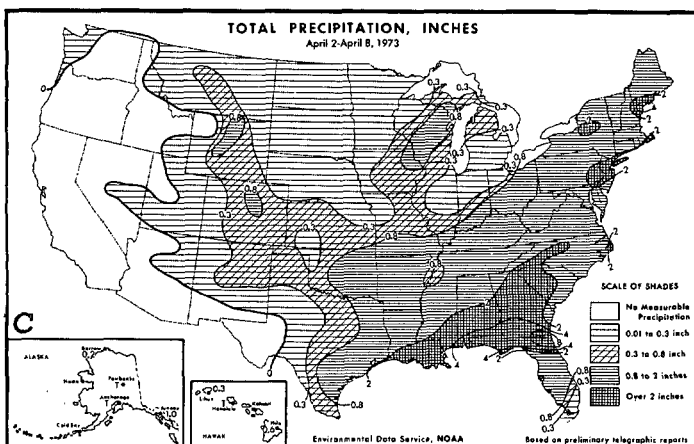
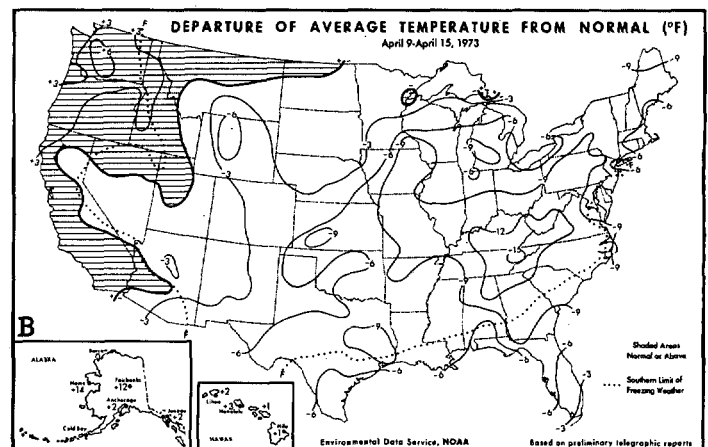
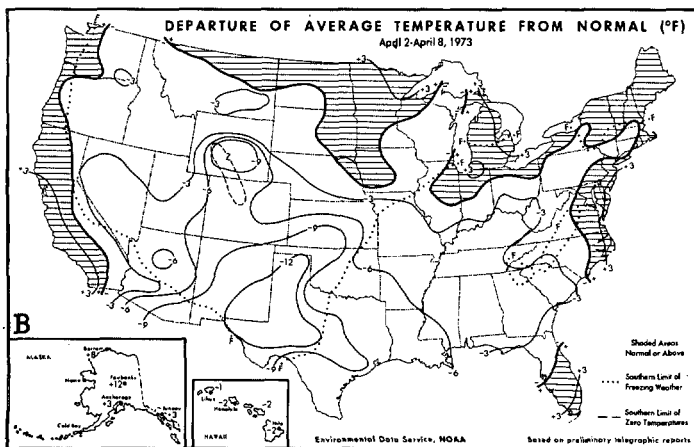
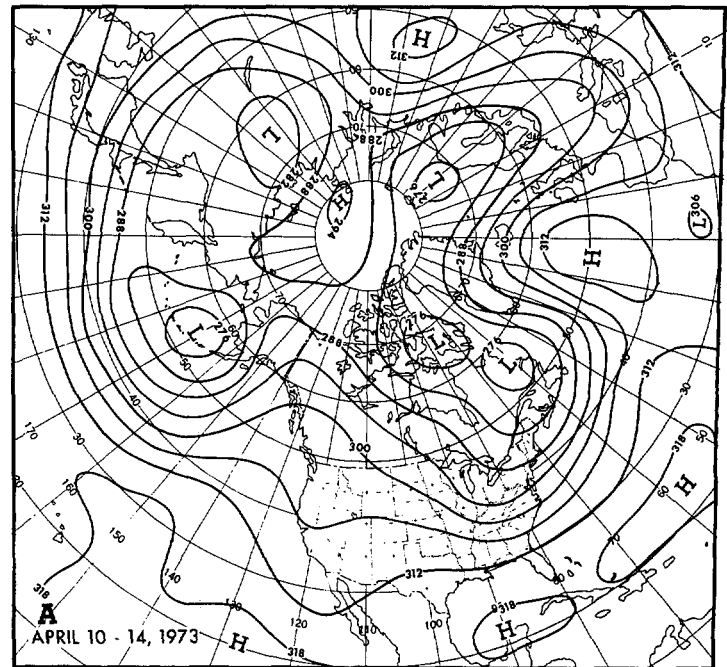
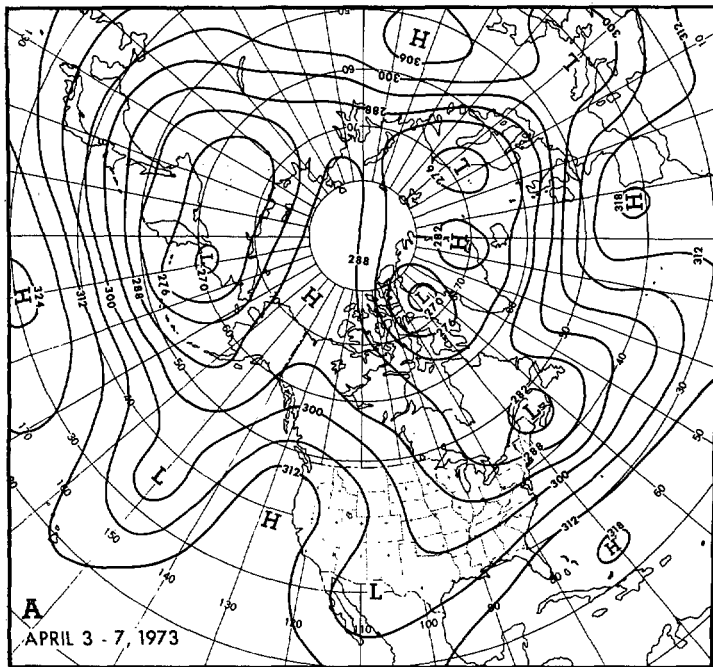


FIGURE 7.—(A) mean 700-mb contours (dam) for Apr. 3-7, 1973; (B) departure from normal of average surface temperature ($^{\circ}$ F) and (C) total precipitation (in.) for week of Apr. 2-8, 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

FIGURE 8.—Same as figure 7, (A) for Apr. 10-14, 1973; (B) and (C) for week of Apr. 9-15, 1973.

April 9-15

During the second week of the month, most circulation features progressed. The southern portion of the ridge, which had been near the west coast, weakened and moved

eastward to the Southern Great Plains as the eastern Pacific trough moved to near the coast while weakening in response to the development of a broad, deep trough over the central Pacific (fig. 8A). Although the ridge over northwest Canada remained stationary, the trough that had extended from the Great Lakes to southern

TABLE 2.—Record low temperatures for the month and for so late in the season set during April 1973

Station	Temp. (°F)	Date	Remarks
Lander, Wyo.	-2	8	Lowest so late in season
Sheridan, Wyo.	1	9	Do.
Denver, Colo.	5	8	Do.
El Paso, Tex.	24	9	Lowest for month and lowest so late in season
Midland, Tex.	20	9	Do.
San Angelo, Tex.	25	9	Do.
Lubbock, Tex.	23	9	Lowest so late in season
Corpus Cristi, Tex.	40	9	Do.
Abilene, Tex.	25	9	Do.
	26	10	Do.
Del Rio, Tex.	33	9	Equaled lowest for month
North Platte, Nebr.	12	10	Equaled lowest so late in season
Lake Charles, La.	40	10	Lowest so late in season
New Orleans, La.	35	11	Do.
Fort Smith, Ark.	28	11	Do.
Meridian, Miss.	31	11	Equaled lowest so late in season
Birmingham, Ala.	26	11	Lowest for month and lowest so late in season
Atlanta, Ga.	26	11	Lowest so late in season
Nashville, Tenn.	24	11	Do.
Chattanooga, Tenn.	26	11	Do.
Dubuque, Iowa	11	11	Do.
Muskegon, Mich.	12	11	Do.
Grand Rapids, Mich.	14	11	Do.
Raleigh-Durham, N.C.	26	12	Do.

Texas moved eastward to near the Atlantic coast. The Azores High began building strongly northward toward Greenland.

In response to these circulation changes, the coldest temperatures also moved eastward while warmer than normal air pushed into the northern Great Basin (fig. 8B). The strong advection of air from Canada that prevailed during the first two weeks of April was climaxed by a record-breaking late-season cold wave, which set numerous records for low temperatures from the northern Rocky Mountains through the Midwest and deep South to the middle Atlantic coast (table 2). Temperatures averaged as much as 15°F below normal over the southern Appalachians during the second week of April.

Precipitation was heaviest in the middle of the country, further delaying the return of the Mississippi and other flooded rivers and streams to their banks. From 1 to 2 in. fell from eastern Texas to southern Wisconsin (fig. 8C). In the northern portion of this area, most of the precipitation fell as snow in what was one of the worst spring blizzards on record in the Midwest. In Iowa, where as much as 20 in. of snow was whipped into huge drifts by winds approaching 60 mi/hr in gusts, it was the greatest single snowstorm on record for any month of the year. The combination of snow, cold, and strong winds took a heavy toll in livestock and poultry.

Lighter amounts of snow occurred eastward through the mid-Atlantic States and New England with storms

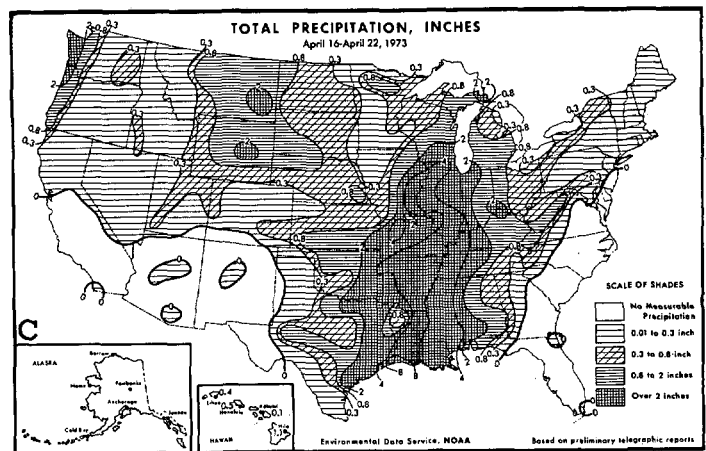
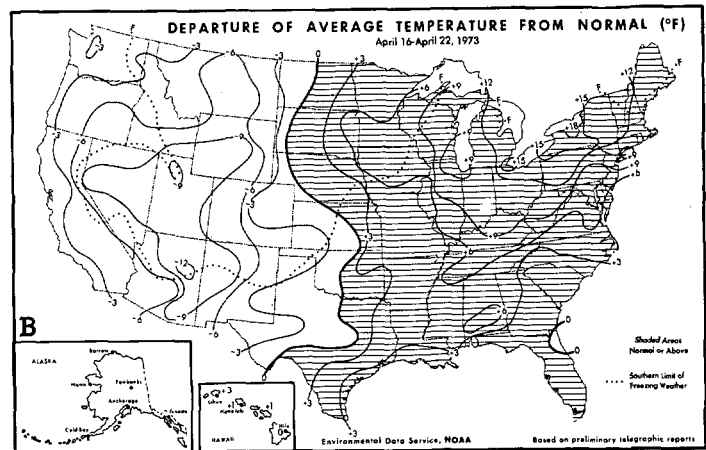
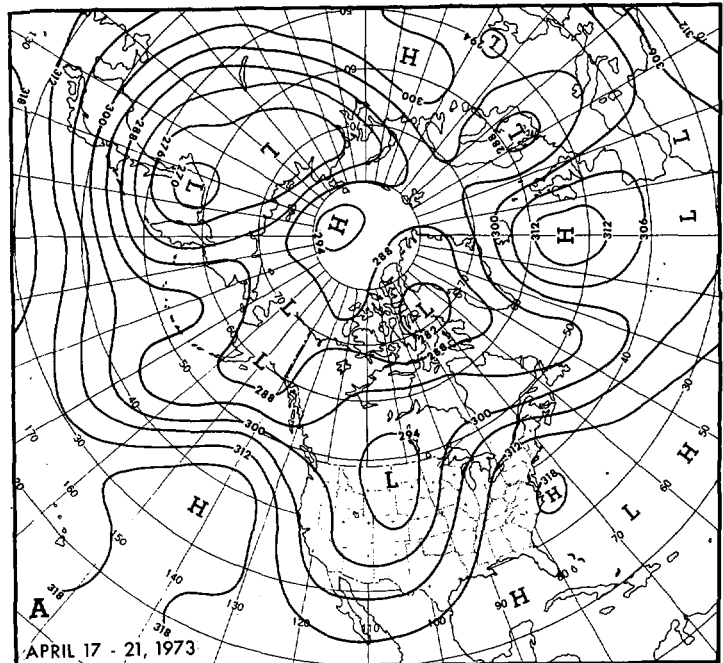


FIGURE 9.—Same as figure 7, (A) for Apr. 17-21, 1973; (B) and (C) for week of Apr. 16-22, 1973.

later in the week. After an almost snowless winter, snow fell 3 days in a row in and near Washington, D.C. Most of it was too light to measure or melted as it fell, however.

April 16-22

Large circulation changes occurred over North America during the third week of April. Sharpening of the central

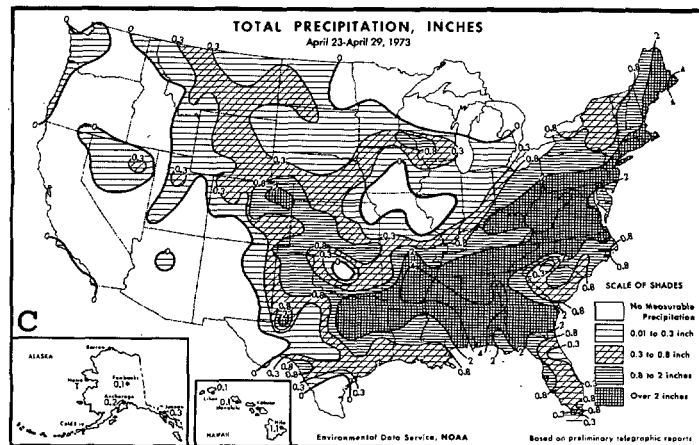
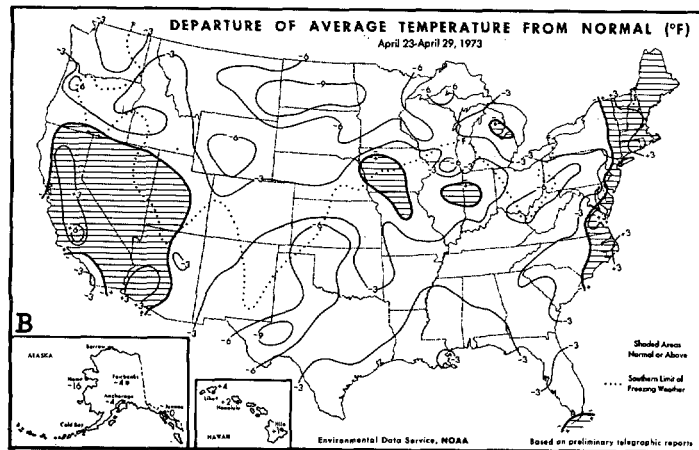
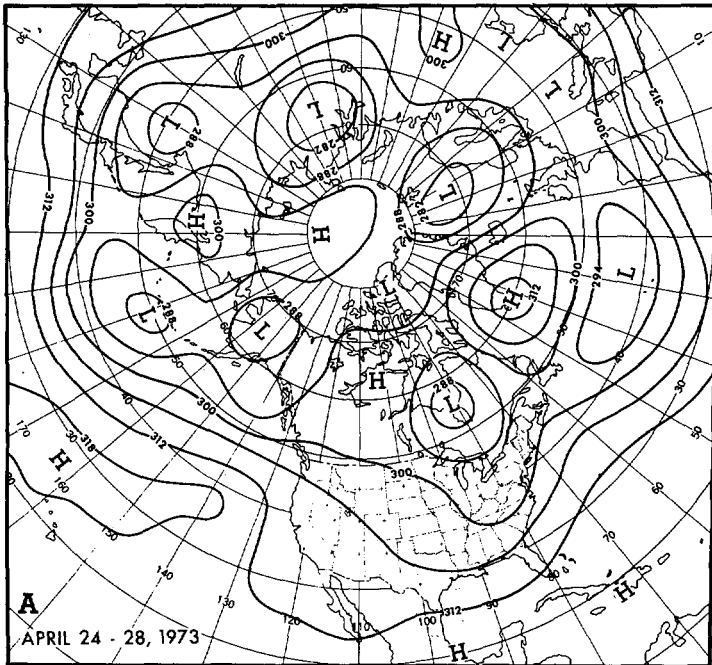


FIGURE 10.—Same as figure 7, (A) for Apr. 24–28, 1973; (B) and (C) for week of Apr. 23–29, 1973.

Pacific trough and amplification of a 700-mb ridge over the eastern Pacific led to the development of a deep trough from the Northern Plains to the Southern Rocky Mountains, with strong ridging over the East (fig. 9A)

This led to a reversal of the temperature anomaly pattern, with a very cold West and unseasonably warm East (fig. 9B). Temperatures averaged 9° to 12°F below

normal over the southern Great Basin and from 10° to 18°F above normal over the Northeast, where numerous daily records for warmth were set over the Easter weekend.

The strong southerly component in the flow over the central part of the country brought in large quantities of moisture and contributed to further aggravation of the major flooding already in progress (figs. 9A, 9C). From 2 to 6 in. of rainfall, some of it associated with severe thunderstorms, fell along most of the Mississippi River. As much as 12 in. fell in Texas and Louisiana, setting off new flash floods on streams there.

Another heavy snowstorm, of record proportions in parts of Montana and Wyoming (table 1), struck the northern Rocky Mountains. Only the far Southwest and Atlantic coast remained dry during the week.

April 23–30

Over the United States, the circulation was similar to that 2 weeks before, although marked changes occurred elsewhere (figs. 8A, 10A). The amplified Azores 700-mb ridge was transformed into a strong blocking High and moved westward across the North Atlantic. As it retrograded, it was undercut by a southern branch of the westerlies. Blocking also began to develop in northern Canada, trapping a Low near James Bay from which a trough extended southward through the eastern United States (fig. 10A).

The temperature anomaly pattern reverted to that which characterized the first 2 weeks of April and the month as a whole (fig. 10B). The coldest weather relative to normal was observed over the Northern Plains and west Texas, where the week averaged 6° to 10°F below normal. Lingering effects of unseasonal warmth early in the week contributed to the above-normal temperatures along the middle and north Atlantic coast, and it warmed to above normal over the California Central Valley and southern Great Basin east of the weak 700-mb ridge.

Under the influence of the eastern trough, excessive precipitation continued across most of the South, with heavy amounts of over 2 in. extending northeastward along the Atlantic coast (fig. 10C). Weekly totals of 4–5 in. continued flash floods on small streams through parts of Arkansas, Mississippi, Alabama, and Georgia and further delayed the planting of cotton and other crops. Some of the heavy rains were accompanied by hail and severe thunderstorms. Although no rain fell locally during the week, a flood crest of 43.3 ft. was observed on the Mississippi at St. Louis, the highest in two centuries of records.

Other areas that were rainless as the month drew to a close were the upper Great Lakes and most of the Great Basin and southern Rocky Mountains.

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- Taubensee, Robert E., "Weather and Circulation of March 1973—Record Heavy Precipitation Over the Central and Southern Great Plains," *Monthly Weather Review*, Vol. 101, No. 6, June 1973, pp. 540–546