

Damaging, Mischievous, and Interesting Whirlwinds and Waterspouts

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The literature appears to contain no record of whirlwinds or dust devils causing significant structural damage to buildings (Cooley 1971). A recent report by Elam (1971), however, indicates that a whirlwind just ahead of a cold front had sufficient energy to cause structural rearrangements.

This particular whirlwind occurred around 1800 EST on Apr. 21, 1971, at a location 6 mi northwest of the Weather Service Office (WSO) in Lexington, Ky. The visible funnel was described to be about 15 ft across at the base and slightly wider at the top; the top was 30–40 ft above the base and was not connected to a cloud.

It had been sunny and warm in the area about ½ hr before, but it quickly became overcast just before the whirlwind touched down as a cold front approached from the northwest. The whirlwind lifted the wooden roof of a double garage 1 or 2 ft above the concrete block walls, displaced it about 1 ft to the east (rear of the garage), and dropped it back down onto the supporting walls. The whirlwind moved farther east, pulled a swing set from the ground causing it to rotate in the air, dropped it, and then continued eastward over an open grass field.

The weather reported at WSO Lexington at 1800 EST was 4,000 ft scattered, 24,000 ft scattered, temperature 72°F, dew point 53°F, west wind 16 mi/hr with towering cumulus to the north. The 1900 EST report indicated that the sharp cold front had just passed: 4,500 ft overcast, visibility 5 mi, thunderstorm, heavy rain shower, temperature 59°F, dew point 53°F, north wind 21 mi/hr with gusts to 36 mi/hr. The thunderstorm began northwest of the station at 1852 EST and moved southeastward. The peak wind occurred at 1855 EST.

In Michigan 18 days later (about noon on May 9), a fair weather waterspout was reported (Miller and Weiner 1971). The two boys were fishing from a bridge on the Grand River south of Lowell (10 mi east of Grand Rapids). They were startled by a “swishing” sound and spotted a waterspout 150–300 ft downstream (west). The spout moved upstream (east) and reached a maximum height around tree-top level before moving onshore. The spout moved up a steep bank as it came ashore, moved inland about 20 ft, slowed its forward motion, became stationary, gradually died down, and then dissipated entirely. The base of the spout was estimated to be about 5–10 ft in diameter with the top about 50–100 ft in diameter.

An article in the May 13, 1971, issue of the Lowell, Mich., weekly newspaper, the *Ledger-Suburban Life*, reported the occurrence of an insolational whirlwind 1–2

mi south of Lowell around 1800 EST that same day (May 9). This whirlwind (maximum visible height about 15 ft) contained sufficient energy to lift a steel umbrella-type table (without umbrella) out of the owner's yard and over a 4-ft fence before depositing it in the adjoining yard. The table was 3–4 ft in diameter and weighed about 30 pounds. Shingles were ripped off the house, the TV antenna was twisted, and debris was scattered around the yard.

A 3-yr old child weighing about 30 pounds was lifted 6–12 in. above the hood of a parked pickup truck upon which she was sitting and was carried slightly to one side before being caught by an older brother. The truck was parked between two buildings and the Venturi effect may have produced accelerated forces. A small, healthy, registered beagle puppy vomited after the whirlwind swept over him. He continued in convulsions for 5–10 min and was disposed of because the owners didn't feel he was going to recover. The force of the winds was sufficient to break the rollers on the opening mechanisms of mobile home windows nearby.

Around 1430 EST on Aug. 15, 1971, another insolational whirlwind was reported in a residential area of southern Grand Rapids, Mich. (Gelders 1971). It was first noted in the vicinity of a concrete, submerged-type swimming pool. The whirlwind turned over three aluminum chaise lounges with spring cushions and moved both the lounges and cushions several feet. Water was sucked out of the pool and thrown into a bath house about 20 ft away.

The whirlwind was relatively transparent since there was little or no loose debris in the area, but it did pick up an inflated heavy-duty airmattress (27 in. × 72 in.) from the concrete area around the pool. The mattress was lifted an estimated 500–600 ft (“until it was the size of a postage stamp”) and was carried out of sight to the southwest. It was estimated to be about 3 city blocks away when it was last seen.

REFERENCES

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- Elam, Ben, record of *Storm Data and Unusual Weather Phenomena* (WB Form F-8), Office for State Climatology, National Weather Service, NOAA, Lexington, Ky., Apr. 21, 1971, 1 p.
- Gelders, Mr. and Mrs. Kenneth, Grand Rapids, Mich., Aug. 15 and 25, 1971 (personal communication).
- Miller, Leroy, and Weiner, Gary, Lowell, Mich., July 31, 1971 (personal communication).

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PICTURE OF THE MONTH

Comparison of Visible, Infrared, and Moisture Channel Data

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Three different types of satellite data, acquired during the 1970 Cloud Truth Program, are discussed in this article. The ESSA 9 television coverage of the western half of the United States on May 8, 1970, appears in figure

1. Two-channel scanning radiometer data from the Nimbus 4 satellite appear in figures 2 and 3. The 10.5- to 12.5- μm "window" channel data in figure 2 provide daytime and nighttime cloud-top and surface temperatures.

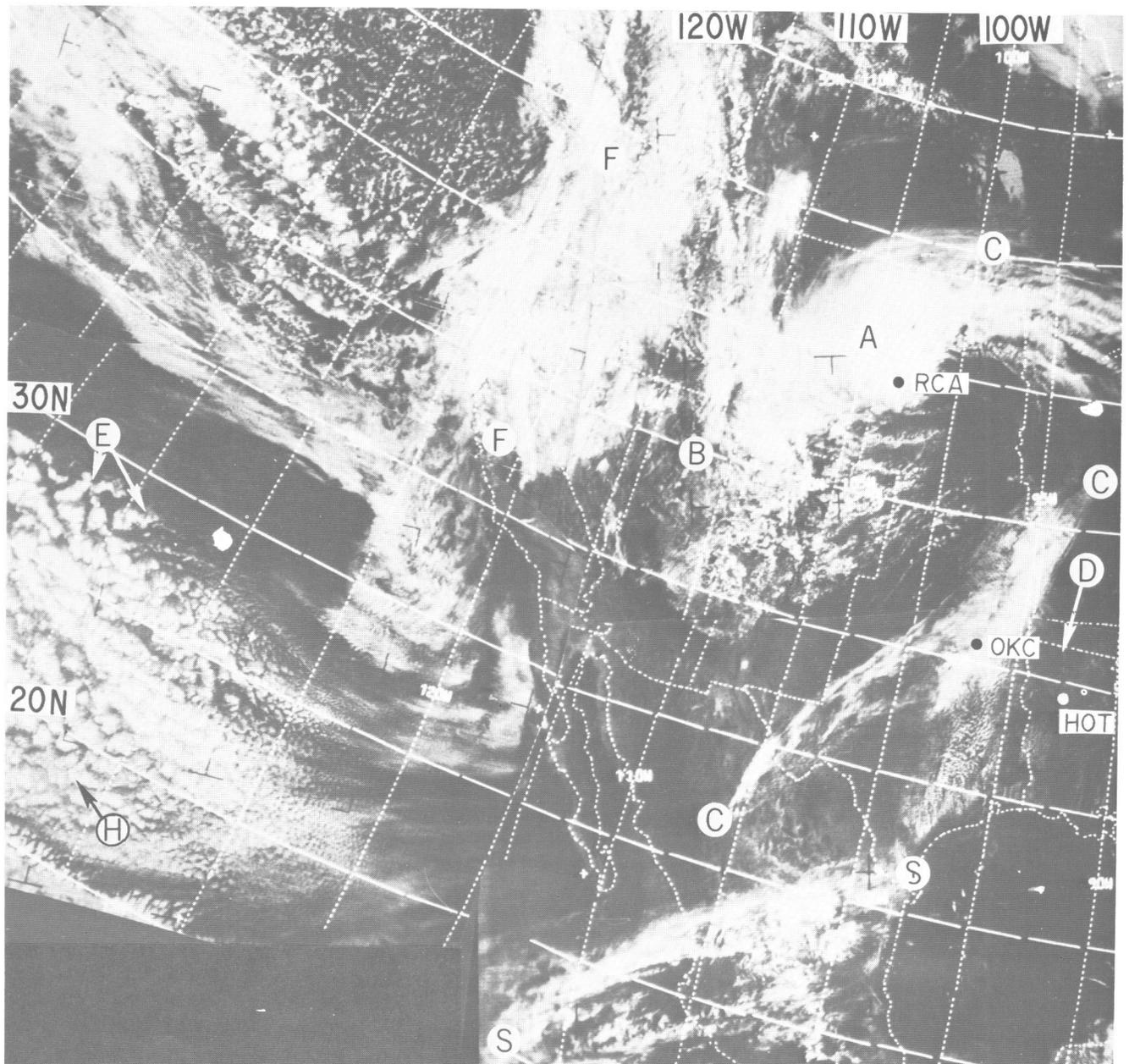


FIGURE 1.—Television coverage, ESSA 9, orbits 5452–5453, 2044–2239 GMT, May 8, 1970.

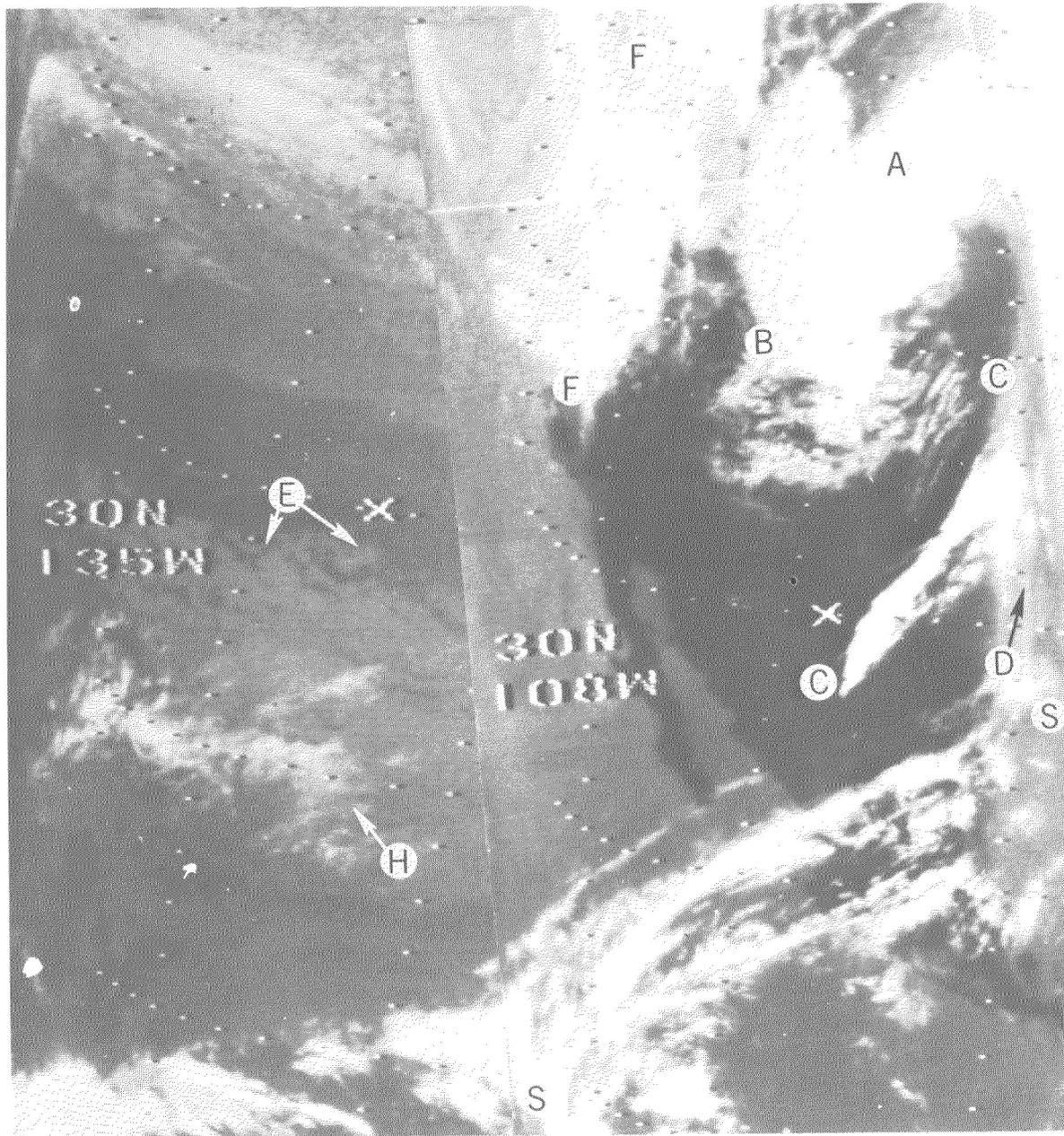


FIGURE 2.—Infrared data, 10.5–12.5 μm , Nimbus 4, orbits 409–410, 1814–2001 GMT, May 8, 1970. (The imprinted grid on this figure is incorrect. The grid imprinted on fig. 3 is correct and applies to the data in this figure also.)

In these data, the coldest surfaces appear white and the warmer surfaces appear dark. Figure 3 is the same view recorded by the 6.7- μm “water vapor” channel. This channel provides information on the moisture content of the upper troposphere and the moisture patterns associated with jet streams and frontal systems. Here, moisture-laden areas will appear white and the dryer areas dark. Many cloud features are easily recognized in all three types of data; yet, when taken together, each of these satellite views provides more information about current atmospheric conditions.

The May 8, 2100 GMT, surface map (fig. 4) showed a long cold front stretching from the Dakotas to Texas. Two Low centers were analyzed, one in South Dakota

and another on the Kansas-Texas border. The cirrus-covered circular cloud mass (A) in figure 1 was associated with the northernmost system, and the cloud band (C) generally marked the position of the cold front. An area of scattered and broken cloudiness was present over the Rocky Mountains from Montana to New Mexico.

These features can also be seen in the Nimbus data appearing in figures 2 and 3. In addition, the infrared (IR) data of figure 2 showed that a layer of cold cirrus clouds was present over the area of broken clouds (B) north of Utah; and the 6.7- μm moisture data of figure 3 showed that dry air aloft had already made one complete revolution into the vortex cloudiness (A). IR temperatures measured by Nimbus 4 ranged from -35° to -50°C

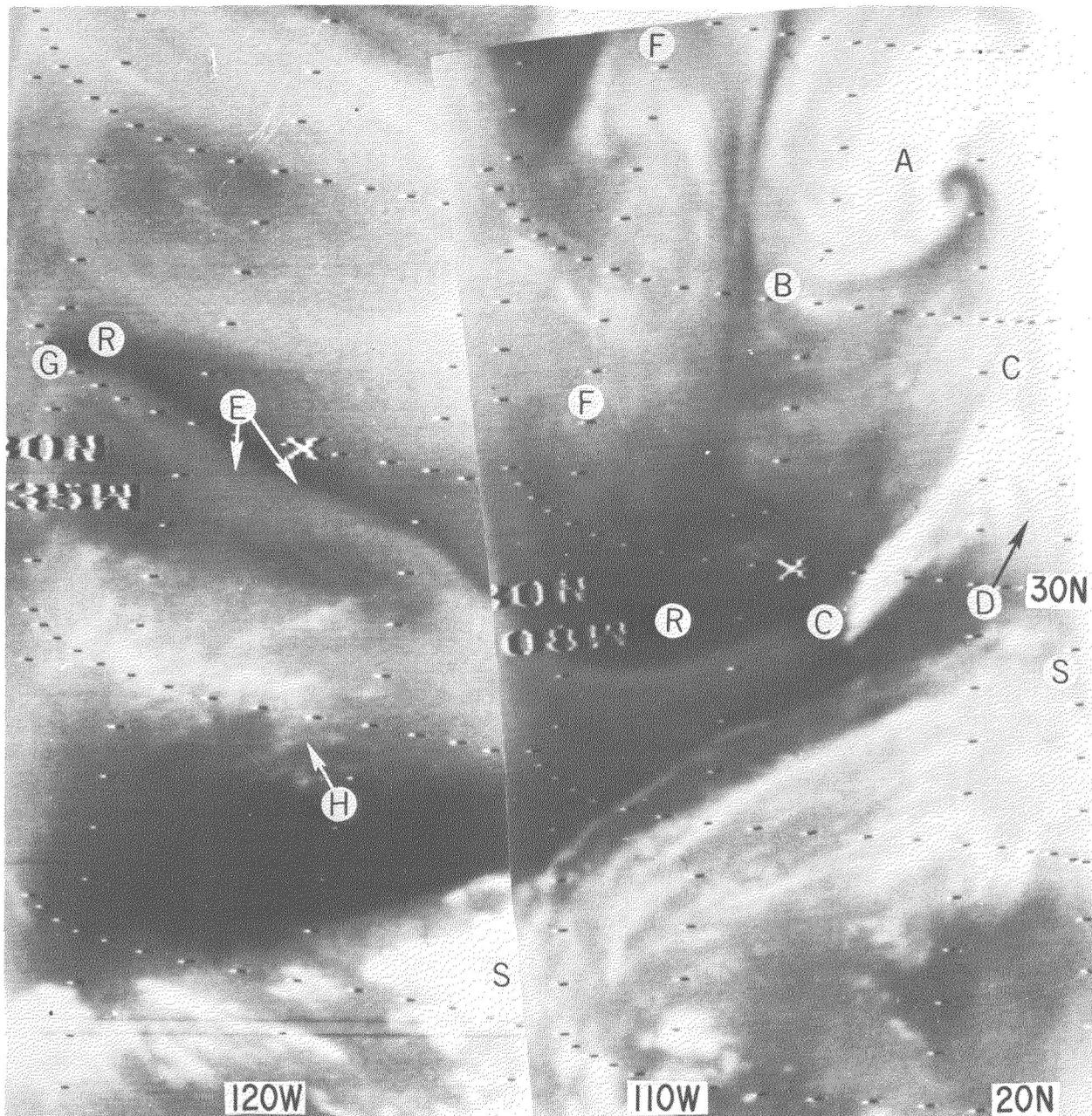


FIGURE 3.—Moisture channel data, 6.7 μ m, Nimbus 4, orbits 409–410, 1814–2001 GMT, May 8, 1970.

over the solid cloud area (A) and from -12° to -25°C over the area of broken clouds (B).¹ An aircraft report² near Rapid City, S. Dak. (RCA), at 2342 GMT, indicated that the top of the cirrus was at 33,000 ft. The 0000 GMT, May 9 sounding taken at RCA showed a -52°C temperature at this level.

The cirrus bands (C) of figure 1 mark the position of the polar jet stream. Paul Kadlec³ flew across this area at 2340 GMT and reported a varying layer of broken to overcast cirrus beginning 95 mi west of Oklahoma City, Okla.

¹ From NASA printout of temperatures calculated from observed radiances

² Special aircraft reports were gathered by the Western Region, National Weather Service, for this project.

³ Paul Kadlec, Continental Airlines, Los Angeles, Calif., provided very detailed cross sections of the cloud layers and atmospheric conditions along his flight from Los Angeles to Miami, Fla.

(OKC), and extending eastward to Birmingham, Ala. He reported a 7,000-ft thick cirrus layer ($290 \oplus 360$) just west of OKC and again about 100 mi east of OKC to Hot Springs, Ark. (HOT), with lower clouds present throughout the area. The temperature within the cirrus layer at 33,000 ft was -50°C .

The television coverage (fig. 1) over this area shows a number of NE–SW cirrus cloud bands (C) with some cirrus striations (D) extending southeastward from over the lower clouds. The Nimbus data (figs. 2, 3) show this to be an area of solid, moist cirrus. Upper air reports (at 1200 GMT) suggested that these clouds were at the 25,000-to 30,000-ft level.

A faint ribbon of moisture, originating from over the Pacific Ocean near 30°N , 145°W (G, fig. 3), appears to

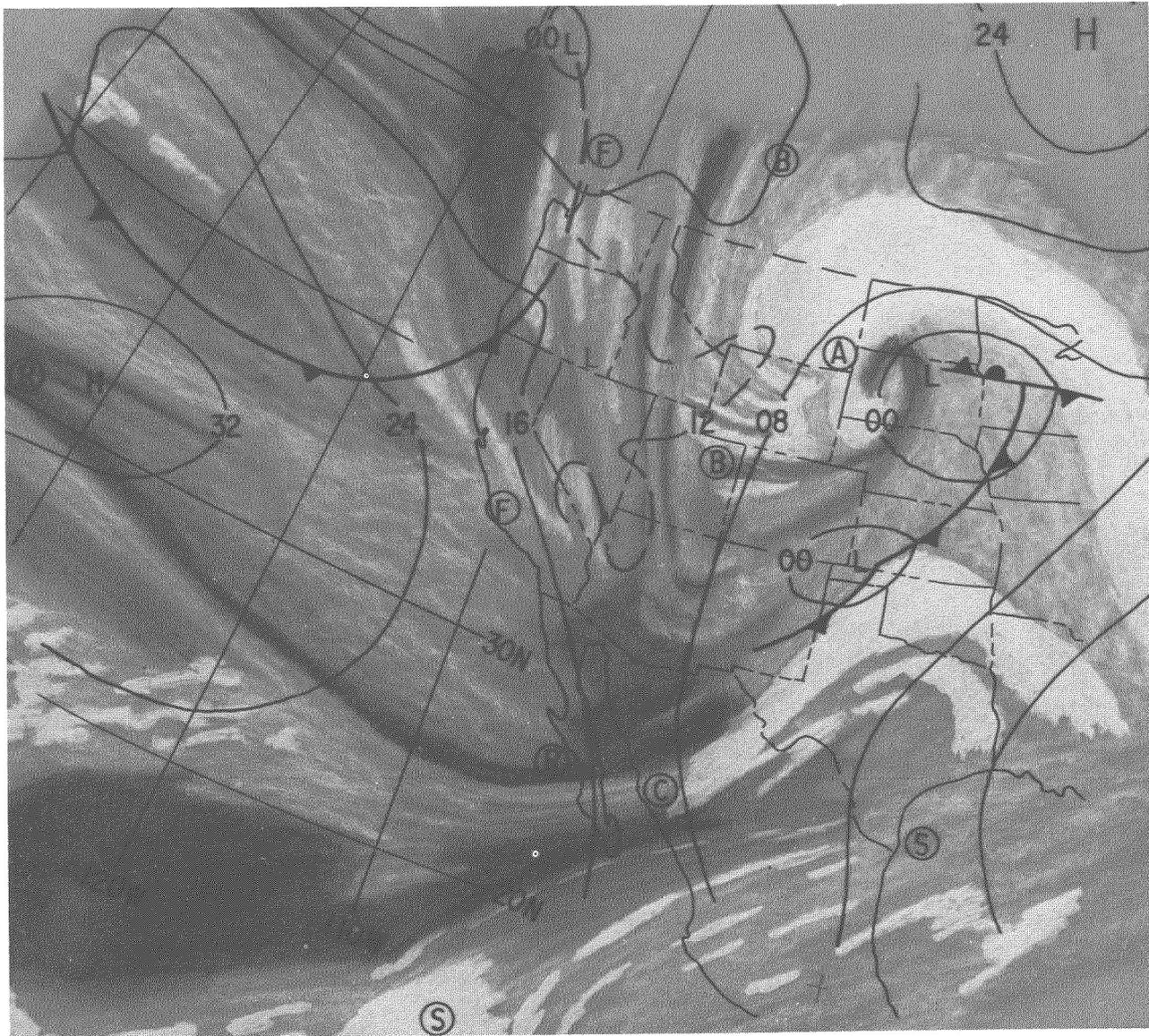


FIGURE 4.—Surface analysis for 2100 GMT, May 8, 1970. The moisture patterns that appear in figure 3 have been rectified and superimposed.

feed directly into this cirrus cloud band. The dark area (R) immediately to the north of this moisture band marks the region of subsidence.

Another cirrus band (S), which can be identified in all the data, originates from the intertropical convergence zone cloudiness and is associated with the subtropical jet stream. Bases of this cirrus were reported to be at 30,000-ft altitude over Brownsville, Tex.

A large, closed cellular pattern can be seen well offshore (E, fig. 1). These clouds have little vertical development and thus appear warm (gray) in the IR data (fig. 2) and are not easily discernible in the moisture data. On the other hand, the Nimbus data reveal that an area of colder (whiter) cirrus clouds (H) is present over the cellular field; this is not readily apparent in the television coverage.

The cloudiness (F) is associated with the frontal system discussed by Parmenter (1972). Although the frontal band

was ragged and disorganized as it moved onshore, it still could be recognized in all of the data. At 2100 GMT, light rain was falling along the coast of Oregon to British Columbia and some light icing was reported by pilots in the Tacoma, Wash., area.

These are a few of the many features that can be compared and studied in the data shown. Further work with various types of satellite observations, especially the moisture channel data, may reveal important details about developing and nondeveloping systems.

REFERENCE

Parmenter, Frances C., "Picture of the Month—Near Simultaneous Aircraft and Satellite Observations Over Western Canada and the Northeast Pacific," *Monthly Weather Review*, Vol. 100, No. 2, Feb. 1972, pp. 168-170.