PICTURES OF THE MONTH

Low-Level Moisture Intrusion from Infrared Imagery

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Infrared sensors on the NOAA and SMS satellites are designed to measure the longwave radiation emitted by clouds and terrestrial surfaces. CO_2 and H_2O vapor are strong absorbers of this emitted terrestrial radiation, and produce the well-known "greenhouse effect." Thus, a higher atmospheric moisture content will serve to keep an air mass warmer through the absorption and re-radiation process. The current SMS-2 IR radiometer, with a 4-mile resolution, is operating in the 11 μ region of the "atmospheric window" where absorption is least. Thus, these data more closely represent atmospheric conditions and allow the user

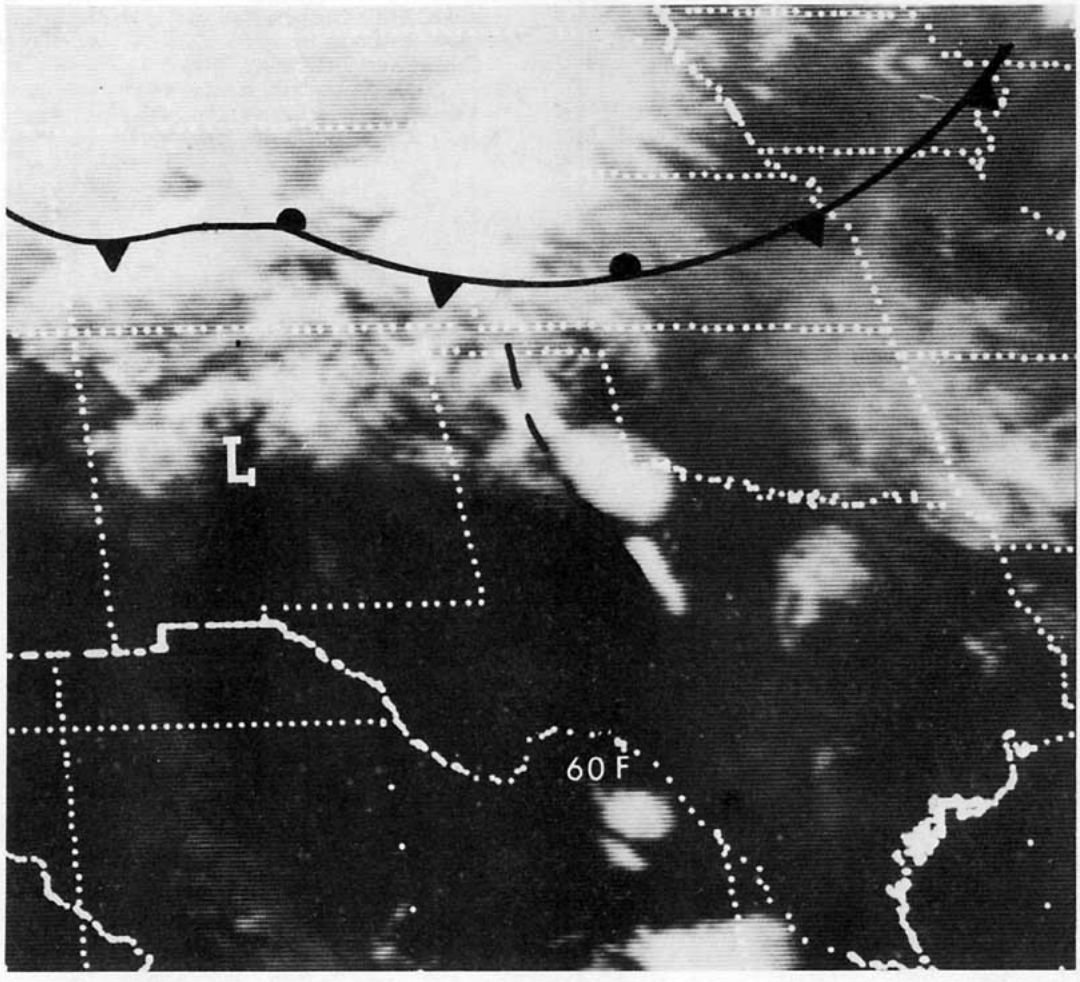

FIG. 1. SMS-2 infrared data 0045 GMT 18 June 1975.

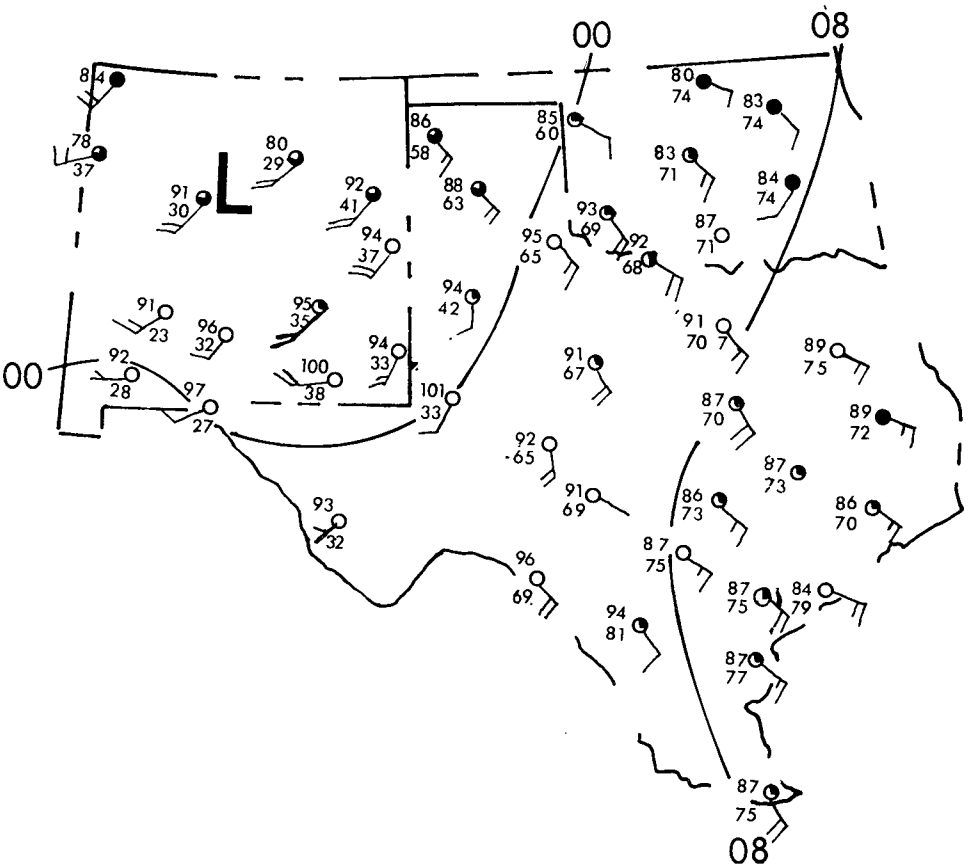

FIG. 2. NMC surface analysis 0000 GMT 18 June 1975. Isobars are in millibars over 1000 mb.

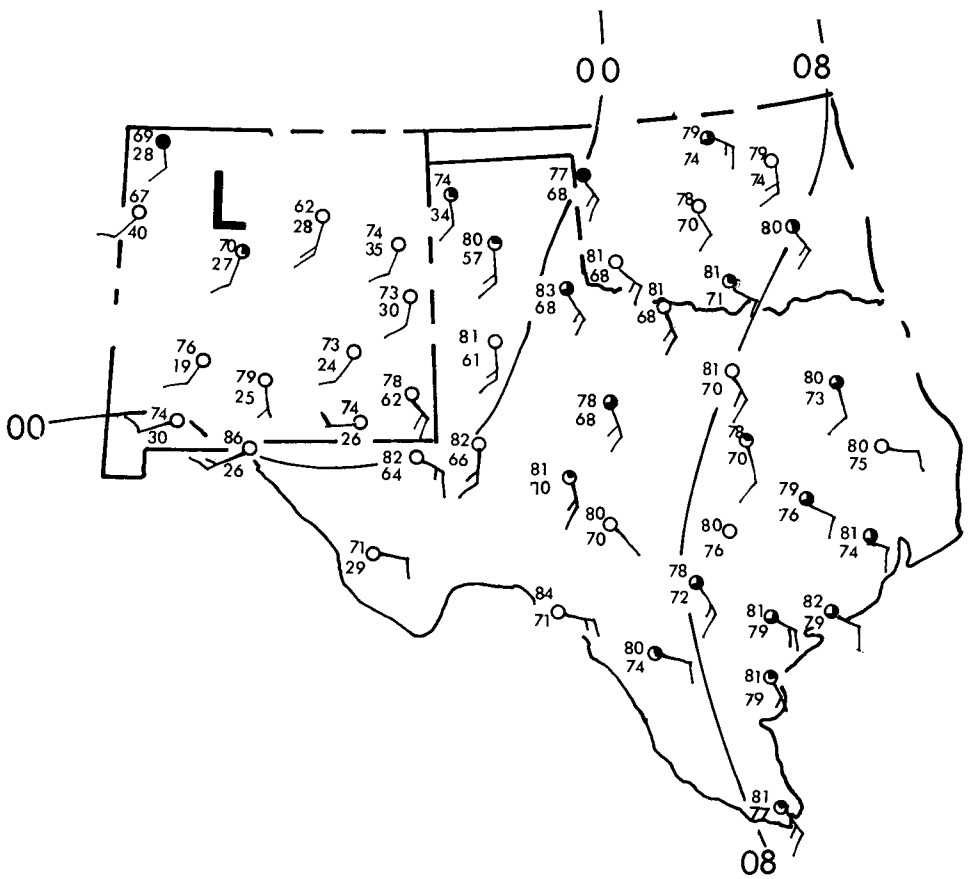

FIG. 3. As in Fig. 2 except, at 0600 GMT 18 June 1975.

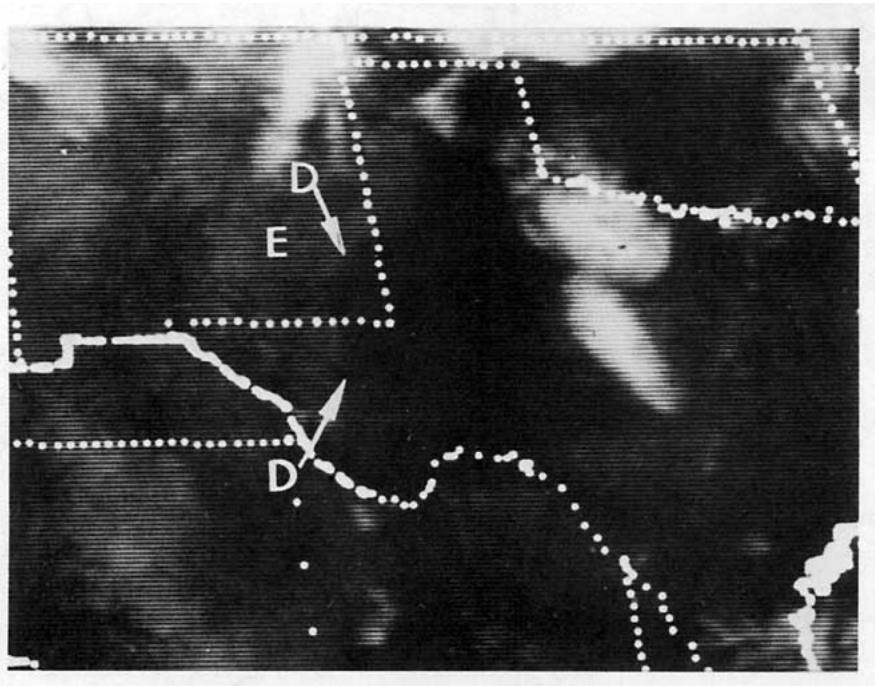

FIG. 4. SMS-2 infrared data 0545 GMT 18 June 1975.

to monitor the progress of warm and cold air masses. This sequence, taken on 18 June 1975, shows the progress of warm moist air from eastern Texas into New Mexico during the nighttime hours.

At 0000 GMT 18 June, a weak low was located in Wisconsin with a cold, then stationary, front extending southwestward through Iowa, central Kansas, then into the mountain states (Fig. 1). Another surface low was analyzed in New Mexico with strong southerly flow throughout Texas and New Mexico. At this time, the 60°F surface isodrosotherm was located just west of Amarillo and San Angelo, Texas. Surface temperatures (Fig. 2) were in the 90's over most of Texas and New Mexico, producing the very dark, uniform display in the IR data (Fig. 1).

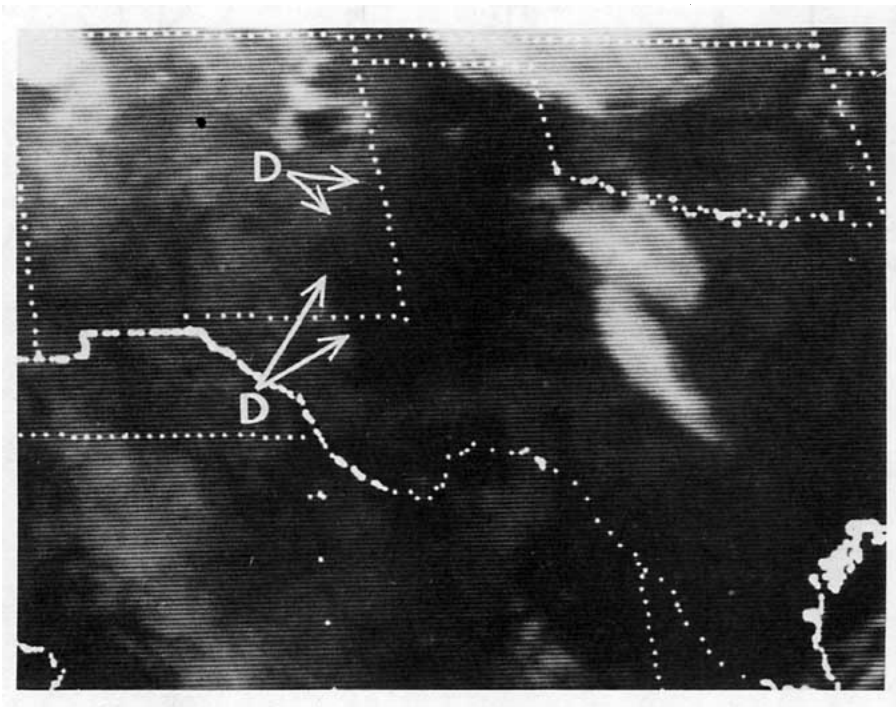

FIG. 5. SMS-2 infrared data 0745 GMT 18 June 1975.

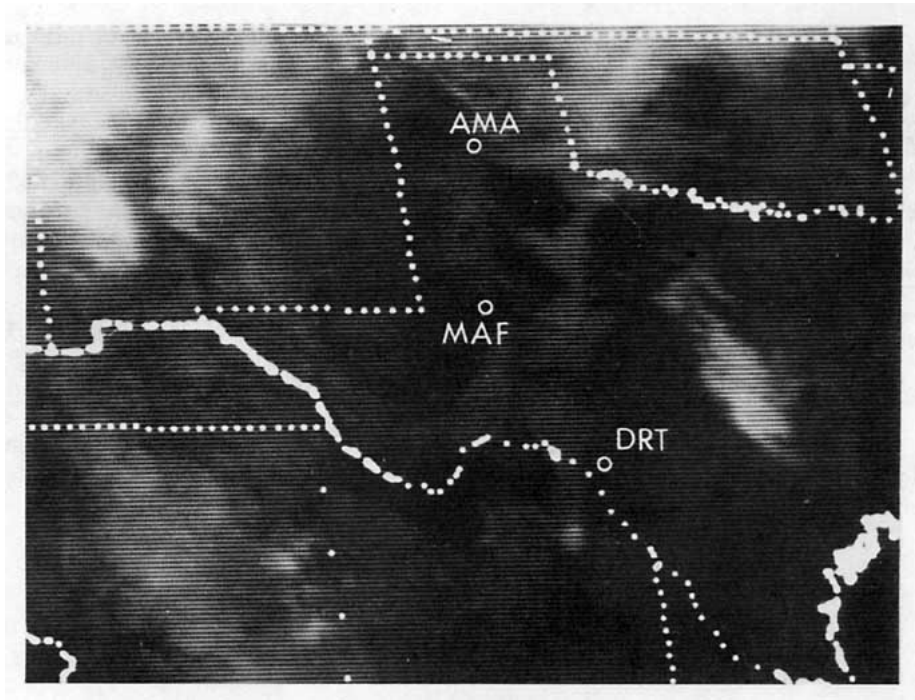

FIG. 6. SMS-2 infrared data 1245 GMT 18 June 1975.

The 0300 GMT observations, taken near sunset in this area, show a general 10°F decrease in surface temperatures. Of particular note is the marked increase (+24°F) in dew-point temperatures at Midland, Texas. By 0600 GMT, 62°F dew-points were reported as far northwest as Hobbs, New Mexico, while very dry air (dew points 24° and 26°F) was reported immediately to the west at Carlsbad and Roswell, respectively (Fig. 3). This area of warmer moist air is cloud-free and appears as a dark edge (D) just entering southeast New Mexico at 0545 GMT (Fig. 4). Further west, temperatures are cooler in the drier air and this area shows a lighter gray return (E) in the IR.

Successive views at 0745 and 1245 GMT (Figs. 5 and 6) show the north-northwestward push of this moist air under the influence of the low-level jet. The time lapse movie shows that this air mass ad-

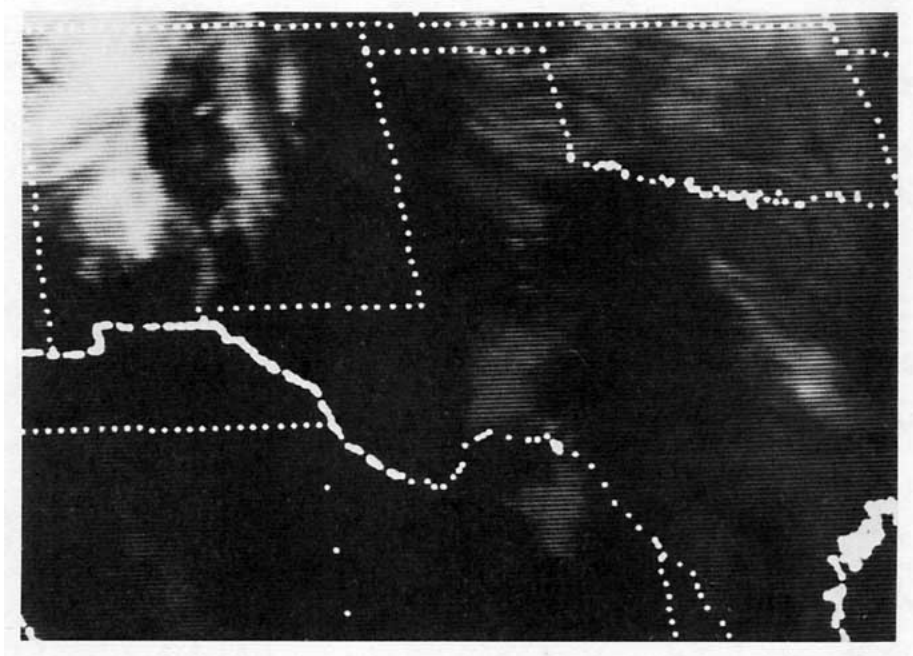

FIG. 7. SMS-2 infrared data 1615 GMT 18 June 1975.

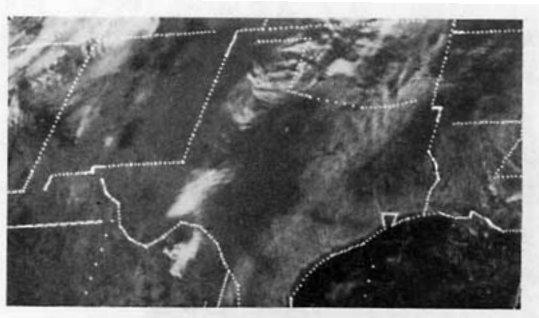

FIG. 8. SMS-1 visual data (1-mile resolution) 1600 GMT, 18 June 1975.

vances quickly between 0545 and 0745 GMT into eastern New Mexico, terminating abruptly along the mountainous terrain. By 1245 GMT (Fig. 6), low-level cloudiness is beginning to form in the moist air over Texas. The 1200 GMT soundings at Midland (MAF), Amarillo (AMA), and Del Rio (DRT), Texas, indicate cloud tops at 6,000, 5,800, and 3,200 feet, respectively.

Early morning surface heating quickly destroys this IR pattern, and by 1615 GMT (Fig. 7) the terrain features are once again uniformly dark. Visual data from SMS-1, taken at 1600 GMT, appear in Fig. 8 for comparison.

Oftentimes, the low-level moisture is accompanied by stratiform clouds that are warmer than their surroundings and serve as useful tracers. Progress of this moist air mass is important to the severe weather forecast problem, and this characteristic signature in the nighttime infrared serves as a useful supplemental observation of this field.