UDC 551.578.45:551.507.362.2:551.576.1(084.1)(76)

PICTURE OF THE MONTH

Snowstorm in the Central Plains

EDWARD W. FERGUSON

National Environmental Satellite Center, ESSA, Washington, D.C.

The ESSA 8 APT picture shown in figure 1 was taken on a day when 3 to 5 in. of snow fell over a portion of Kansas. Smaller amounts were observed in parts of Texas, Oklahoma, and Nebraska. By the time this picture was taken (1500 GMT), a low-level southerly flow from the Gulf of Mexico had produced a vast area of stratus and fog from Texas to Kansas. These low clouds can be seen in figure 1 and are easily identified by the sharp western edge and smooth upper surface of the cloud mass.

The weather depiction chart for 1600 GMT is presented in figure 2A. Note that low clouds cover much of Kansas, while middle clouds are reported over the northeast part of the State.

Another feature of interest in the satellite picture is the area of middle and high clouds that forms a vortical pattern over northern Oklahoma and Kansas. Shadows and highlights produced by the low sun angle give a three-dimensional effect to the clouds in this area. This system is associated with a vorticity maximum that was centered in northeast Colorado at 1200 GMT (fig. 2B). Before this vorticity maximum moved into the area covered by low stable clouds, little or no precipitation was reported. As the vorticity center moved across Kansas, moderate to heavy snow began to fall. A total accumulation of up to 5 in. was reported near Concordia, Kans. It is interesting to note that measureable snow occurred only in that area of fog and stratus that was located beneath the clouds associated with this vorticity center.

East of a line (A–B) that marks the eastern edge of the stratus deck (figs. 1 and 2A), only light snow and very light freezing rain were reported. It seems probable that snow falling from the middle and high clouds into the supercooled deck of stratus provided natural seeding which lead to relatively large amounts of snowfall. This idea is further supported by the fact that little or no precipitation occurred east of the stratus, even though the middle and high clouds persisted as the vorticity center moved southeastward away from the low clouds. Bergeron (1949) made a study that may apply to this situation. He showed that when orographically produced clouds are naturally seeded with ice crystals from a higher cloud, a significant increase in precipitation amount results.

In this example, the upper level cloud system, which is thought to be responsible for the major precipitation, is easily identified in the picture. The boundary of the stratus is also clearly defined. If the precipitation mechanism described here is correct, the satellite picture gives insight into the timing and area of occurrence of precipitation under these conditions.

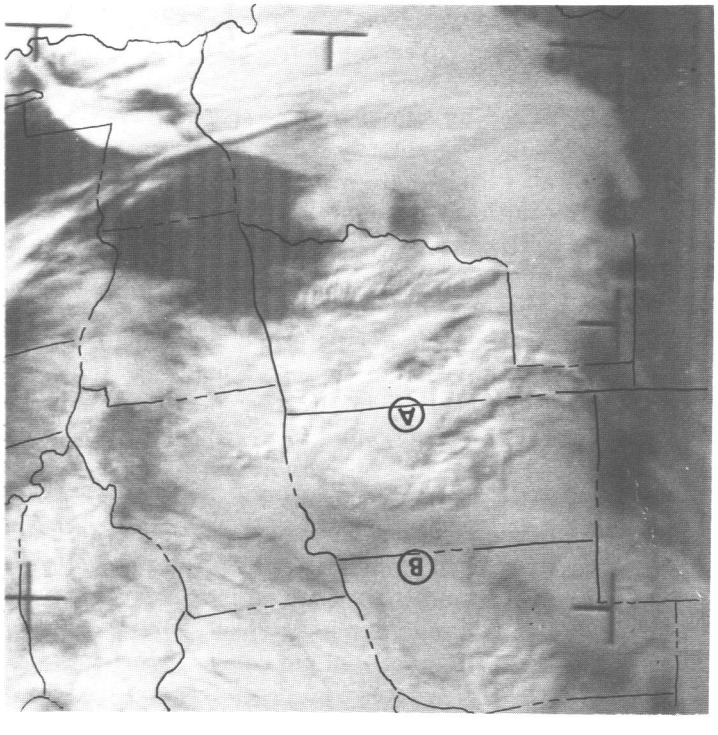

FIGURE 1.—ESSA 8 APT picture at 1500 GMT on Jan. 21, 1970.

REFERENCE

Bergeron, Tor, "The Problem of Artificial Control of Rainfall on the Globe: II. The Coastal Orographic Maxima of Precipitation in Autumn and Winter," *Tellus*, Vol. 1, No. 3, **1949**, pp. 15–32.

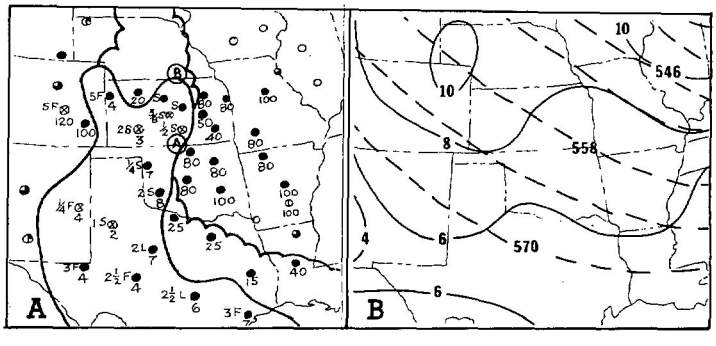

FIGURE 2.—(A) NMC Weather Depiction Chart for 1600 GMT on Jan. 21, 1970; (B) vorticity analysis (solid lines) and 500-mb analysis (dashed lines) for 1200 GMT on Jan. 21, 1970.