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THE DEEPENING OF A LOW-LEVEL TROUGH AS INDICATED BY DUST ALOFT IN GOES-1 INFRARED PICTURES

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1. INTRODUCTION

Dust aloft in the plains area of the central United States has been observed on satellite pictures on several occasions.^{1, 2, 3} The occurrence of blowing dust is recognized as a problem to agriculture, aviation and other activities. The occurrence of dust as indicated by satellite pictures can also be used as a forecast aid. On 13 March 1977, a low-level trough was moving slowly eastward out of the Rockies. As it moved over the plains it deepened rapidly. As the low-level winds became more southerly and increased in speed along the eastern side of the trough, quantities of dust were indicated by GOES-1 infrared pictures from eastern Texas and Louisiana to Kansas. The shift in low-level winds as indicated by dust aloft in the GOES-1 pictures provided evidence of the rapid deepening of the trough many hours sooner than provided by constant-pressure charts.

2. DISCUSSION

On 10 March 1977, a rather deep low, with a tight

pressure gradient and strong surface winds moved out of southeastern Colorado into Kansas. The surface low became virtually stationary over Kansas for about thirty-six hours (from 0000 GMT, 11 March 1977 to about 1200 GMT, 12 March 1977). During this thirty-six hour period, the associated cold front moved rapidly eastward across Oklahoma and Texas. During this time strong winds on the west and south sides of the low picked up quantities of dust, resulting in reports of dust and blowing dust over southeastern Colorado, eastern New Mexico, western Kansas, western Oklahoma and most of Texas. After 1200 GMT, 12 March 1977 the low moved rapidly northeastward over Iowa, southeastern Minnesota and Wisconsin, leaving quantities of dust aloft over the plains area.

By 1200 GMT, March 13, 1977, a new surface trough lay from southeastern Wyoming across eastern Colorado and along the Texas-New Mexico border (Figure 1). This trough was reflected at 850 mb as a shallow short wave (Figure 2), while the only indication of the trough that could be

