PICTURE OF THE MONTH

A Strong Inversion Episode in the Salt Lake Valley of Northern Utah

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Strong temperature inversions are very common occurrences in the Salt Lake Valley of northern Utah during the months of December and January. The temperature from ground level to within 500 to 1000 m above the valley floor can easily increase by 5°C or more during these episodes. The Salt Lake Valley is particularly susceptible to the trapping of very cold air since high mountains nearly enclose the area on three sides (Fig. 1). The development of the inversion is commonly triggered by the combined effects of the building high pressure and the seasonal reduction of insolation. This permits locally-produced pollutants to accumulate rapidly beneath the inversion. Above the inversion, visibilities remain unrestricted.

One such inversion episode occurred on 20 December 1975. A rather strong upper level ridge was

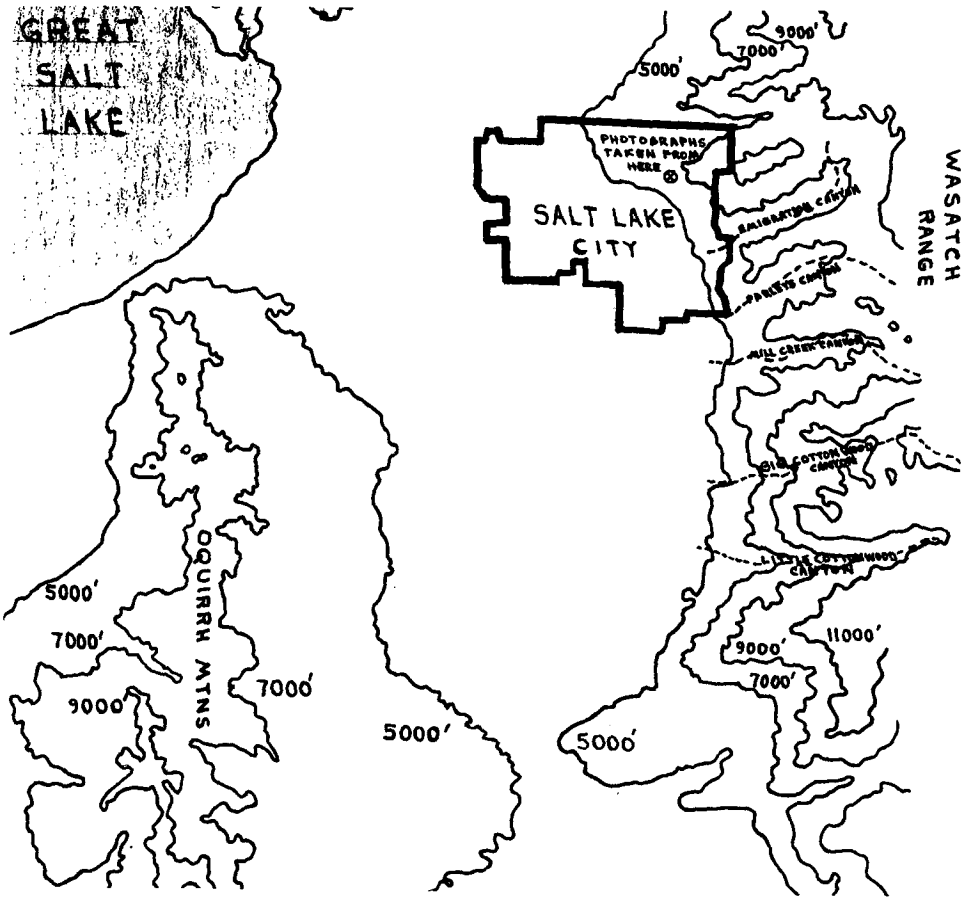


FIG. 1. Contour map of the Salt Lake Valley showing elevations at 2000 ft intervals.

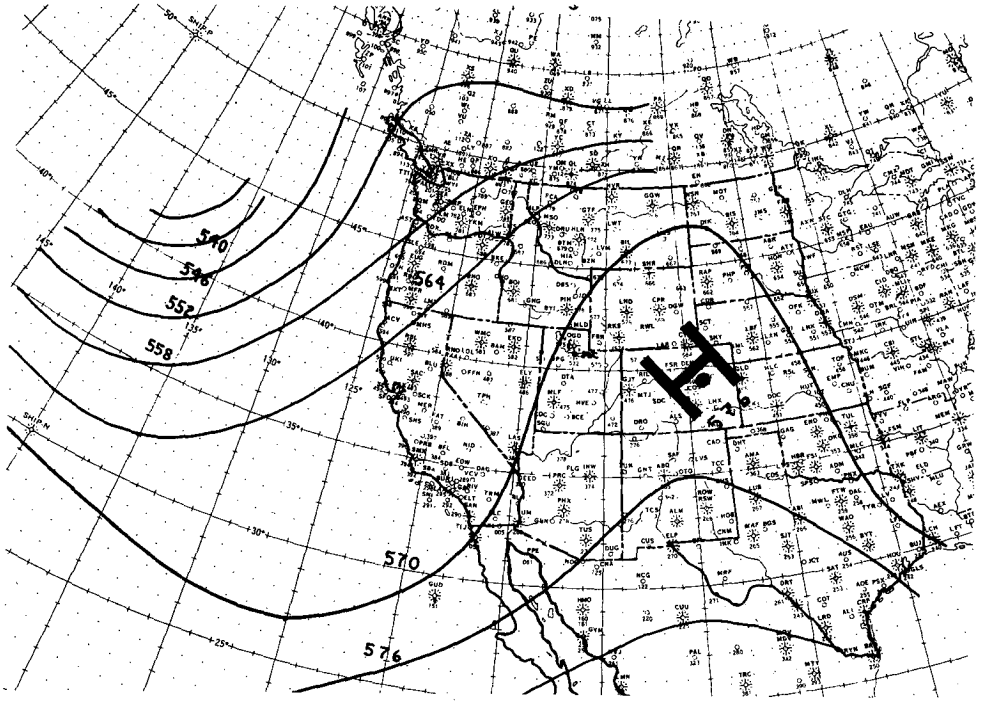


FIG. 2a. 500 mb analysis for 0000 GMT 21 December 1975.

present over the Rocky Mountain states (Fig. 2a). The associated surface high near northeast Utah was over 1035 mb (Fig. 2b). This high-pressure regime originally moved in over Utah on 18 December and was in strong evidence by the steady lowering of daytime temperatures and overall visibility. Fig. 3 portrays the sounding data for Salt Lake City airport at 0000 GMT 21 December 1975 (1700 MST 20 December 1975). The effects of the inversion are well delineated in the lower 800 m. Minimal insolation and the trapping of the cold air in the valley failed to allow the afternoon surface temperature to even

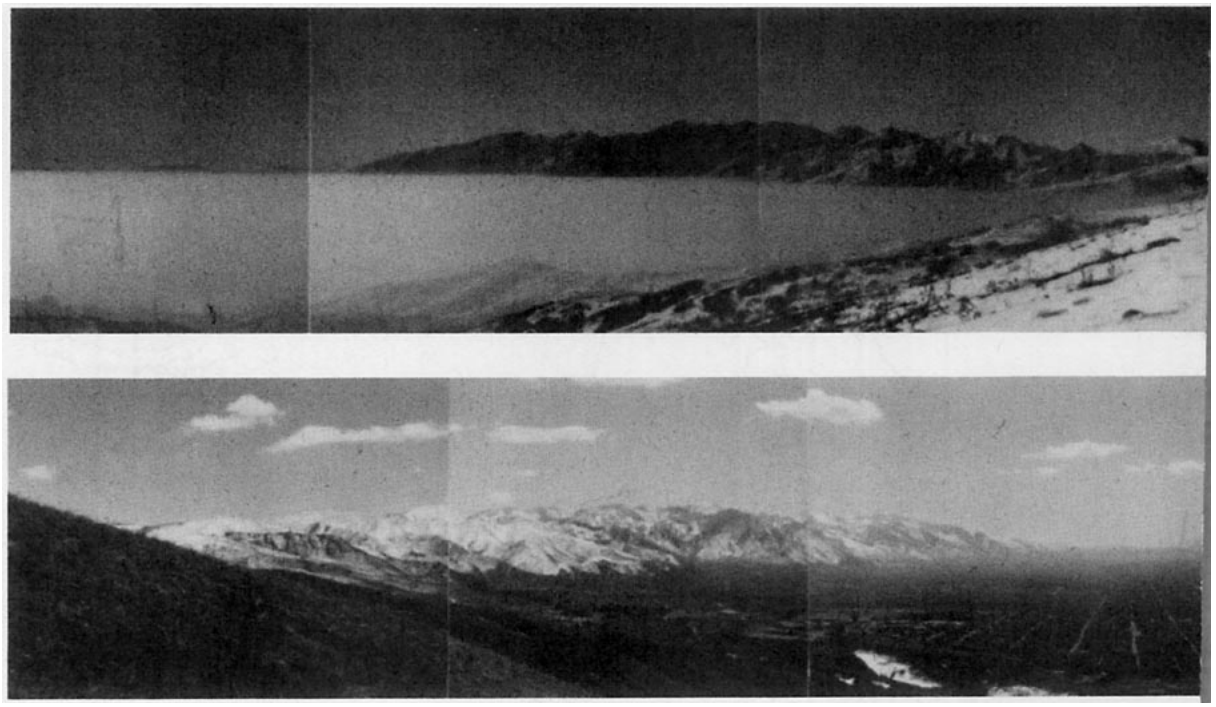


FIG. 4. Panoramic view of the Salt Lake Valley. Inversion

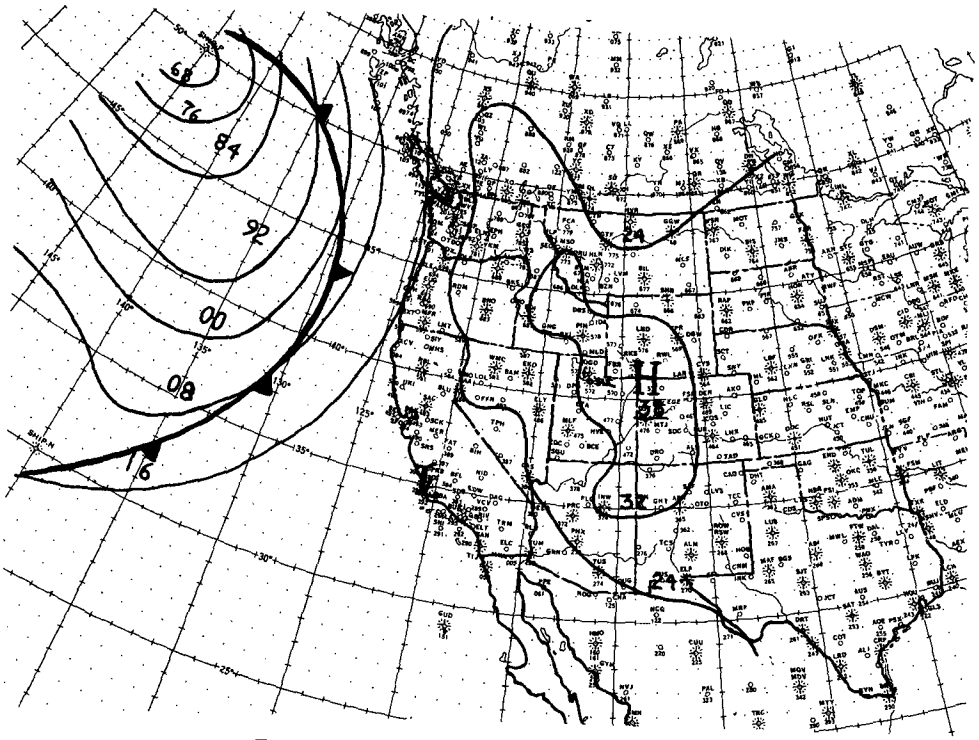
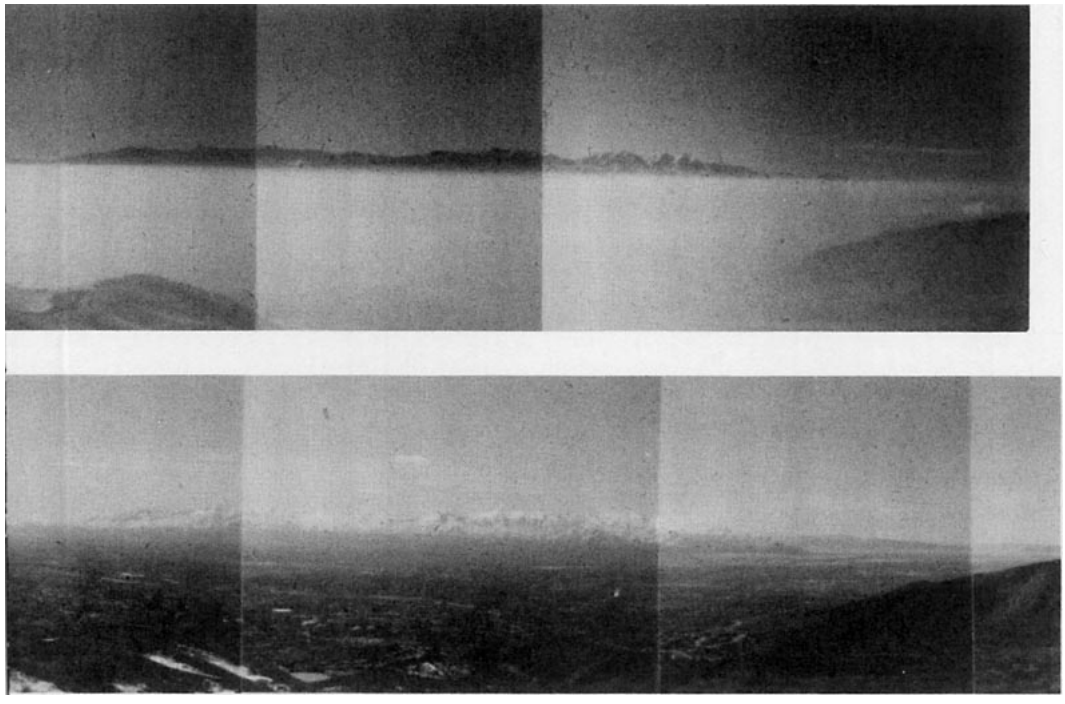


FIG. 2b. Surface analysis for 0000 GMT 21 December 1975.



episode of 20 December is shown along with a clear day.

reach 0°C. Mixing in the lower levels was limited to only 300 m above the ground where the temperature was about −5°C. The temperature at the top of the inversion was near 4°C. Winds below the inversion were light and variable.

Fig. 4 is a panoramic view taken at 1630 MST 20 December, overlooking the effects of the inversion. The location from which the photographs were taken is indicated on Fig. 1. The tops of the Wasatch Range on the left side of the photos with the Oquirrh Mountains on the right. The obscurant below the inversion consisted of a considerable amount of pollutants and fog. Visibility at the Salt Lake City airport at 1700 MST was officially recorded as being $\frac{1}{8}$ mi with an indefinite ceiling at 200 ft. For comparison purposes, a view of the valley from the same location is shown on a clear day.

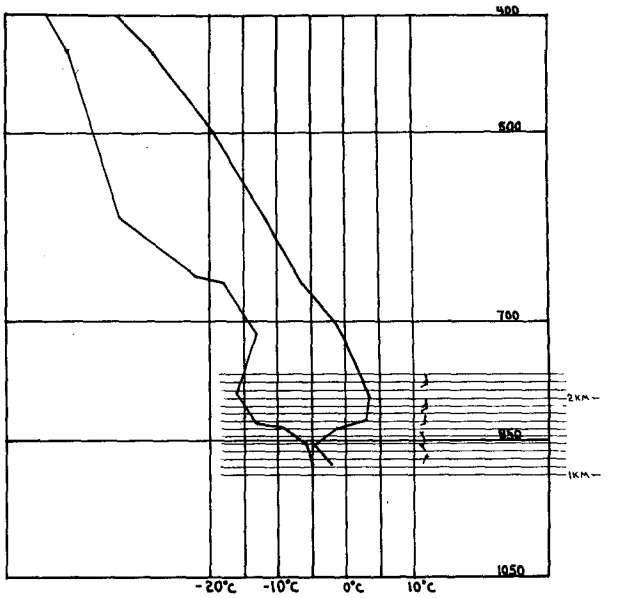


FIG. 3. Salt Lake City sounding for 0000 GMT 21 December 1975.