PICTURE OF THE MONTH

Urban Clear Islands in California Central Valley Fog

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Dense fog which frequents the Central Valley in early winter disrupts aviation, snarls automobile traffic and makes life gloomy for valley residents. During stagnant weather regimes the valley is a natural receptacle for fog (Holets and Swanson, 1981). Satellite images reveal that daytime dissipation is favored over urban areas.

Dense valley fog prevailed on 16–18 December 1985 when, under the influence of strong high pressure, the storm track was diverted far to the north. A representative rural sounding (Fig. 1) taken at Sheridan (Fig. 2) at 2200 UTC 16 December 1985 shows a shallow saturated layer to about 250 meters with a strong inversion above. Low-level winds are light and variable. A visible afternoon GOES shot at 2201 UTC 18 December (Fig. 3) shows relatively uniform fog coverage within the valley (Fig. 2). Nevertheless, there are distinct breaks: the Sutter Buttes rise 600 meters above the north end of the valley and poke an island in the fog; the cresent-shaped clearing south of the Sutter Buttes coincides with the Sacramento metropolitan area; Stockton, Fresno and Bakersfield are all clear. Similar sets of urban clear islands occurred on the afternoons of 16 and 17 December 1985 (not shown).

Surface data reflect the same trend. Twenty-four hour trends of visibility (Fig. 4) from the Sacramento area (Fig. 2) on 18 December shows greater afternoon clearing at Sacramento Executive Airport (SAC), 7 km south of downtown in an urban location, than at Sacramento Metropolitan Airport (SMF), a rural site 20 km northwest of the city. Visibility at both stations remains near zero from midnight until 0600 PST, but daytime improvement occurs at SAC two hours earlier than at SMF and is much more pronounced. Zero visibility returns to both stations by late afternoon, but

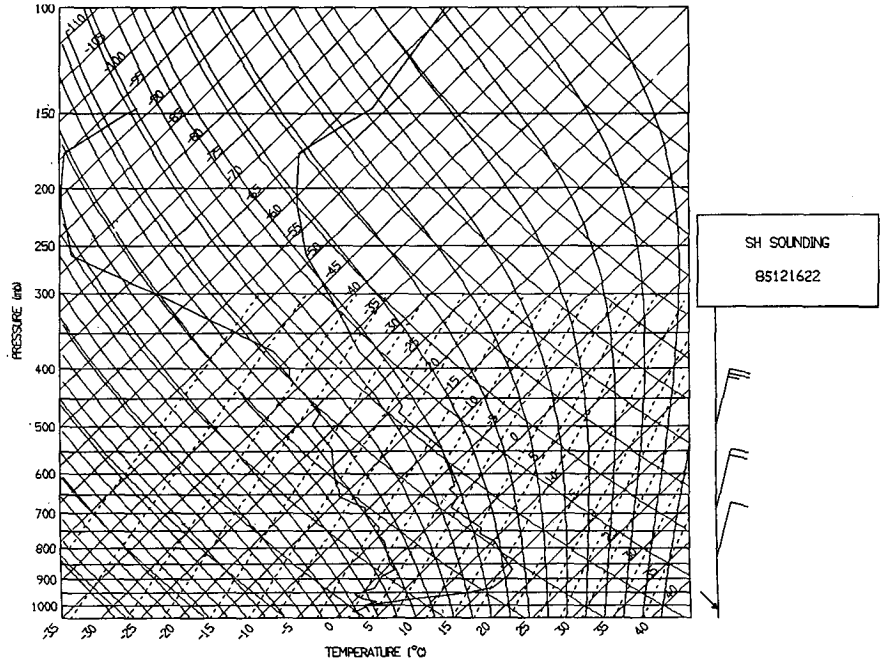

FIG. 1. Sounding at Sheridan, California at 2200 UTC (1400 PST) 16 December 1985.

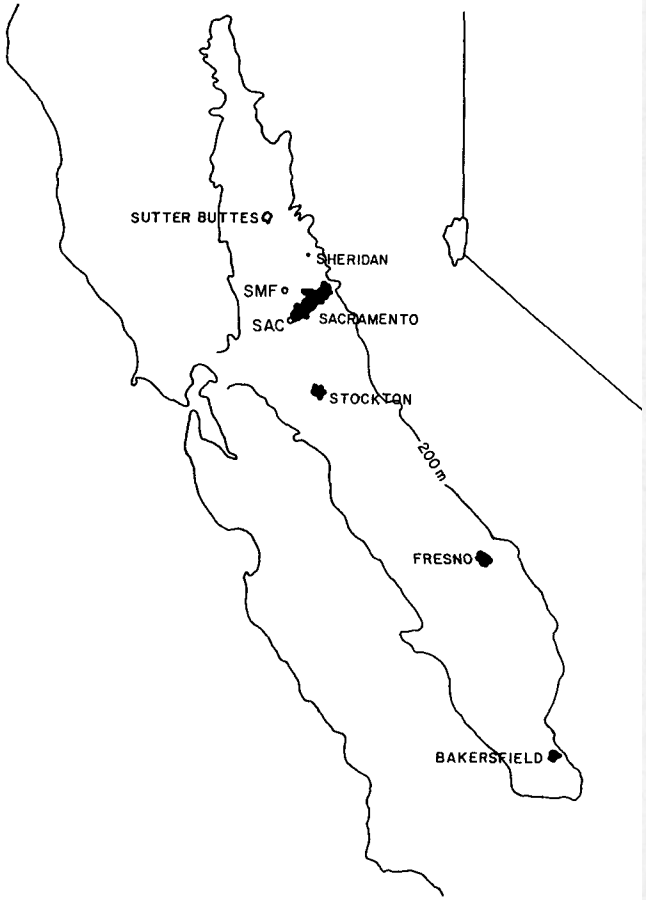

FIG. 2. Central Valley of California.

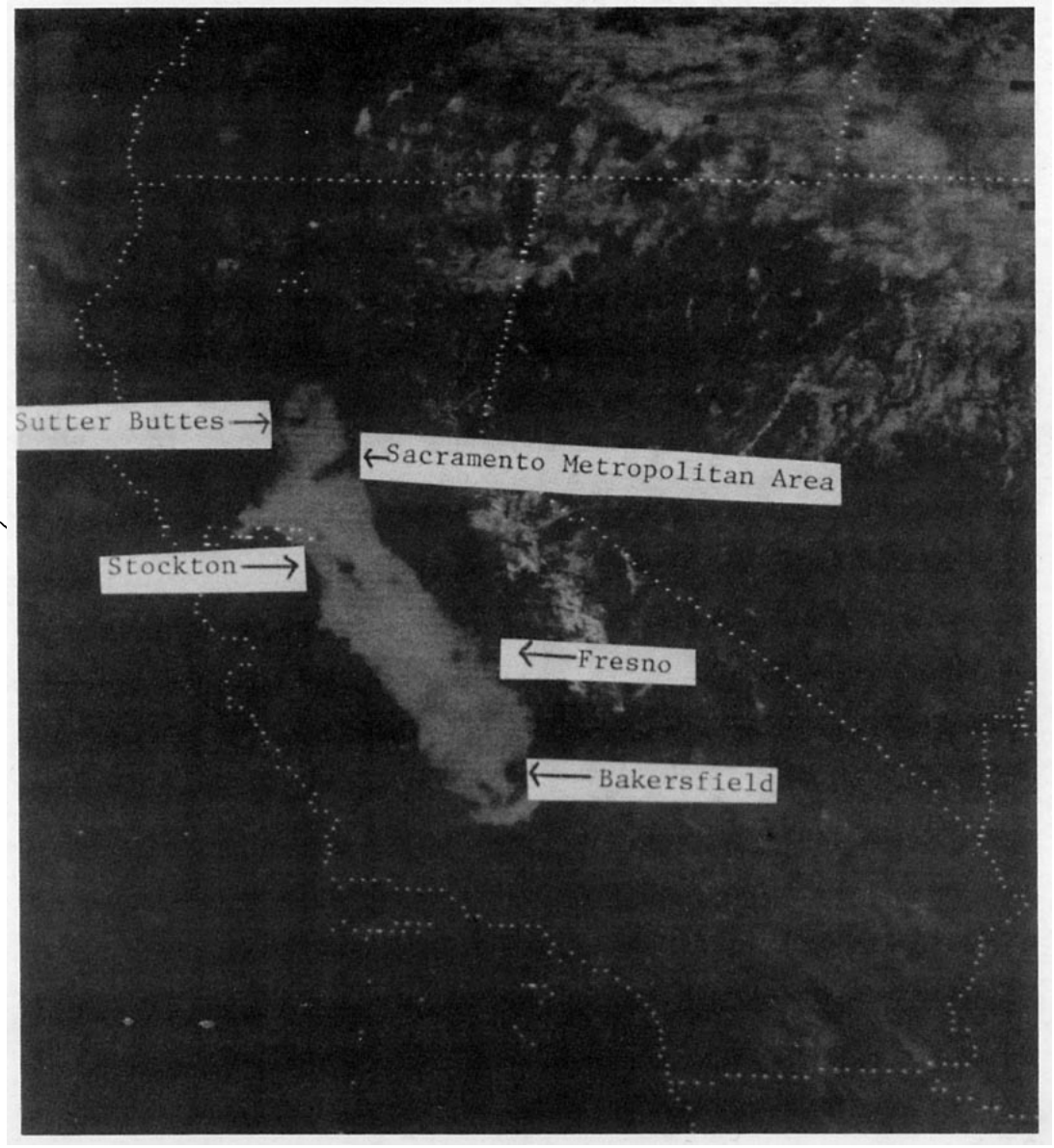

FIG. 3. Visible SAC at 2201 UTC (1401 PST) 18 December 1985.

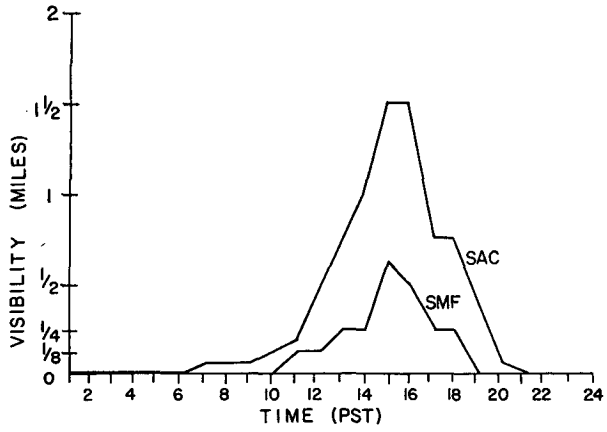

FIG. 4. Twenty-four hour trends of surface visibility at Sacramento Executive Airport (SAC) and Sacramento Metropolitan Airport (SMF) on 18 December 1985.

two hours later at SAC than at SMF. This trend also occurred on 16 and 17 December with significantly greater afternoon improvement at SAC than at SMF. An urban heat island effect may explain the difference between the two stations and the existence of the clear islands in general. Temperature and dewpoint depression trends from the two stations could not be used to test this hypothesis because data from SMF were out of calibration.

Clear islands are small in area but have an important impact, particularly on aviation, because they occur over urban areas. For example, valley airports in urban areas should experience required minimums of ceiling and visibility more often than at rural airports, especially during the daytime flying peak. Faced with such a situation, a forecaster might issue the following forecast: "Considerable night and morning dense fog with local afternoon clearing *especially in urban areas.*"

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REFERENCE

Holets, S., and R. N. Swanson, 1981: High-inversion fog episodes in Central California. *J. Appl. Meteor.*, **20**, 890–899.