Journal of Applied Meteorology

Article: pp. 785–795 | Abstract | PDF (842K)

Santa Barbara Pyrotechnic Cloud Seeding Test Results 1967–70

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(Manuscript received January 26, 1971, in final form March 12, 1971)

ABSTRACT

Tests of the effectiveness of ground-released pyrotechnics in enhancing precipitation in storms in Santa Barbara County were conducted during the three winter seasons of 1967–68, 1968–69 and 1969–70. The mode of operation and the type of pyrotechnic device remained fixed through the three years in order to develop a large sample of data. The observation unit employed was a convective band embedded within a general storm system. A series of pyrotechnic candles of the LW-83 formulation were ignited just prior to and during the passage of convective bands over the seeding site, located on a 3500-ft mountain ridge in the Santa Ynez mountains. The bands were detected upwind of the test area and tracked into the test area by use of telemetered raingages and weather radar. Out of a total of 85 bands, 43 were seeded and 42 not-seeded. The selection of bands to seed was made on a random basis following declaration of the approach of a seedable band.

Over 60 recording raingages extending over an area of 1500 mi^2 provided the basic evaluation data. Soundings taken with a GMD-1 system just prior to band passage into the test area provided useful air mass documentation. The cases were stratified by stability and 500-mb temperature categories.

The statistical analysis shows that there was a statistically significant difference between the distributions of seeded and not-seeded band precipitation totals for stations distributed over a several hundred square mile area downwind of the point source of nuclei. Indications were that precipitation was increased by 50% or more. The effect was greatest in the case of the warmer and more unstable categories.

When the overall precipitation is considered, including the between-band (not-seeded) component, the net increase is about 32%. Precipitation between bands was not significantly changed by seeding.

A computerized seeding-area-of-effect model was employed to predict an envelope of areas of seeding effect for the various categories of seeded bands. The bulk of the stations for which seeded precipitation distributions were significantly different from the not-seeded distributions fell within these areas.

The test results show the value of seeding winter convective orographic systems with this pyrotechnic device. The test results also demonstrate the value of employing the convection band as a natural unit of seeding and of observation. The sensitivity of the statistical evaluation was greatly enhanced through the use of this approach.