

A RANDOMIZED CLOUD SEEDING EXPERIMENT AT CLIMAX, COLORADO, 1960-65

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1. Introduction

Investigations of snowfall and snowfall modification were initiated in the Central Colorado Rockies by Colorado State University during the latter part of the 1959-60 winter season. These studies have continued and expanded since that time.

The broad objectives are to obtain an increasingly complete understanding of mountain clouds, their precipitation processes, and changes in their behavior when artificial ice nuclei are supplied. The evaluation of the effects of seeding on precipitation, consequently, forms a basic but single phase of the program.

The specific objective of the program with respect to weather modification is to determine if changes in precipitation result from the ground releases of silver iodide on the upwind mountain slopes. If the observed results appear negative, an understanding of the reasons for this is essential; and, if results are positive, it is considered important to determine how this occurred and how even more precipitation might be obtained with operational changes.

This paper deals primarily with the experimental design and statistical analyses used in the detection of actual changes in precipitation. The analyses of physical factors intermittent between the actual seeding and resulting precipitation are also integral parts of this experimental design. These physical factors include the material transport mechanisms, ice nuclei concentrations, in-cloud processes, and so forth.

2. Design of experiment

Atmospheric variability severely complicates studies of precipitation processes and their modification. This variability extends to all phases of the process including the general atmospheric circulation in which the cloud system forms, the thermodynamics of the cloud itself, the physical characteristics of the cloud, and to the precipitation which is highly variable in intensity, form, and amount. Consequently, statistical evaluations based on a sound experimental design are essential to this project. The basic features of the experimental design are the following.