

EVALUATION OF WEATHER MODIFICATION AS EXPRESSED IN STREAMFLOW RESPONSE

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1. Introduction

Two main hypotheses underly this paper. First, weather modification has the capability of augmenting the water supply from high mountains by an increase of predominantly orographic precipitation. Second, the engineering operation in weather modification would be economically justified when the water supply measured by streamflow response is substantially increased.

One of the objectives in the statistical design of weather modification experiments and of their control techniques is to minimize the confidence limits for any parameter used in evaluating their attainments. Design of experiments and their control techniques are judged partly by the time necessary for detecting changes in streamflow or precipitation.

Three levels of control may be used when evaluating various aspects and results of weather modification techniques, either for research purposes or for engineering operations: (a) evaluation of phenomena produced in the atmosphere by weather modification (changes in cloud physics, precipitation at the cloud base, and evaporation of precipitation between the cloud base and the ground); (b) evaluation of weather modification attainments at the ground surface through measurement of precipitation (rain and snow); and (c) evaluation of weather modification attainments through streamflow response. The last evaluation level is discussed in this paper.

Attainments may be evaluated by pertinent streamflow information already available in a selected area. This approach does not assume that years are needed for the calibration of target and control basins for the evaluation of future weather modification attainment at the target basin. The basic material for control of future weather modification may be the streamflow data presently available. Previous general purpose streamflow gaging can be utilized to evaluate attainments by appropriate hydrologic and statistical techniques.

Proper quality assessment of streamflow data from main control gaging stations enables the selection and use of reliable streamflow data for the evaluation

This paper is primarily based on experience obtained by the writer at Colorado State University while currently working on a contract with the U. S. Bureau of Reclamation in using the streamflow for control of weather modification attainments.