PHYSICAL FACTORS IN PRECIPITATION PROCESSES AND THEIR INFLUENCE ON THE EFFECTIVENESS OF CLOUD SEEDING

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> *"An old wisdom from the Far East says: you cannot tell how the flower looks if you know only the seed. You have to know first how the bud looks like. It appears that in our age of modern technology of the conquest of space and time, we sometimes tend to forget this simple wisdom. So, for instance, when man tries to make or prevent rain or hail artificially without even knowing all the intermediate steps that Nature has provided in the evolutionary process that leads from a cloud droplet or ice crystal to a rain drop or hailstone."*
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> —from the foreword to the *Proceedings of the International Conference on Cloud Physics, May 24–June 1, 1965*, by Helmut Weickmann

1. Introduction

The above quotation focuses on the crux of the situation with which I shall deal. From the physical standpoint, the problem with respect to the effectiveness of attempts to modify the precipitation process is that while we have a fairly clear understanding of the process in qualitative terms, adequate theories and observational data for quantitative evaluation of process rates are not available. Consequently, we cannot tell whether the natural process in a given case will proceed at optimum efficiency, or whether a particular change in the conditions will lead to an increase or a decrease in the rate.

Under these circumstances it is likely, if not inevitable, that insofar as they have any effect at all the attempts to affect precipitation by cloud seeding will in some cases increase it and in other cases decrease it, with results which are impossible to predict and difficult to detect.

In the following I shall review the status of our knowledge of the process of formation of precipitation and point out the implications of our present knowledge and the requirements for future research to enable the intelligent selection of cases and procedures to seed to produce a particular effect in optimum fashion.