CLOUD SEEDING EXPERIMENT

13. Final Comments

The boxplots of the rainfalls for seeded and unseeded days reveal that the two distributions of rainfall are skewed. As the t-tools require the normality assumption be satisfied, they cannot be used on the original scale of measurement. However, the boxplots of the log-transformed data display symmetric distributions for seeded and unseeded days.

The comparison of the boxplots for seeded and unseeded observations for the log-transformed data reveals an additive treatment effect. The additive treatment effect for the log-transformed data can be converted into a multiplicative treatment effect for the data on the original scale of measurement. We estimated that the rainfall is 3.1 times as much when a cloud is seeded as when it is left unseeded.

The two-sample t-test can be used as an approximation to the randomization test. The null hypothesis about no additive treatment effect of seeding on log rainfall can be back-transformed into the hypothesis about no multiplicative treatment effect of seeding on rainfall. The 95% confidence interval for the multiplicative treatment effect on the original scale is 1.2720 to 7.7425. Thus the treatment effect is estimated to be between 1.27 and 7.74 times.

The case study is an example of a randomized experiment. We used a random mechanism to decide whether to seed the target cloud on a given day or to leave it unseeded as a control. However, the clouds (experimental units) subjected to the treatment (seeding) were not selected from any well-defined population.

As the clouds were randomly allocated to the two treatment groups (seeded and unseeded), cause-and-effect conclusions can be drawn regarding the effect on the particular clouds selected. However, the observed pattern cannot be inferred to hold in some general population.