

Comments on Cloud Seeding for use by Snowy Hydro

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Introduction

Cloud Seeding has been practiced in Australia and around the world for over 55 years. The first CSIRO experiments on single clouds were rather spectacular but were not designed to answer the question of whether increases in rainfall were possible over large areas and over long periods of time.

The Snowy Mountains Cloud Seeding Experiment conducted by CSIRO from 1955 to 1959 was a strictly controlled, randomised scientific experiment that delivered a 19% increase in rainfall / snowfall over the five year period, significant at the 5% level. (see Ryan and Sadler at www.dar.csiro.au/publications/cloud.htm).

The World Meteorological Organisation recognizes the potential of cloud seeding in favoured locations in a statement on the status of weather modification issued in Geneva in June 2001. In part that statement says;

“In our present state of knowledge, it is considered that the glaciogenic seeding of clouds formed by air flowing over mountains offers the best prospects for increasing precipitation in an economically viable manner. These clouds attracted great interest in the modification because of their potential in terms of water management, i.e. the possibility of storing water in reservoirs or in the snowpack at higher elevations. There is statistical evidence that, under certain conditions, precipitation from supercooled orographic clouds can be increased with existing techniques. Statistical analyses of surface precipitation records from some long term projects indicate that seasonal increases have been realized.”

The situation described above fits the Tasmanian experience exactly, and is also analogous to the Snowy Mountains situation.

The Tasmanian Experience

Cloud seeding began in Tasmania in 1964 with the first experiment designed and operated by CSIRO running in alternate years till the end of 1970. The Hydro Electric Commission (now Hydro Tasmania) picked up the work in 1971 and has continued to manage experiments and operations ever since. In 41 years of cloud seeding experience, three experiments have been conducted spanning a total of 13 years, a further 7 years have been operational cloud seeding years (no randomization of seeding treatments) and 4 years have been drought relief operations when water storages fell to seriously low levels.

Positive Impacts

The statistics of benefits are impressive. Rainfall over the Tasmanian target area has increased in seeded periods by 20% - 30%. The statistical significance has likewise been impressive with less than a 1% chance of such an effect occurring naturally.

Negative Impacts

When the first experiment was designed by CSIRO, they wisely included provisions for searching for potential negative impacts, specifically by including an area downwind of the target area to be included in all statistical analyses of rainfall. Many other parameters were also measured including levels of silver in rainwater and naturally occurring atmospheric ice nuclei.

After more than 40 years of research, the Tasmanian experience mirrors that of researchers world-wide. There are no discernable negative impacts of cloud seeding. However, the fact that Hydro Tasmania has found none and now expects none, has not diminished their attention to the way cloud seeding is conducted and the identification and measurement of all impacts, whether positive or negative.

Ongoing Controversies

Despite the observations obtained from the various scientific experiments, several old furrphies are resurrected from time to time, namely;

- That cloud seeding conducted in one area steals rain from other areas downwind (i.e. Robbing Peter to pay Paul),
- That cloud seeding makes the lives of residents in the seeding area a misery by creating too much rain,
- That cloud seeding is responsible for floods (in wet periods) and droughts (in dry periods).

Needless to say, these allegations are usually trotted out without any supporting evidence and are easily refuted by analysis of public rainfall records. The most serious charge involving the “Robbing Peter to pay Paul” principle, has been the subject of much research in Tasmania and indeed, world-wide. In Tasmania (as in the Snowy Mountains) the downwind area is in a meteorological zone downwind of a major mountain barrier. The mountains modify the clouds whether or not cloud seeding is in progress so that the clouds evaporate in the down-drafts in the lee of the ranges and rain or snow forming processes that were active on the windward side are terminated. These “downwind” regions receive their most useful rains when the winds are other than westerly.

Recent allegations of “a host of environmental problems” associated with cloud seeding are again offered without a shred of evidence and are manifestly untrue. Far greater problems are occurring due to long term rainfall decline even in Tasmania. The loss of rain and snow is apparently due to global warming or similar wide scale phenomena at work in our region.

Protection Strategies

Cloud Seeding operations in Tasmania have been governed by soundly based scientific principles and statistical methods, the oversight of an independent referee, and by independent review. The most recent review was requested by the Tasmanian Department of Primary Industries, Water and the Environment, the Tasmanian Farmers and Graziers Association and Hydro Tasmania. The review was designed among other things, to investigate the concerns raised by farmers in downwind areas. This review is entitled;

“An Evaluation of Cloud Seeding Carried Out in Tasmania by Hydro Tasmania - An Independent Review.” By M.J. Pook and W.F. Budd of the Antarctic CRC Hobart, June 2002.

Pook and Budd affirmed;

- that the Tasmanian experiments were conducted in a scientifically credible manner
- that there was an apparent modest increase in rainfall from the first five year experiment due to cloud seeding
- that there was a marked increase in rainfall from the improved second five year experiment
- that there is no evidence of significant influences of seeding operations outside the seeding area
- that while there is a substantial decline in rainfall over the Southern Midlands area of Tasmania, (SE of the cloud seeding target area) it is not associated with cloud seeding operations but is strongly correlated with broad scale influences such as those associated with the El-Nino Southern Oscillation phenomenon.

Conclusion

Tasmania's cloud seeding programme has been in force for over 40 years and has returned benefits by way of extra rainfall and runoff worth hundreds of millions of dollars to the state economy.

There have been absolutely NO adverse impacts of cloud seeding observed in 40 years.

The Tasmanian World Heritage Area (which was proclaimed after cloud seeding had been in operation for many years) is not under threat from cloud seeding operations.