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**Selected Cloud Seeding Reading Material** Source: Duncan Axisa with additions by Don Griffith and Dr. Conrad Keyes. References related to evaluation are in **bold type**.

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## CLOUD SEEDING GLOSSARY

The terms selected are intended to assist the reader in understanding both the proceedings and the referenced or other documents discussing cloud seeding. Definitions are those found within the Glossary of Meteorology or in the American Society of Civil Engineering. Italicized print in this section indicates an alternative glossary entry that the reader may also wish to review.

**CCN**– cloud condensation nuclei. The tiny particles, either liquid or solid, upon which condensation of water vapor first begins in the atmosphere, they are necessary for the formation of cloud droplets.

**cell**– a convective element (cloud) which in its life cycle, develops, matures, and dissipates, usually in about 30 min.

**cloud base seeding**—the release of cloud seeding agent into updrafts beneath developing cloud turrets, which transport the seeding agent aloft into the precipitation development zones.

**cloud droplet**– a particle of liquid water from a few microns to tens of microns in diameter, formed by condensation of atmospheric water vapor, and suspended in the atmosphere with other droplets to form a cloud. These liquid water droplets are too small to precipitate.

**cloud model**– physical description of cloud processes programmed into a computer to simulate cloud development and evolution. Very useful in understanding the relative importance of the many factors that influence cloud development, and the only way in which *exactly the same cloud* can be both seeded and unseeded (see also *targeting model*).

**collision-coalescence process**- the process by which liquid cloud particles collide and then coalesce into larger drops.

**control area**– an area where cloud seeding operations do not take place, preferably similar in character and near to the *target area*. The behavior of storms over the control area is compared to those treated over the target area, to assess differences and thus measure project effectiveness. See also, *target area*, *seeding area*, and *seeded area*.

**convective cloud**- a cloud characterized by organized, fluid motion, including both upward and downward motions. This term is generally interchangeable with cumulus clouds.

**dispersion rate**- rate at which seeding material spreads in relation to the location of release.

**direct targeting**– the placement of seeding agents directly into the targeted cloud by release *at* the targeted cloud.

**droplet spectrum**– the numbers and sizes of the droplets within the cloud volume of interest.

**dynamic seeding**– the treatment of clouds with the intent of utilizing the latent heat produced by additional freezing and perhaps in some cases by condensation or deposition to invigorate cloud development.

**glaciogenic seeding**– treatment of clouds with materials intended to increase and/or initiate the formation of ice crystals.

**graupel**– white, opaque, approximately round (sometimes conical) ice particles having a snow-like structure, and about 2-5 mm in diameter. Also known as snow pellets, they form in convective clouds when supercooled water droplets freeze to an ice particle upon impact.

**hygroscopic**– pertaining to a marked ability to accelerate the condensation of water vapor; having the property of attracting water, or having the effect of encouraging the formation of larger droplets.

**hygroscopic seeding**– treatment of clouds with hygroscopic materials which encourage the formation of larger droplets, changing the cloud droplet spectrum in such a way as to enhance development of precipitation through coalescence.

**ice nucleus**– any particle that serves as a nucleus for the formation of ice crystals in the atmosphere.

**Ice process**- the process by which cloud particles grow large enough to fall out as ice-phase precipitation; this often occurs where there is coexistence of ice and supercooled water droplets; the ice particles can grow rapidly at the expense of the supercooled water droplets.

**Inadvertent weather modification**- the unintentional modification of the weather through some aspect of man's activities, such as the production of cloud nuclei or ice nuclei from various industrial manufacturing processes.

**JWM**– Journal of Weather Modification, the official journal of the Weather Modification Association.

**latent heat**– The heat released when water vapor condenses (latent heat of condensation), or when liquid water drops freeze (latent heat of fusion).

**NCAR**– National Center for Atmospheric Research, P.O. Box 3000, Boulder, CO, 80307-3000.

**Nucleation**- any process through which a phase change of a substance to a more condensed state is initiated upon a nucleus.

**potassium chloride**- KCl, a simple salt often used as a primary ingredient in hygroscopic cloud seeding

**raindrop**- a drop of water of diameter greater than 0.5 mm falling through the atmosphere. In careful usage, falling drops with diameters lying in the interval 0.2 to 0.5 mm are called drizzle drops rather than raindrops, though this is frequently overlooked.

**RDAS** - Radar data acquisition system. The hardware and software that controls the radar and ingests the radar data, before passing it to *TITAN*.

**response time**- the time that elapses from identification of a seeding opportunity until the release of seeding agent actually begins.

**seeding agents**- agents dispensed by any means in or near a cloud volume which are intended to modify (seed) the cloud characteristics.

**silver iodide**- AgI, a common glaciogenic seeding agent.

**supercooled water**- water, still in liquid state, at temperatures less than 0°C (32°F). Under ideal conditions in the free atmosphere, water may exist in a supercooled state to temperatures as cold as -40°C (-40°F).

**target area**- the area for which cloud seeding operations are targeted, usually near a *control area* similar in character and climatology. The behavior of treated storms over the target area is compared to untreated storms over the control area, to assess differences and thus measure project effectiveness. See also, *control area*, *seeding area*, and *seeded area*.

**targeting model**- computer modeling in which terrain and winds are used to project when and where cloud seeding upwind of a target area should be conducted.

**TITAN**- Thunderstorm Identification, Tracking, Analysis, and Nowcasting. Software for the display and analysis of weather radar data, widely used in operational convective cloud seeding programs.

**wing-tip generator**- ice nucleus generators mounted at the tips of aircraft wings, or sometimes below the wings, also usually near the ends.

**WMA**- Weather Modification Association, P.O. Box 26926, Fresno, CA 93729-6926.