Overview of Weather Modification

Observations / Forecast / Blogs
Vitae (pdf) / NSF-Bio (pdf)
Peer Reviewed Publications
Archives & Technical Papers
Guides, White Papers/Slides
Talks & Presentations
Videos & Audio Recordings
Research Interests
Projects / NSF-CPS (Positions)
ADPAA Software Gateway
Teaching (Catalog)
Dissertation Research
Master Thesis (pdf)

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Dr. David J. Delene, Research Professor

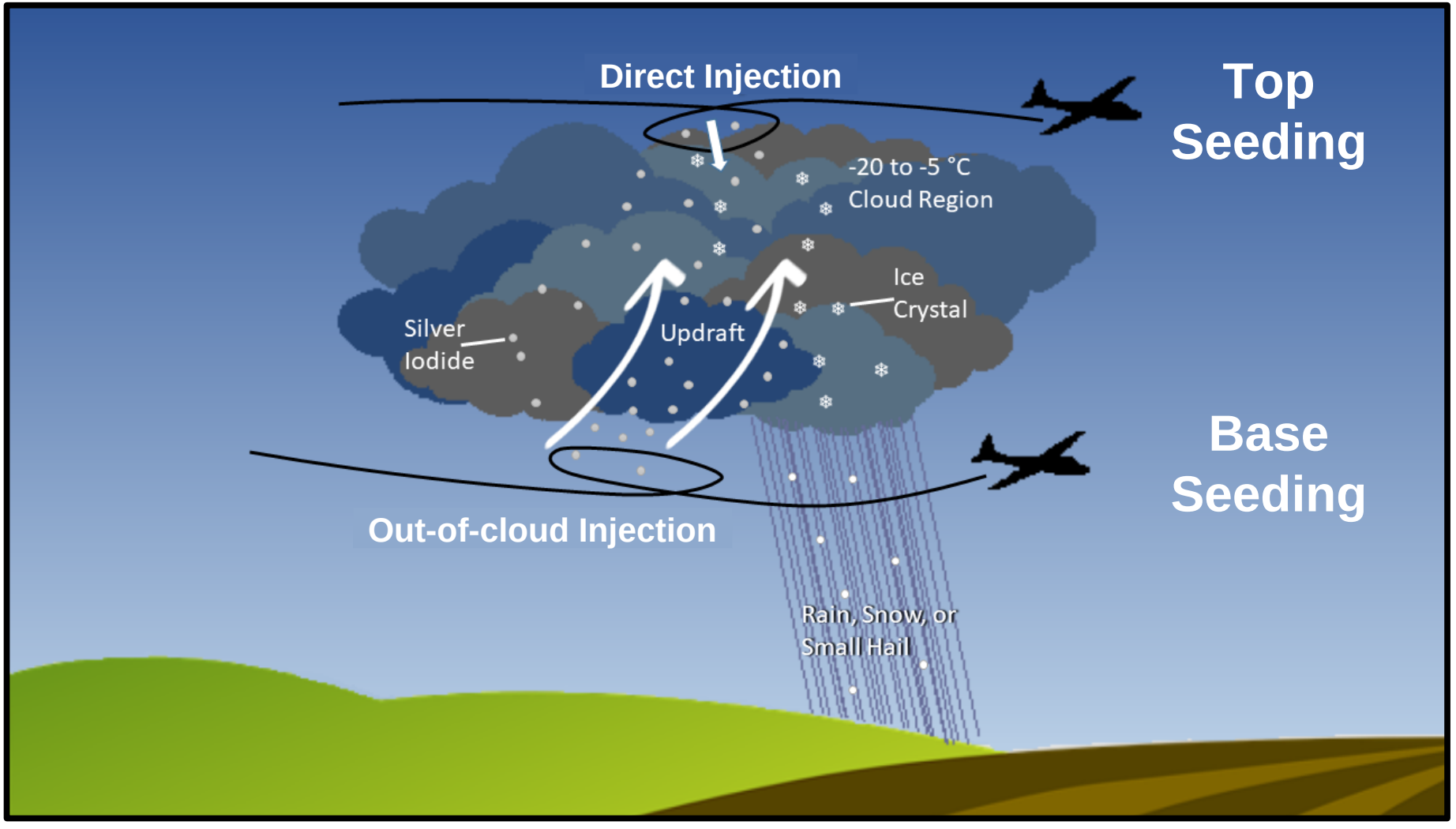
Atmospheric Sciences Department, University of North Dakota

Start of Weather Modification Research

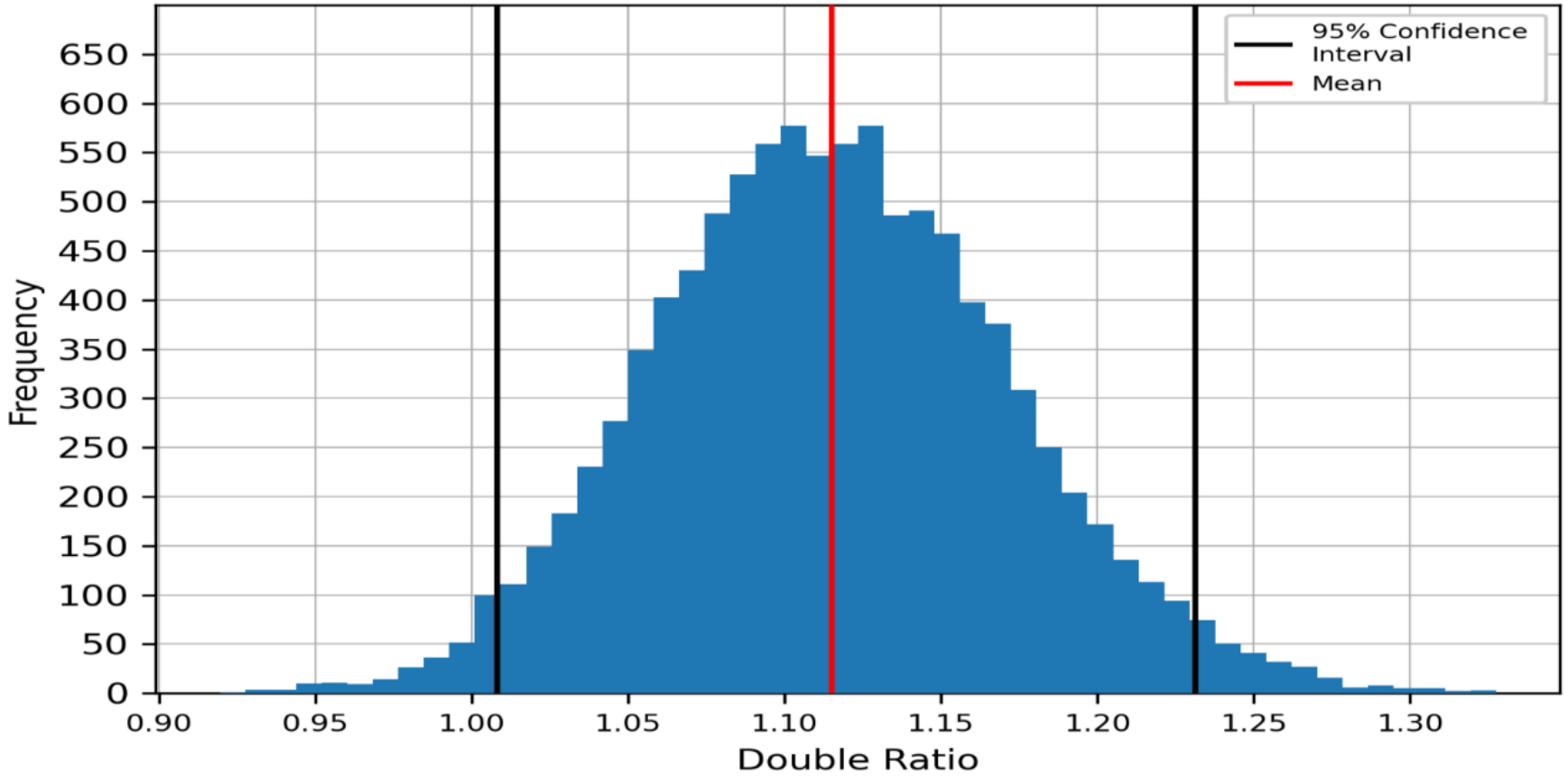
- Experiments during World War II built on aircraft icing work at General Electric.
- Aircraft icing experiments directed by Irving Langmuir.
- Additional group involved Vincent Schaefer and Bernard Vonnegut.

Wilson Hunter, the Head of the Icing Research Section is shown demonstrating the dangerous icing of the propellers of a P-39 after a wind tunnel test. General Arnold (left) and George Lewis (far left).

Basic Conceptual Model of Cloud Seeding



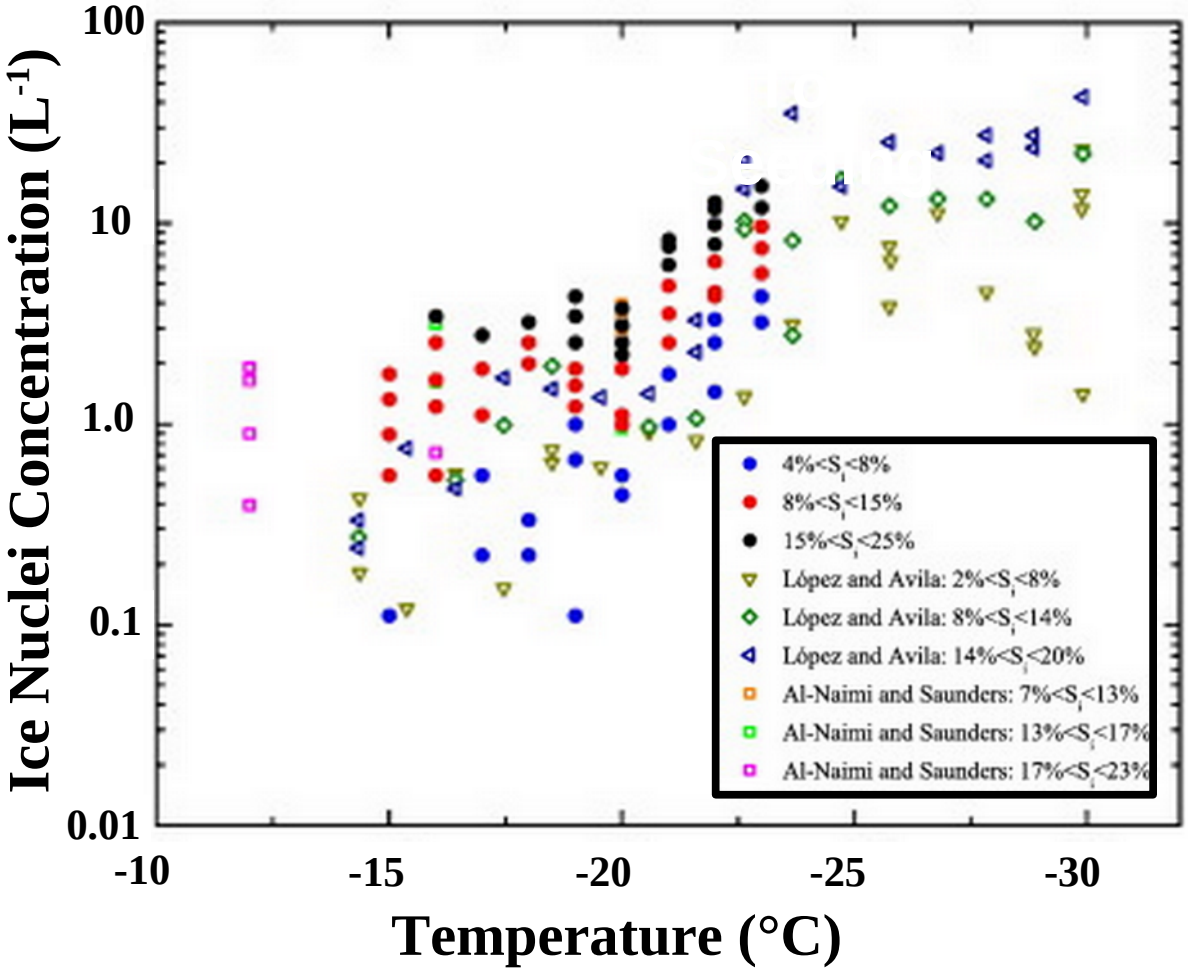
Statistical Evaluation: 5-15% Precipitation Increase



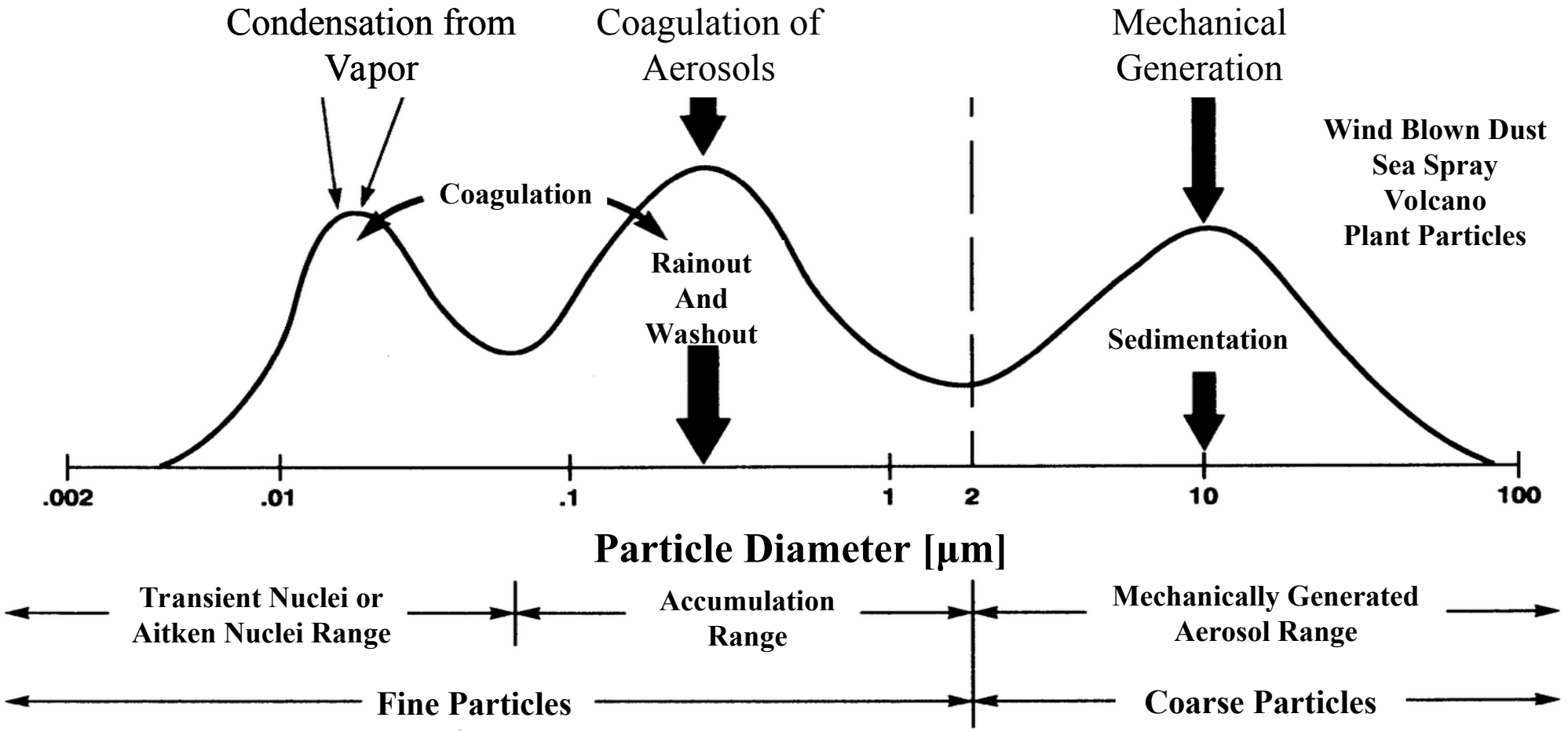
Distribution of Double Ratios from Area-wide, Seasonal Precipitation Averages for McKenzie/Wibaux

Glaciogenic (Silver Iodine) Cloud Seeding

- Effectiveness is often measured by “threshold temperature”.
- Threshold temperature is when 1 in 10,000 produce an ice crystal.
- Different substances have different threshold temperatures ranging from about -5 to -40 °C.
- Sliver Iodine (AgI) threshold temperature is -5 °C.



Hygroscopic Cloud Seeding

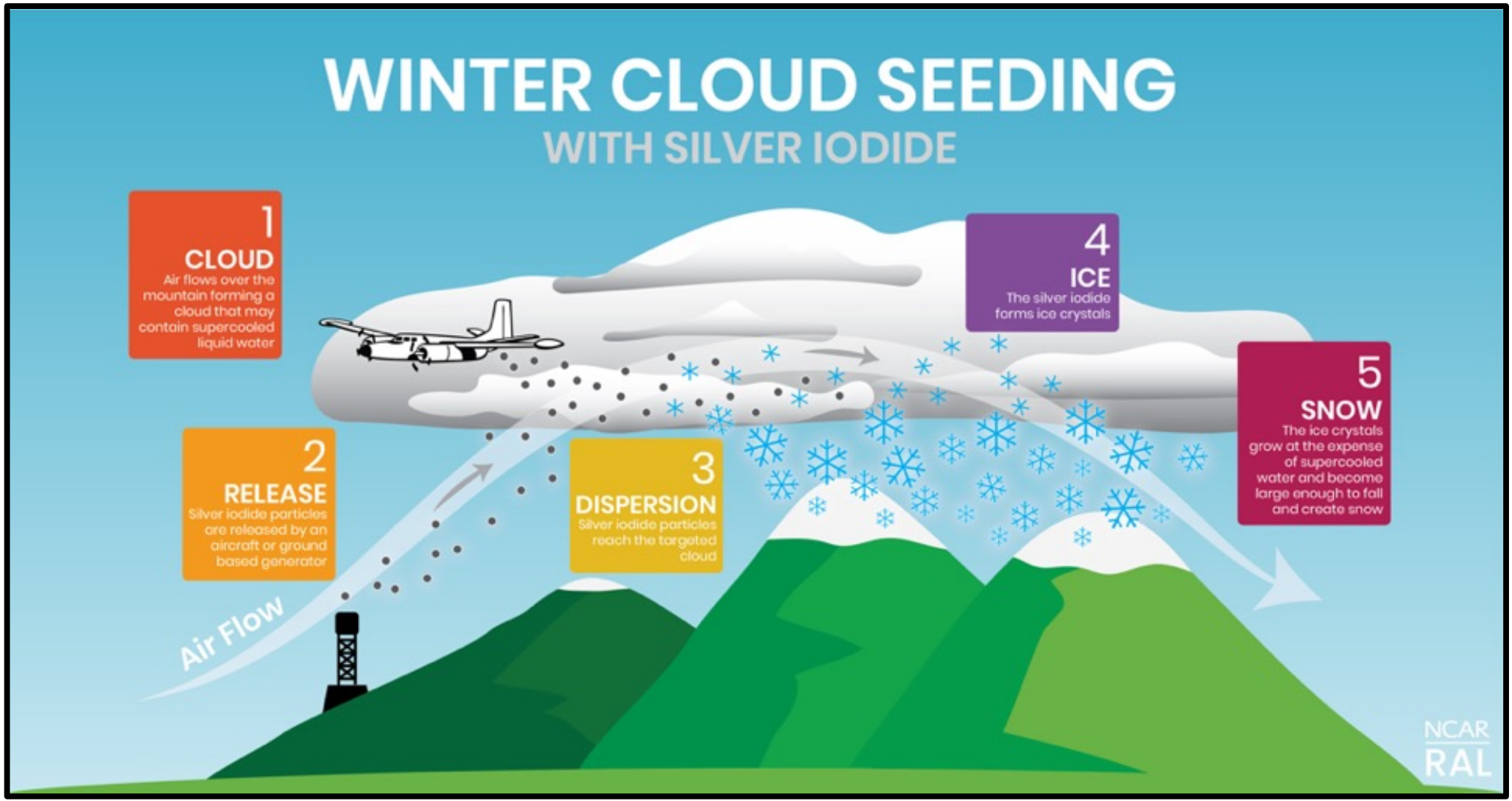


- Few number of large sized atmospheric particles.

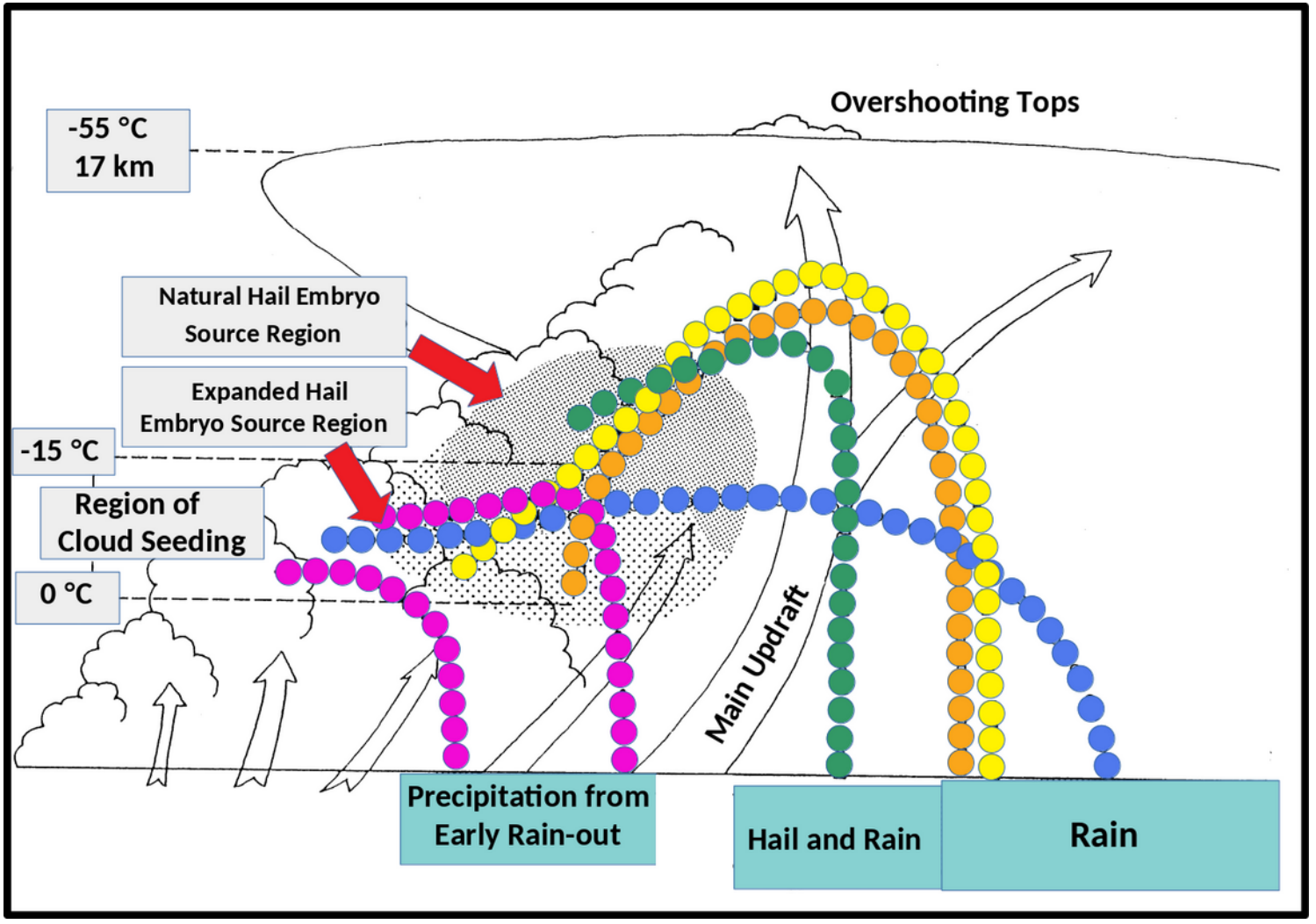
Precipitation Augmentation

- Enhancing the cold rain process through addition of ice particles.
- Enhancing the warm rain process by addition of giant Cloud Condensation Nuclei (CCN).
- Increasing the cloud depth by release of latent heat of fusion.
- Promoting the merger of small clouds into larger clouds through release of latent heat of fusion.

Snowfall Enhancement



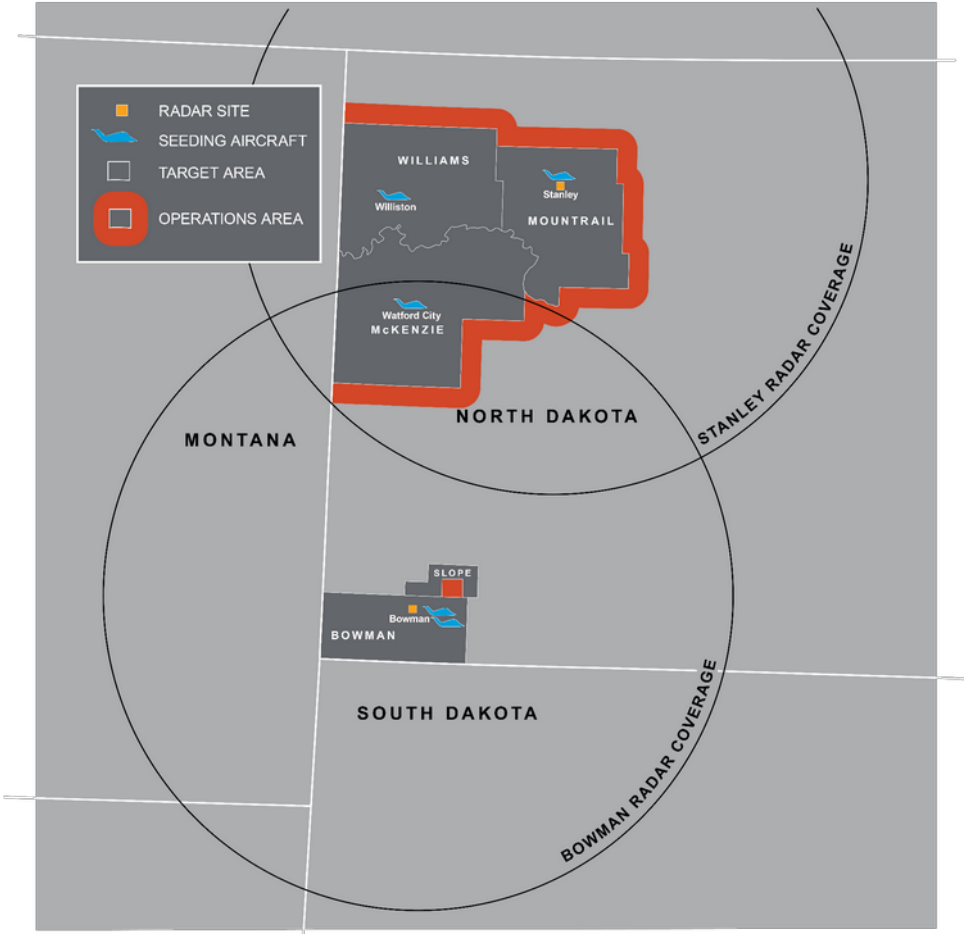
Hail Suppression Conceptual Models

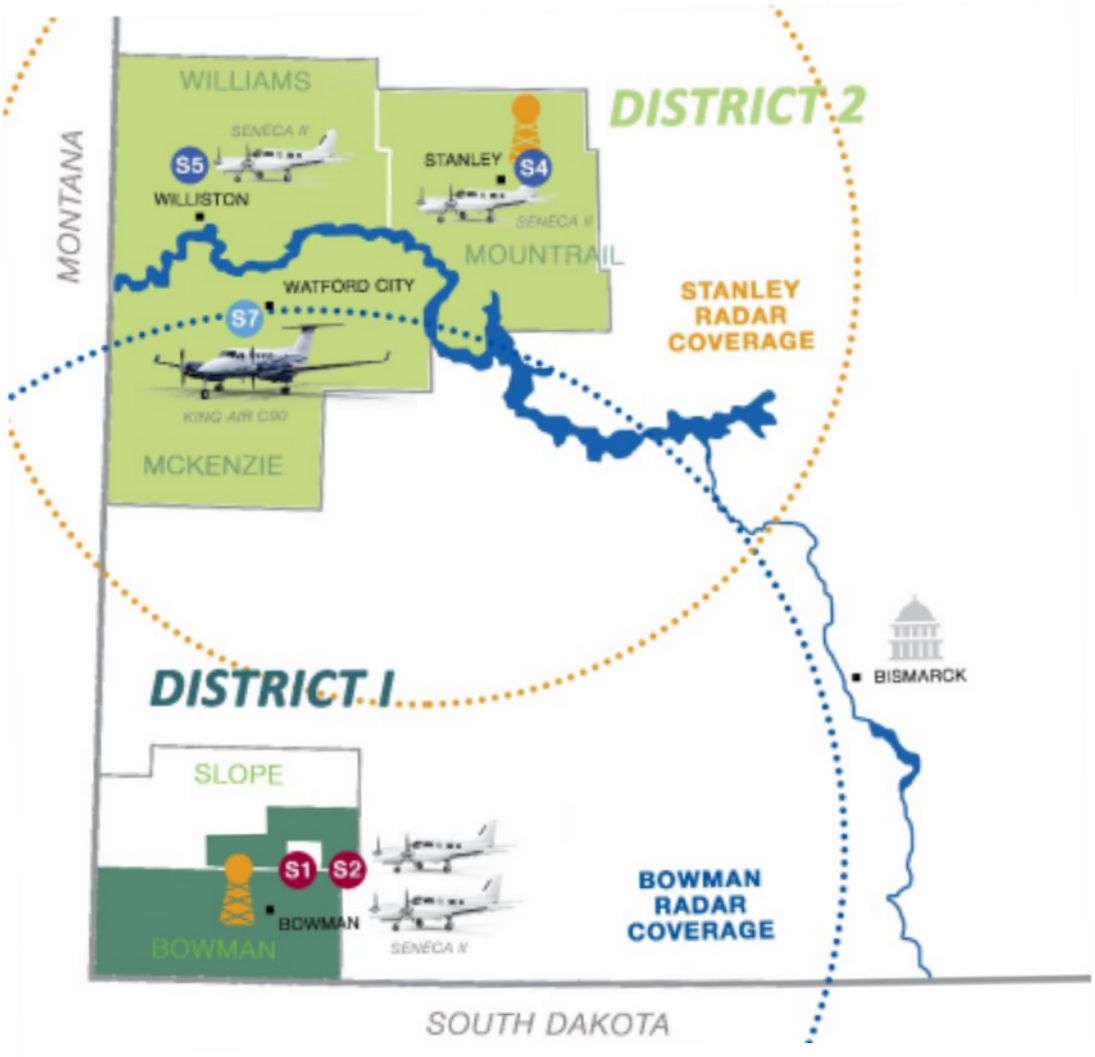


- Natural Hail Trajectory
- Beneficial Competition
- Early Rain-out
- Trajectory Lowering
- Promotion of Coalescence

Current North Dakota Cloud Modification Program

- Program started in 1977.





Weather Modification Operational Program