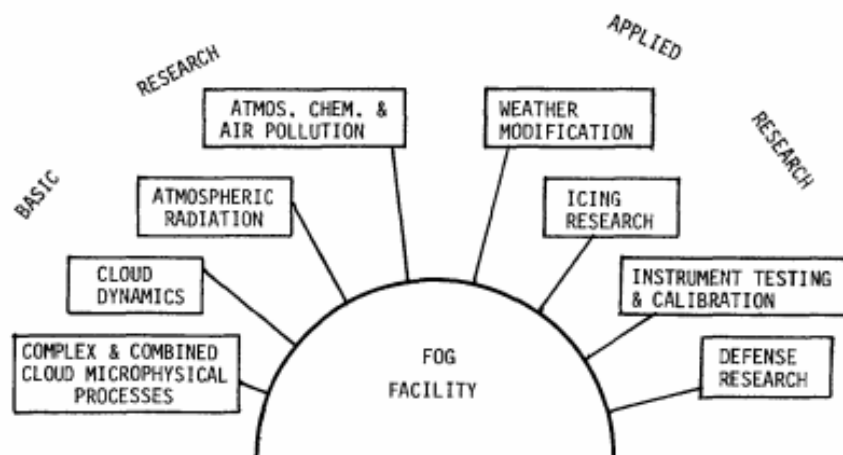


CLOUD SEEDING RESEARCH IN A FOG FACILITY

A large hemispherical balloon with a diameter on the order of 100 m (or alternatively a large air tank) containing an artificially generated fog in a Rocky Mountain high valley site making use of the cold, clean air which flows and accumulates there due to the daily radiation cooling, may prove to be useful for a variety of research studies involving clouds and fogs under supercooled and non-supercooled conditions. The facility may accommodate a horizontal high speed wind tunnel and a vertical one using the fog. An effort is currently underway to integrate interest of all federal agencies involved, and possibly of some private foundations, towards establishing a nationally or even internationally shared fog facility. Suggestions are made below for its use by the scientific and technological communities.

This facility is suitable to simulate phenomena of clouds and fogs on scales larger than the laboratory scale but smaller than in the free atmosphere. It is anticipated that the facility will find its utilization in the following major areas.

1. COMPLEX AND COMBINED MICROPHYSICAL PROCESSES:

Ice phase and non-ice phase processes, coalescence of cloud and fog droplets, coalescence and disintegration of rain drops, diffusional growth of ice crystals, competitive growth, graupel and hail growth, heating and cooling due to phase changes, microphysics-induced dynamics, secondary ice crystal production, ice melting and evaporation, basic data gene-

ration for cloud modeling, charge generation and cloud electrification and ice aggregation.

2. INSTRUMENT TESTING AND CALIBRATION:

Direct sensors; temperature, humidity, liquid water content, drop size distribution, ice crystal size distribution, in supercooled and non-supercooled clouds and fogs and in ice crystals of various forms, under moving or still conditions.

Remote sensors; radar, lidar, sodar and microwaves, including ultra-high energy beams against liquid clouds, ice clouds and precipitation of various sorts.

3. ICING RESEARCH:

Aircraft; wing performance, mechanism and instrument malfunction due to icing, helicopter rotor performance under icing condition, deicing testing.

Automobile; wind shield glaciation due to freezing rain and melted snow and deicing device testing, highway fog and the shielding plantation.

Ice crystal generation by sensing aircraft.

4. FORMATION AND DISSIPATION OF CLOUDS AND FOGS:

Intermediate scale experiment of entrainment, cloud and fog formation by mixing and adiabatic

tic expansion, effect of condensation nuclei including acid rain formation process.

5. RADIATION BALANCE:

Simulation experiments, scattering, transmission, and reflection of electromagnetic waves in non-ice and ice phase clouds and precipitation, cirrus crystal behaviors, frost damage research involving fog and smoke method for protection.

6. CLOUD SEEDING RESEARCH:

Special ice nuclei generator testing, homogeneous ice nucleants in particular, ice nuclei performance, nucleation mechanisms, initial behaviors of ice nuclei and ice crystals including their fall and diffusion, moisture depletion by growing ice crystals at the plume center, warm fog modification method testing.

7. AIR POLLUTION AND ATMOSPHERIC CHEMISTRY:

Scavenging of aerosol particles by cloud droplets, ice crystals, and precipitation elements including thermo- and diffusiophoretic effect, chemical reactions and gas to particle conversion in cloud air space and droplets and resultant change of particulate characteristics after evaporation, condensation nuclei generation, residual nuclei, acid rain processes.

8. DEFENSE RESEARCH:

9. LOW TEMPERATURE TESTING OF EQUIPMENT:

Preparation for polar and high altitude research.

10. OTHER APPLICATIONS:

Base for other field studies, interaction between natural precipitation and artificial fog, natural fog and ice crystal studies.

Considering recent development in areas such as remote sensing, cloud modeling and airborne probing of clouds in addition to the steady progress made in laboratories, and looking into the direction of atmospheric research in the immediate and distant future, the fog and cloud facility is expected to find numerous and sometimes unique uses, some of which are not even foreseen at present.

Those who have interest or suggestions on the facility, write or call Nori Fukuta

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