# Wet-snow production and snowing wind tunnel test for snow accretion and prevention

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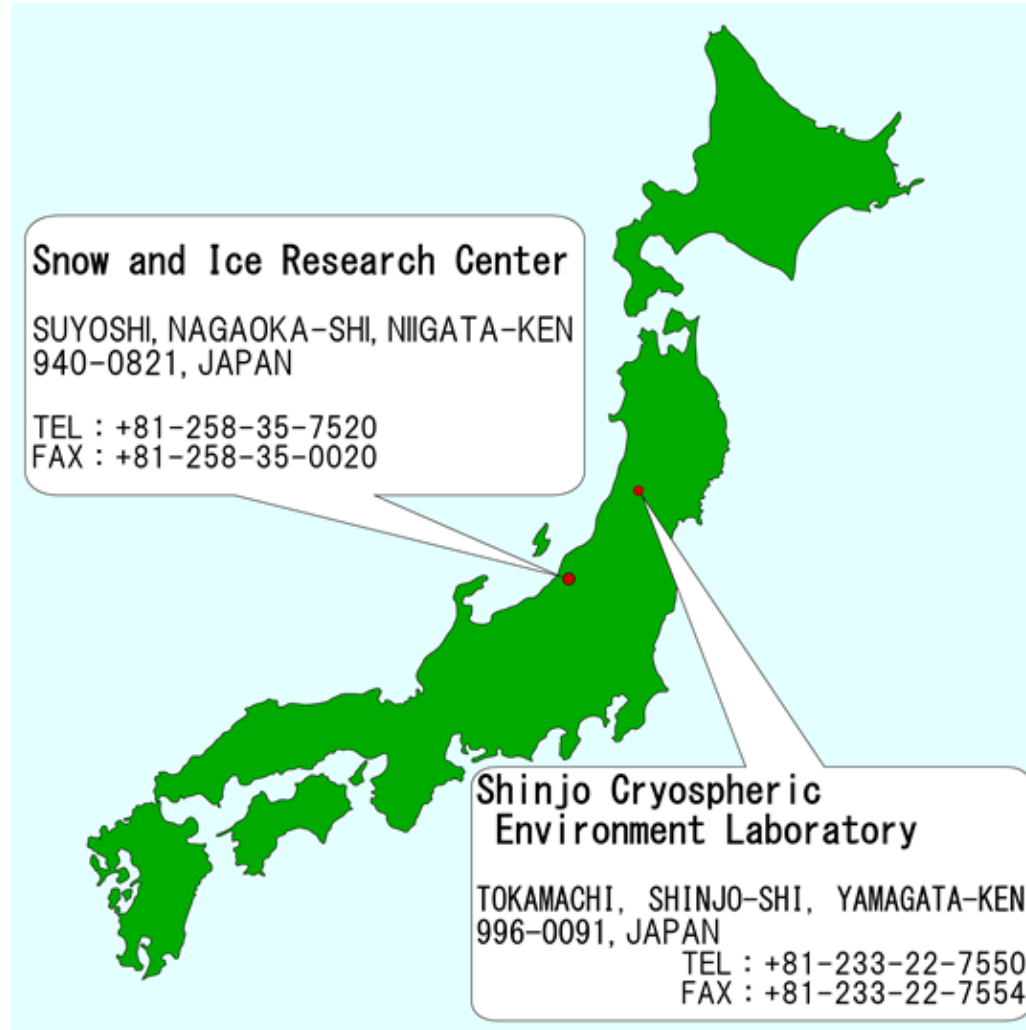Tetsuya    Kojima    Haruka    Endo

Agenda
- ・ What is the Cryospheric Environment Simulator(CES)
- ・ How to produce Wet-snow
- ・ Verification of effect of preventing snow accretion using the wind tunnel.

# Agenda

- <span style="color:red">What is the Cryospheric Environment Simulator(CES</span>
- How to produce Wet-snow
- Examination of effect of preventing snow accretion using the wind tunnel.

# Aiming for a secure and comfortable winter life in Japan



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Organization

# What is the Cryospheric Environment Simulator (CES)?



Cryospheric Environment Simulator (CES)

· Purpose

Reproduce phenomena in cryosphere and elucidate the role of snow and ice in global climate system.

Reproduce the processes of the snow and ice disasters and elucidate the mechanism of disaster generation.

Shinjyo Cryospheric Environment Laboratory, Snow and Ice Research Center
National Research Institute for Earth Science and Disaster Prevention

# What is the Cryospheric Environment Simulator (CES)?
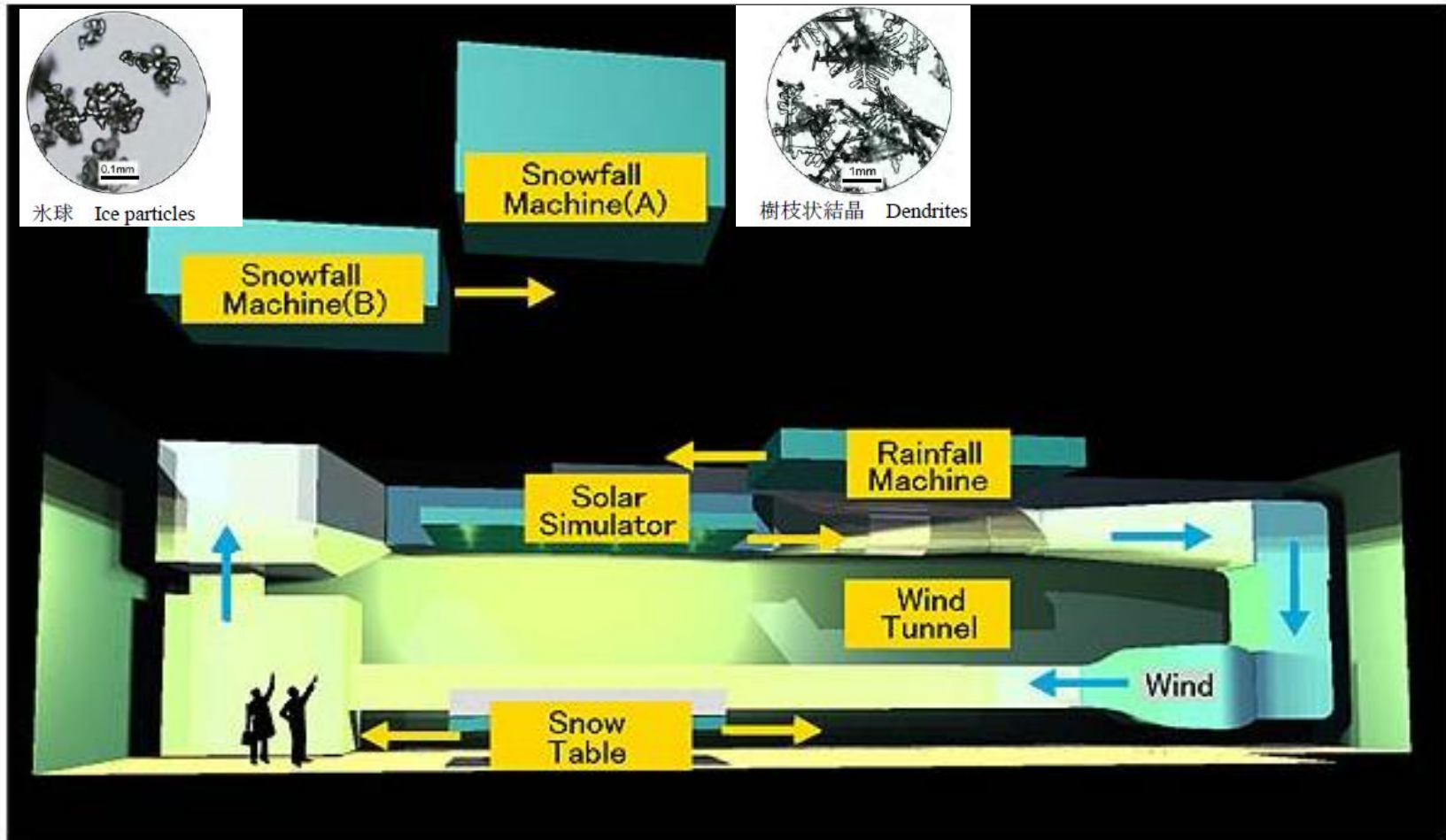


Arrangement of facilities in a large cold room.

An operator and a technical staff support the experiments in the CES.
The CES can be lent as well as used for cooperative researches.
Proposed research using the CES will be judged by the CES steering committee.

# Snowfall machine(dendrites)



Snowfall intensity : 0 – 1 mm/h (water equiv.)
Crystal type : dendrites etc. (size 0.5 – 5 mm)
Area : 3m×5m



樹枝状結晶　Dendrites

# Snowfall machine (ice particles)



Snowfall intensity : 0 – 5 mm/h(water equiv.)
Crystal type : sphere(diameter 0.025 mm)
Area : 3m×5m



氷球　Ice particles

# Rainfall machine



Rainfall intensity : 0 – 2 mm/h
Area : 3m×5m

# Solar simulator



Solar radiation : 0 – 1000 W/m2
Area : 3m×5m

# Wind tunnel



Size: 1 m x 1 m x 14 m   (test section),
Wind speed : 0 – 20 m/s

# Agenda

- What is the Cryospheric Environment Simulator(CES
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# Wet-snow production 1

Air Temperature

-10℃ | + 1℃
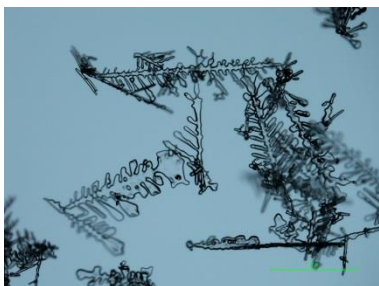


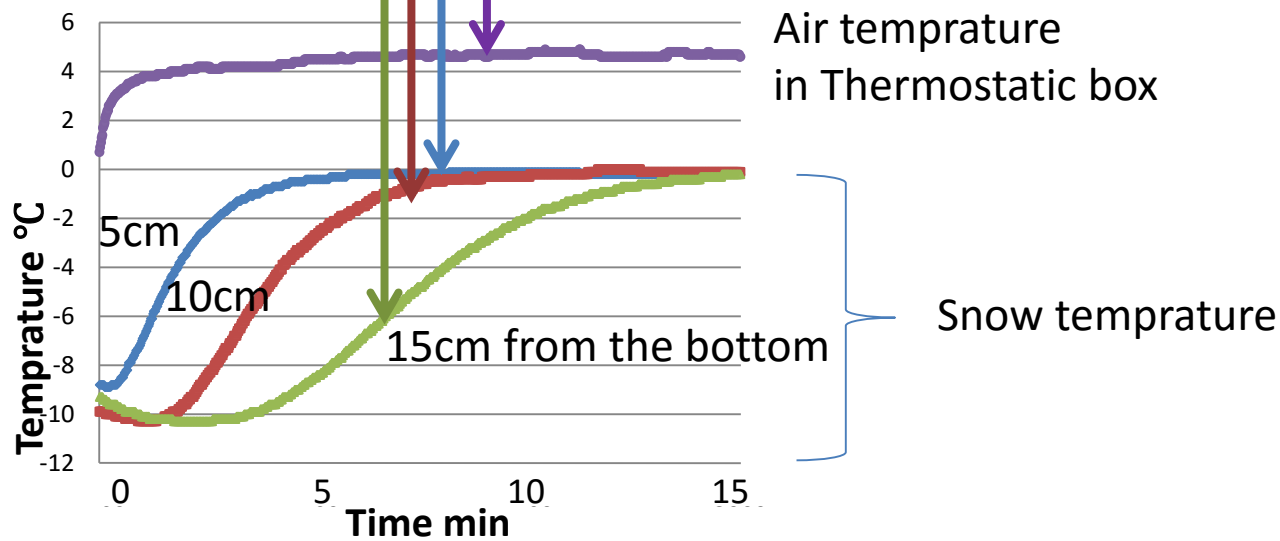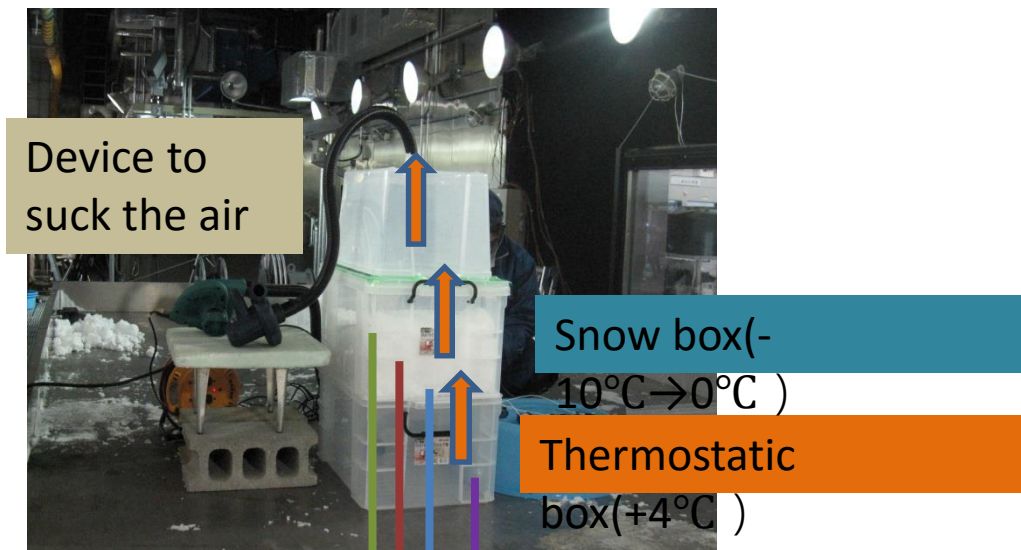Forced draft method to control low percentage water content of wet snow

10min
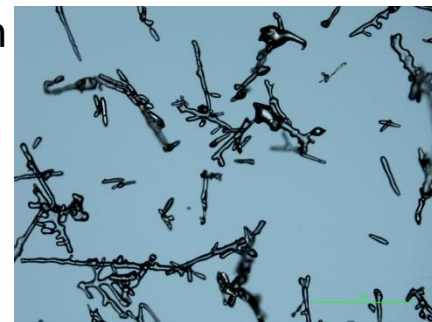


Wet snow

24hour



Put the dry snow of -10 ℃ in the temperature 1 ℃ of room. It will change to wet snow in about 24 hours.

Dry snow

# Wet-snow production　2



Device to suck the air

Snow box(-10℃→0℃ ）

Thermostatic box(+4℃ ）

Air temprature in Thermostatic box

Snow temprature

5cm

10cm

15cm from the bottom

Temprature ℃

Time min

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# Snow accretion experiments

# Background

Snowfall affects to the ground facilities in winter

For example：

Ultrasonic anemometer：Abnormal value measurement

Communication equipment：Interruption ・
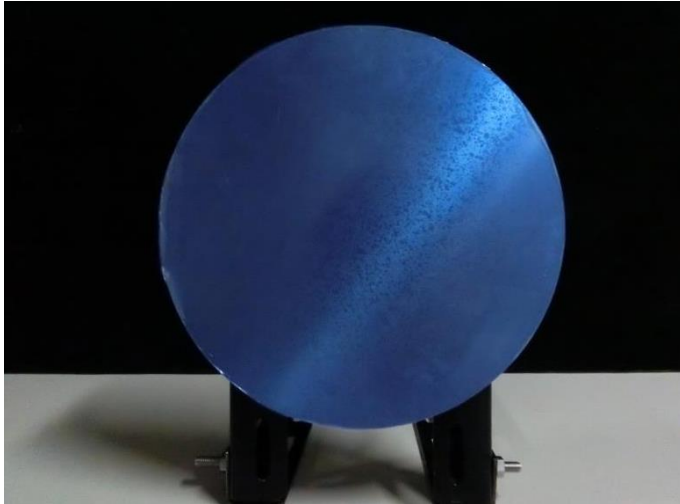Communication failure

Parabolic antenna
Wireless LAN
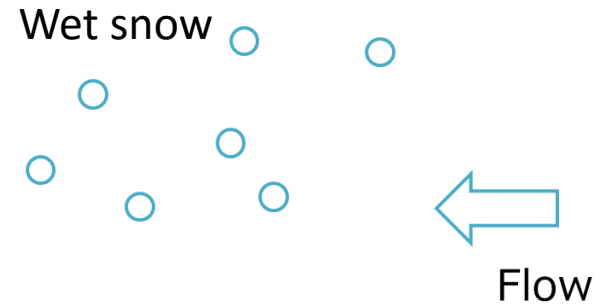
These ground equipment is required method of snow removal.
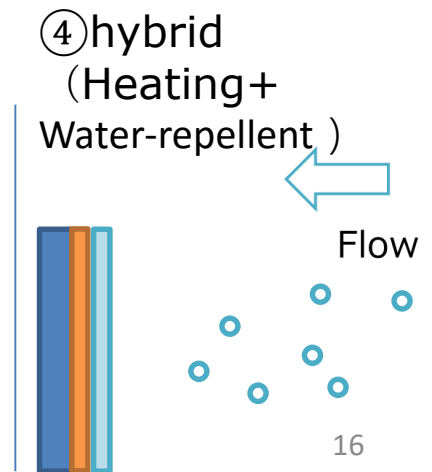
# Snow accretion experiments
# Assessment method

Plate simulating the antenna



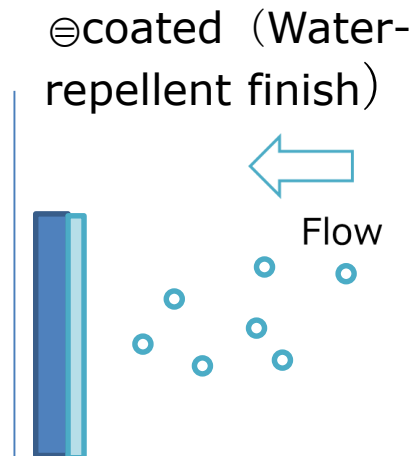To observe the snow accretion and shape

Wet snow

Flow

Wind tunnel

⊖Base
(No measures)

Flow

⊖coated（Water-repellent finish）

Flow

⊛heated

Flow

④hybrid
（Heating+
Water-repellent）

Flow
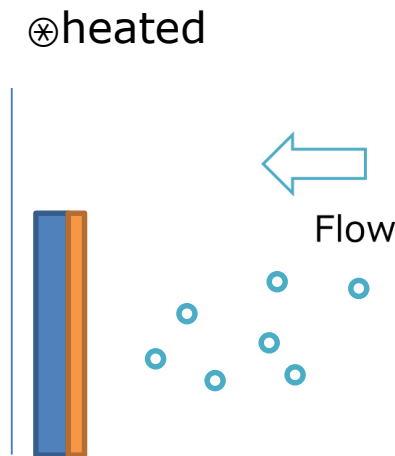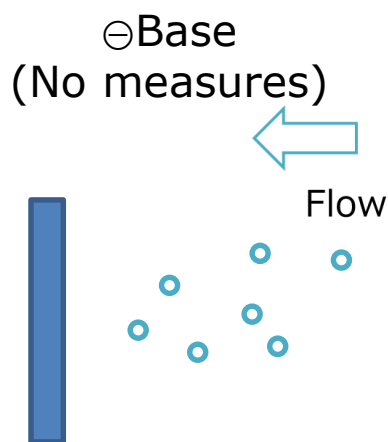
# Experiment result 1

15min 10m/s
×64



⊖Base(No measures)



⊜coated



✳heated



④hybrid

# Experiment result 2
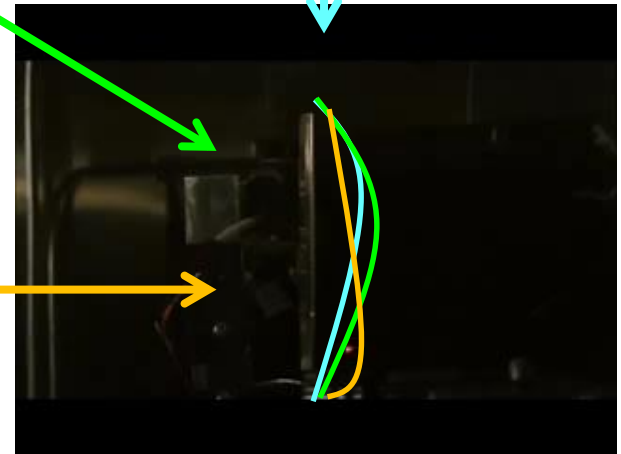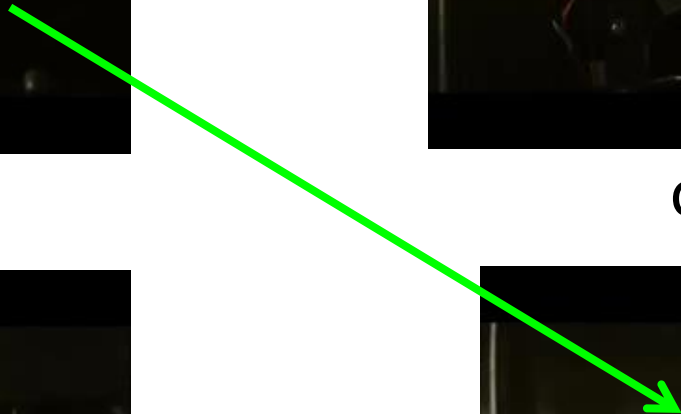
15min×64    10m/s


base


coated


heated


hybrid

# Conclusion

· Anyone can use the ces, you can a variety of snow and ice disaster research

· Since the wet snow can be created in the CES, it is possible to reproduce the wet snow accretion

· In order to prevent the snow accretion, it is effective method of utilizing both the heater and the water-repellent