Tentative Training Programme

Understanding of Cloud Nature and Weather Modification for Water Resources Management in ASEAN

Hua Hin, Thailand, July 2019 **Lecture at 17:30-18:30, 25 July**

Practice on Hail Suppression

Xueliang Guo
Institute of Atmospheric Physics, Chinese Academy of Sciences
guoxl@mail.iap.ac.cn

- Goal and purpose
- Critical issues in hail suppression practice
- Effectiveness evaluation of hail suppression operation
- Uncertainties and future focus

--Outline--

- Introducing hail suppression practices in China
- Understanding the important issues relevant to hail suppression operation

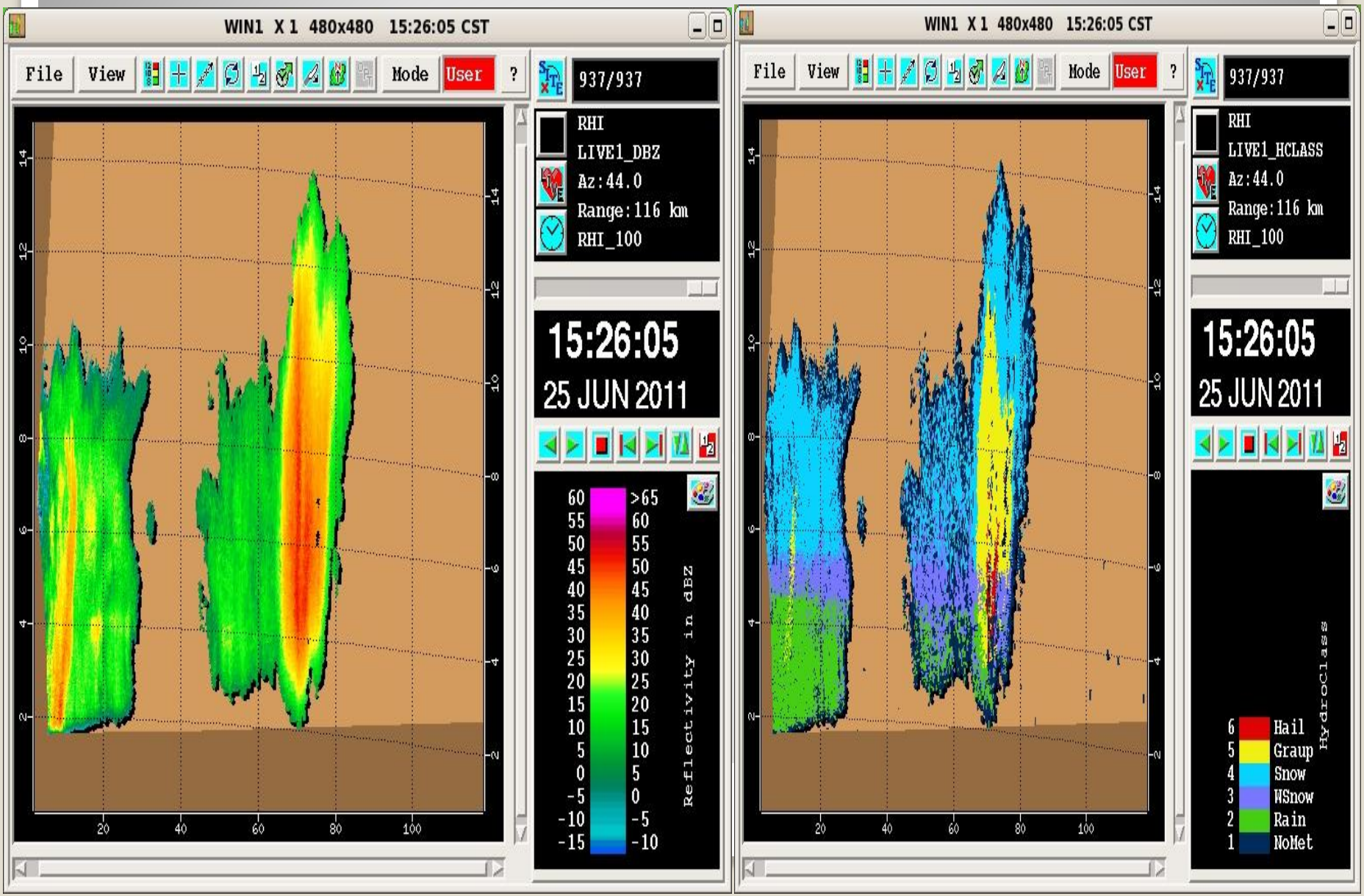
--Goal and purpose--

Steps and critical issue for hail suppression operation:

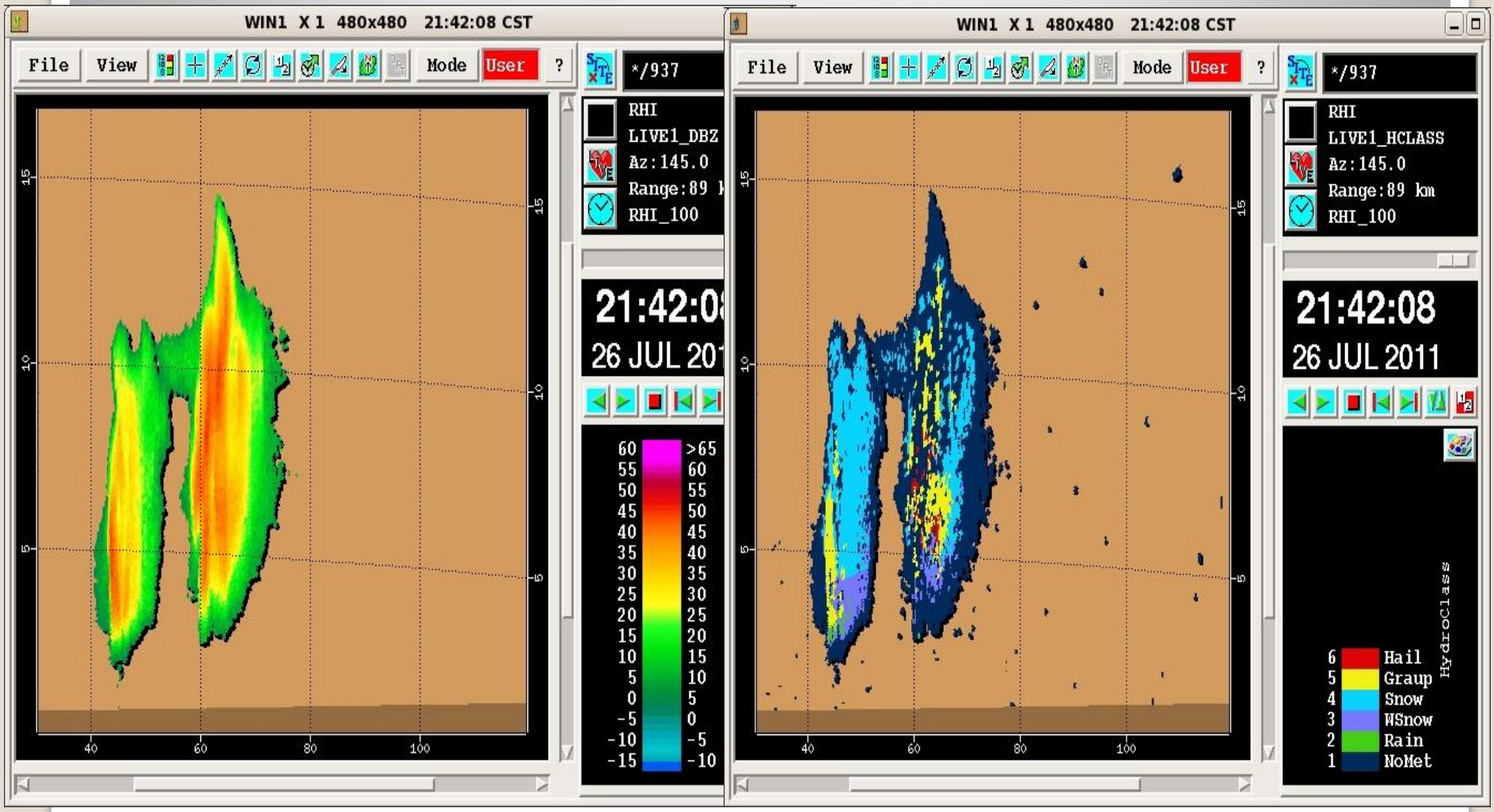
- Forecasting of hailstorm, intensity, evolution and types;
- Monitoring of hail clouds and indentification of hail clouds and rain clouds;
- Choosing new formation area of hailstone based on the type of hailstorm;
- Preparing for seeding operation and calculation of seeding agent amount based on the intensity of hailstorm;
- Evaluation of effectiveness.

--Critical issues in hail suppression practice--

June 25,2011 hailstorm in western China



July 26,2011, hailstorm in northeastern China



Critical issue for seeding

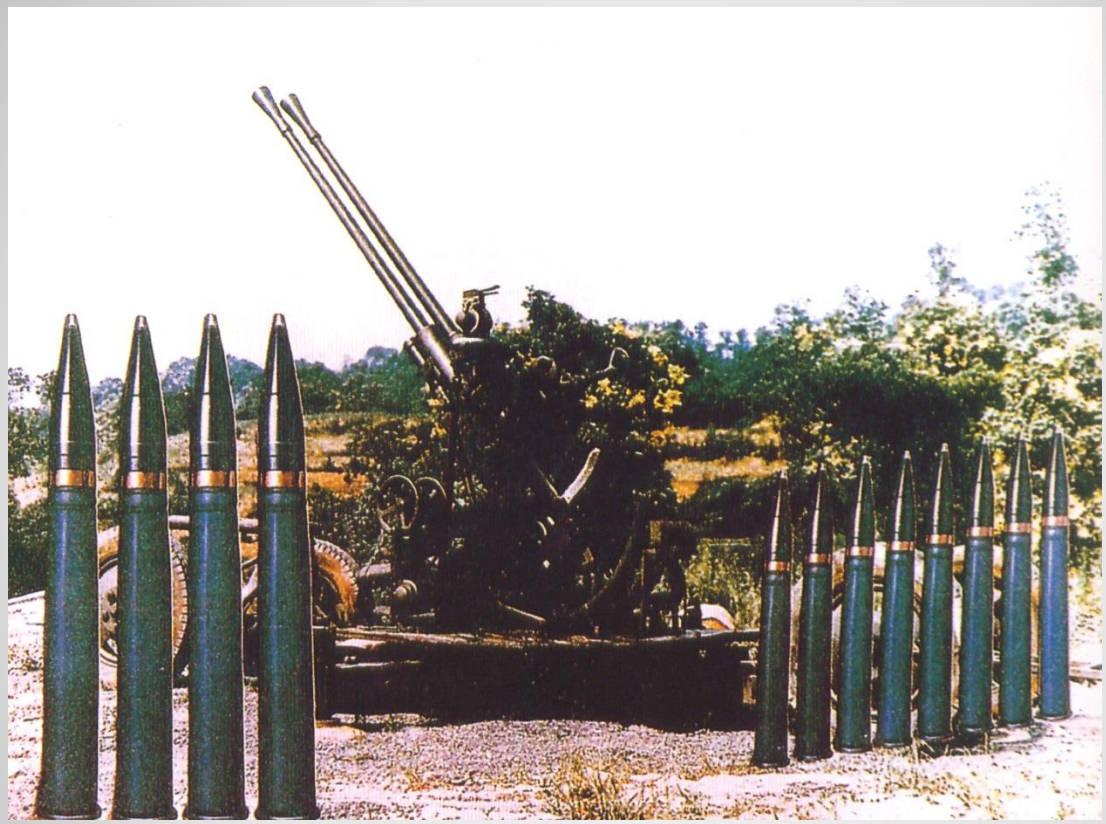
- Enhancing rain formation in hail formation area for potential or mature hail clouds.
- Indentification of new formation area of hailsone: in cumulus clouds,the area of feeder cloud or daughter cloud in mature hail cloud tend to develop.
- Seeding amount should reach about 10^{10}-10^{11} m^{-3} , which may induce early rainfall.

Important!

In order to obtain the maximum effectiveness of hail suppression, early seeding is critical in consuming supercooled water, suppressing of updraft and damaging the new formation area of hailstone by inducing early rainfall.

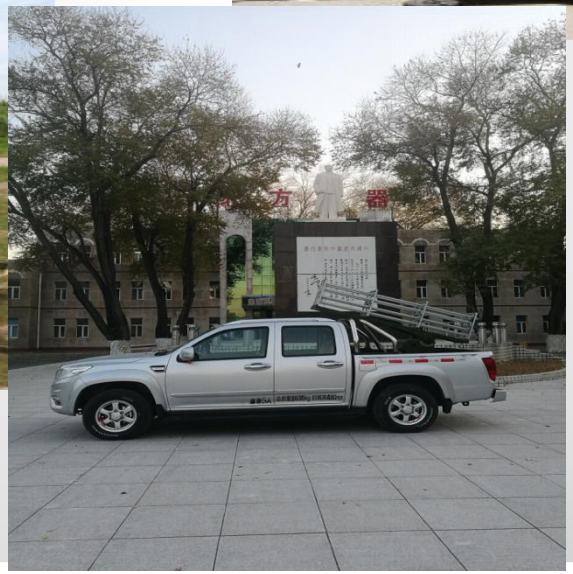
Accurate identification of hail cloud is critical in hail suppression practice!

- If the advanced polarized radar is not available in seeding operation, you may choose convential operational radar.
- In this case, radar reflecivity is the only way to identify hail cloud and rain cloud, such as Ref. larger than 45 dBz at temperature levels of -10~-25℃ might be considered as hail cloud.

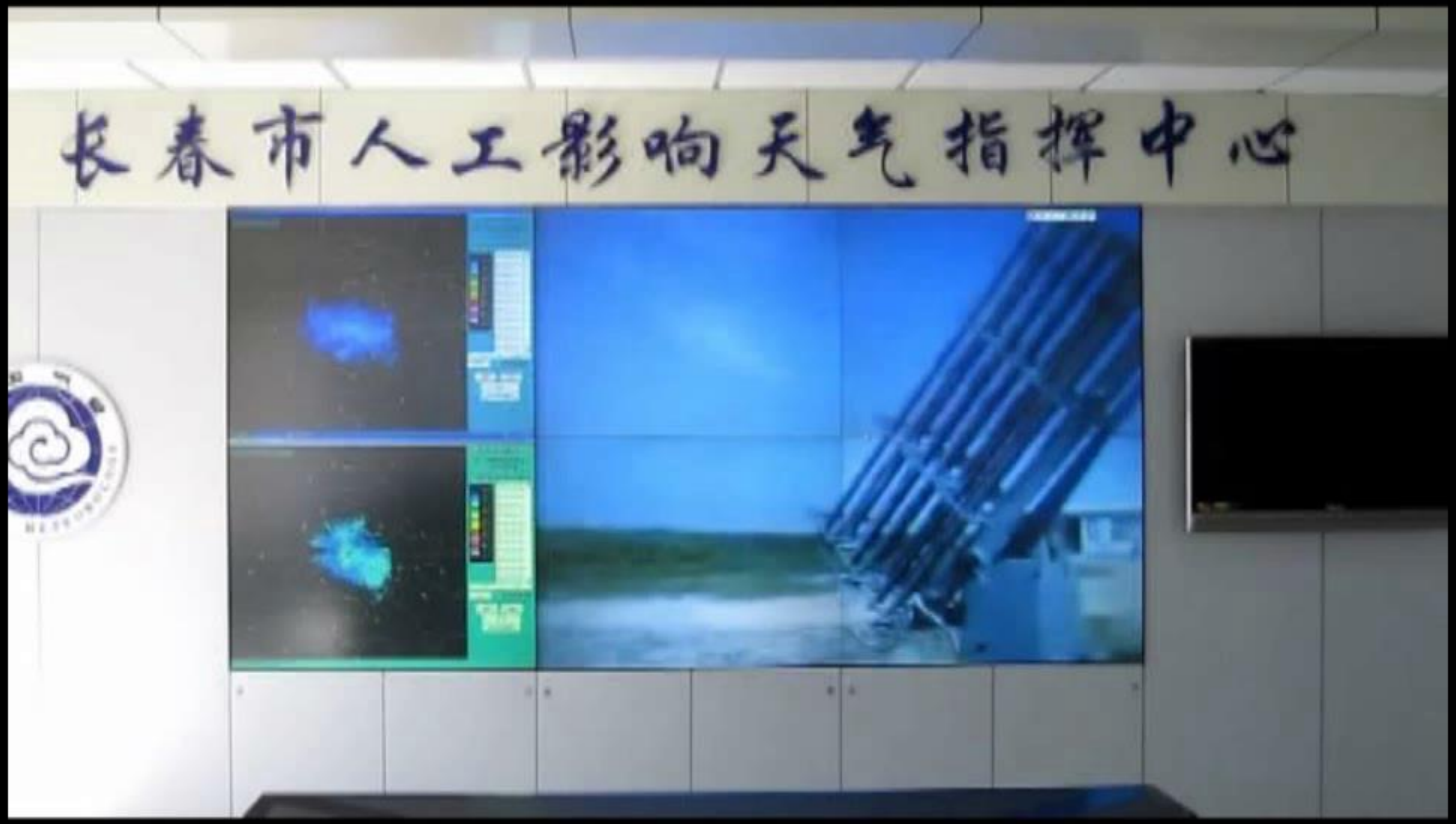


Anti-aircraft gun system

Cloud seeding rochet system in China



Spe


长春市人工影响天气指挥中心

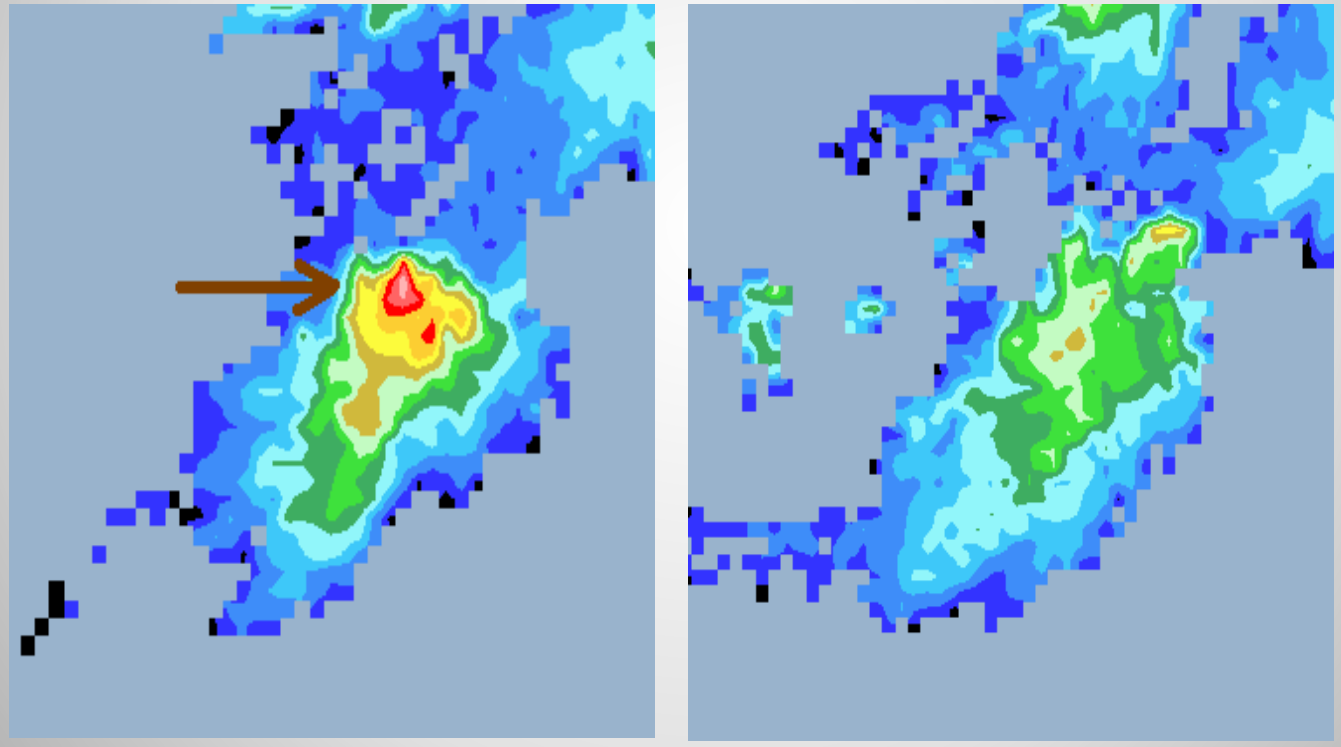
Specifications of high effiency rocket system

1. A
2. C
3. H

- Radar-based evaluation;
- hailstone size measurement
- Damage assessment
- …

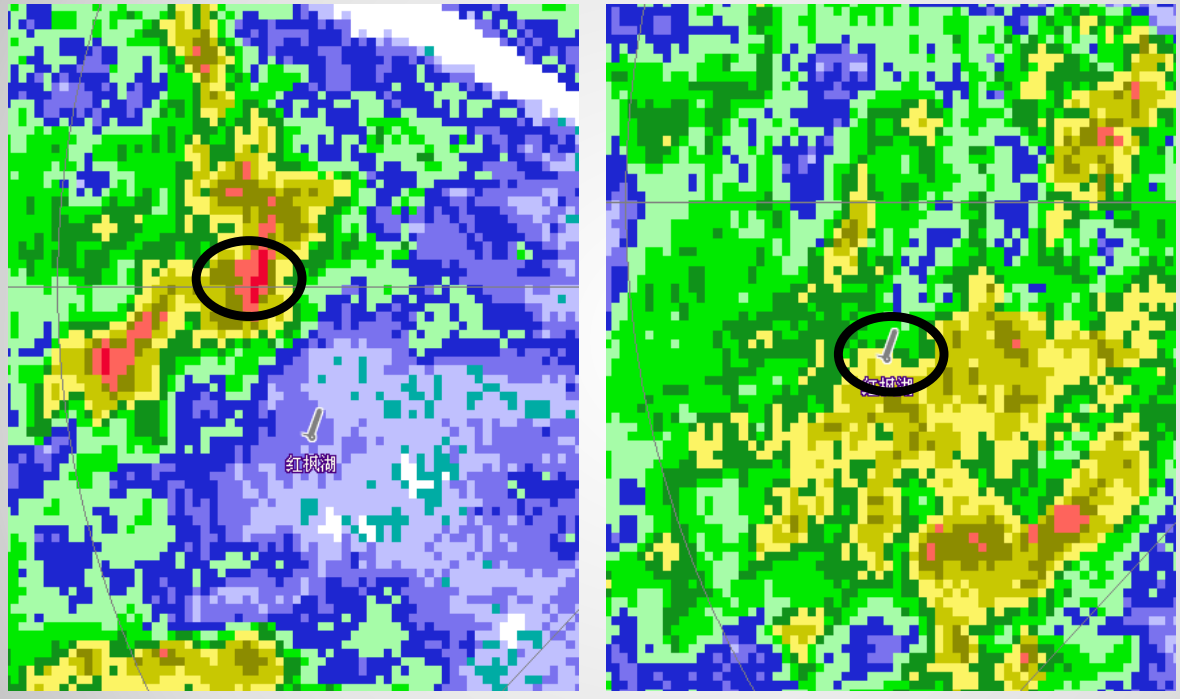
--Effectiveness evaluation of hail suppression operation--

- **Case in southwest region**
- **Max ref. 55 dBz, decrease to 30 dBz after seeding of 3 rockets.**



typical case

- **Max ref. 45 dBz, decrease to 20 dBz after seeding**



seeding evaluation by radar

起降时的地面滑跑距离仅为数十米

Thank you!

Share experience in weather modification