Microphysical Retrieval in Hailstorms Using Scattering Simulation Based on in-situ Aircraft Measurements and Dual Polarimetric Radar Observations

I. Arias Hernández*, P. Kennedy+, V. Chandrasekar+,
J. Klinman, D. J. Delene, and A. Detwiler**

*Naval Postgraduate School, +Colorado State University,
** University of North Dakota

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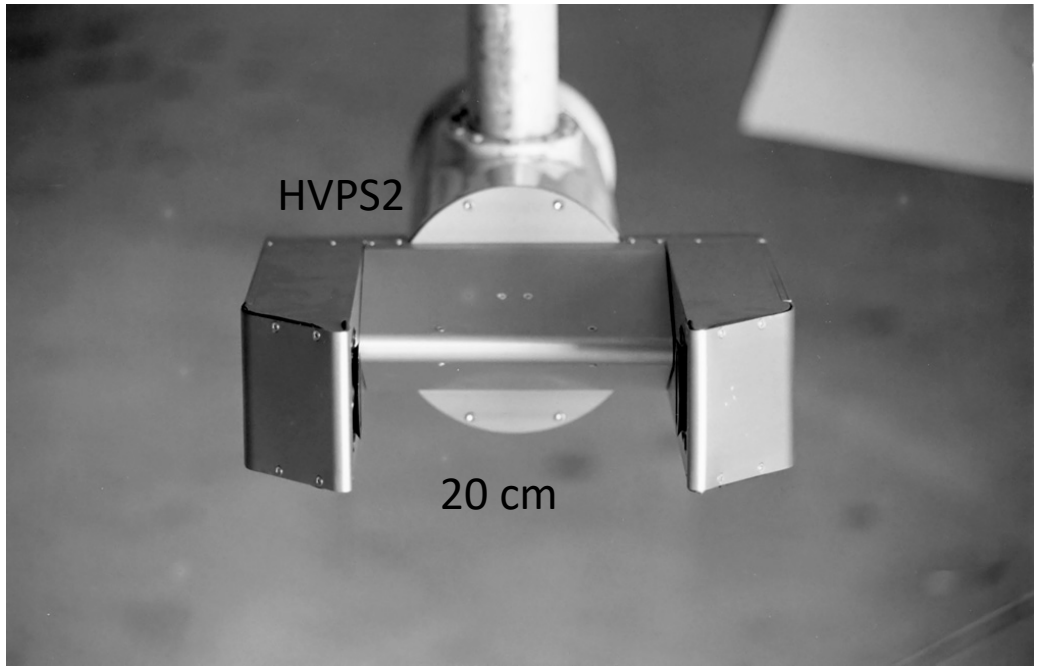
Outline

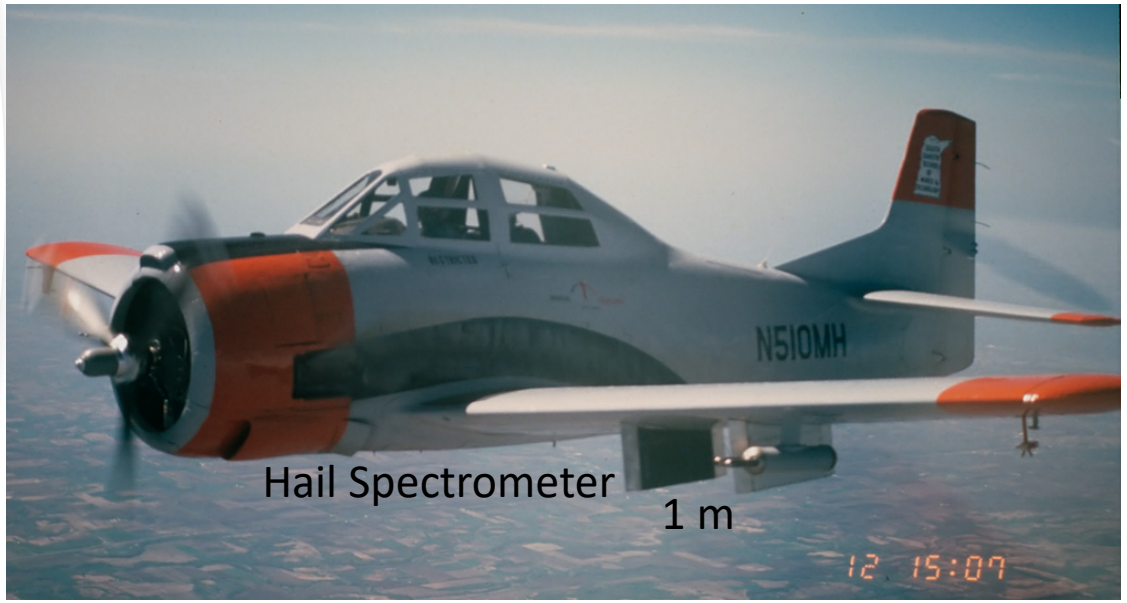
- T-28 aircraft and CSU-CHILL radar
- STEPS 2000/06/23 case
- In situ drop size distribution
- Scattering simulations
- Matching radar measurements and simulations
- Ice density and axis ratios


T-28 Aircraft


CSU-CHILL

T-28 Aircraft and probe



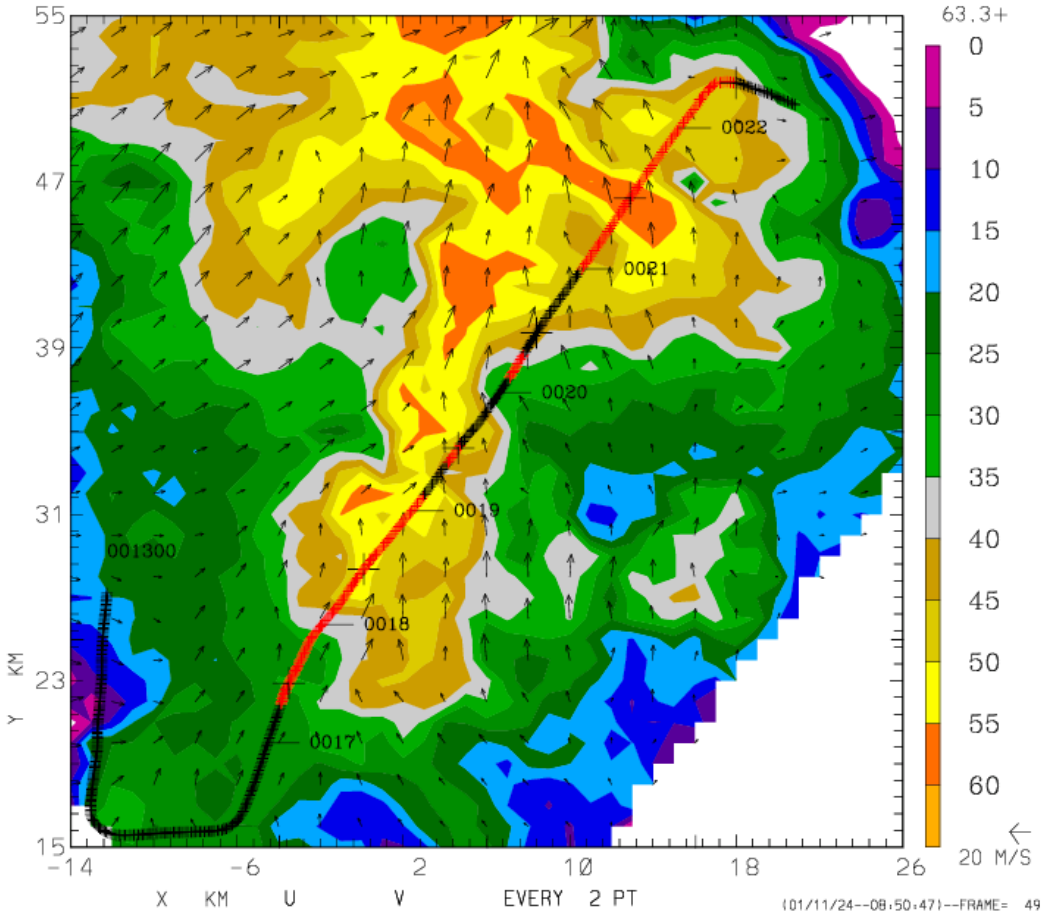


CSU-CHILL Radar

CSU CHILL radar is a facility in Greeley Colorado.
The S-band measurements from CHILL are used.

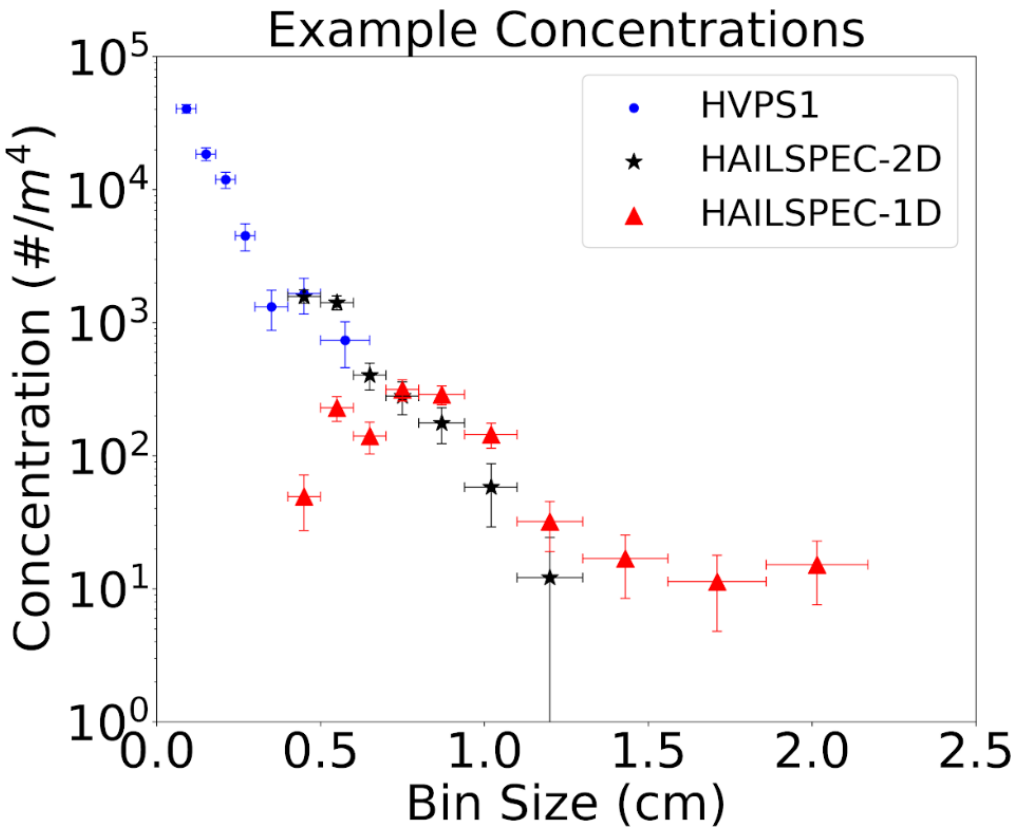
STEPS Jun-23, 2000

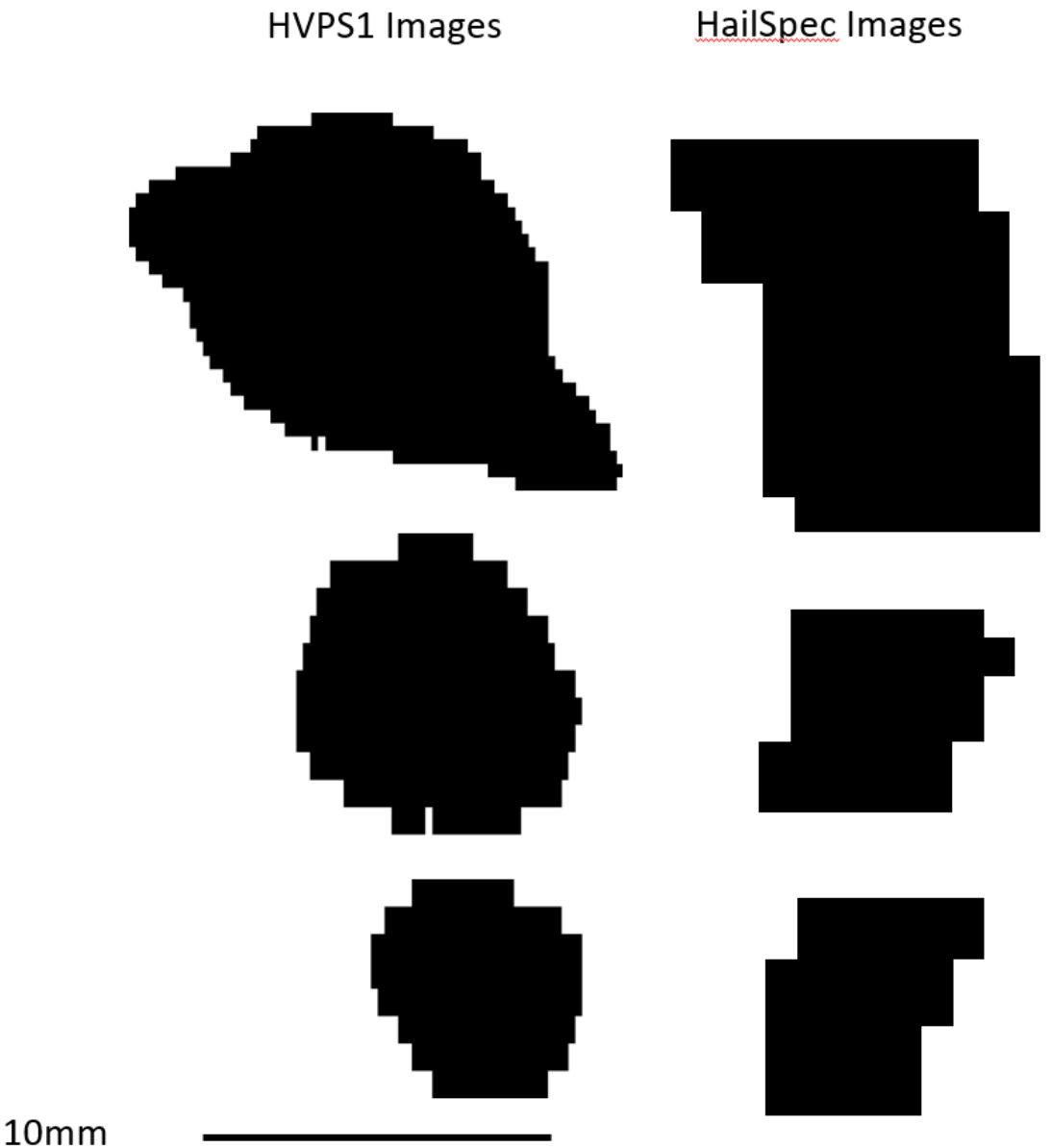
CSU-CHILL 2000/06/23 00:18 UTC CAPPI @5.3 km



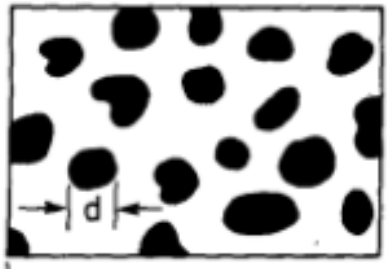
Significant hail was observed on the ground. The pilot report hail and had to turn at the end of the track.

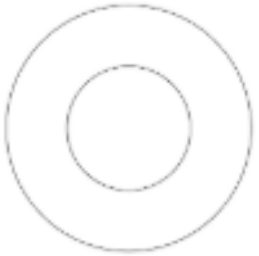
Probe measurements

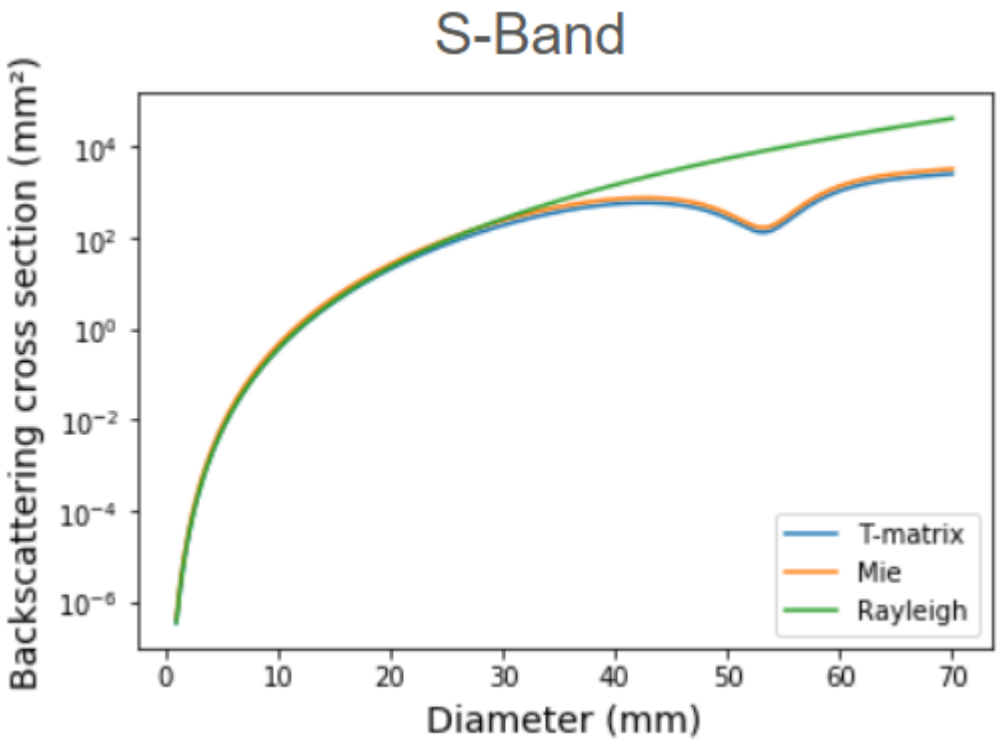


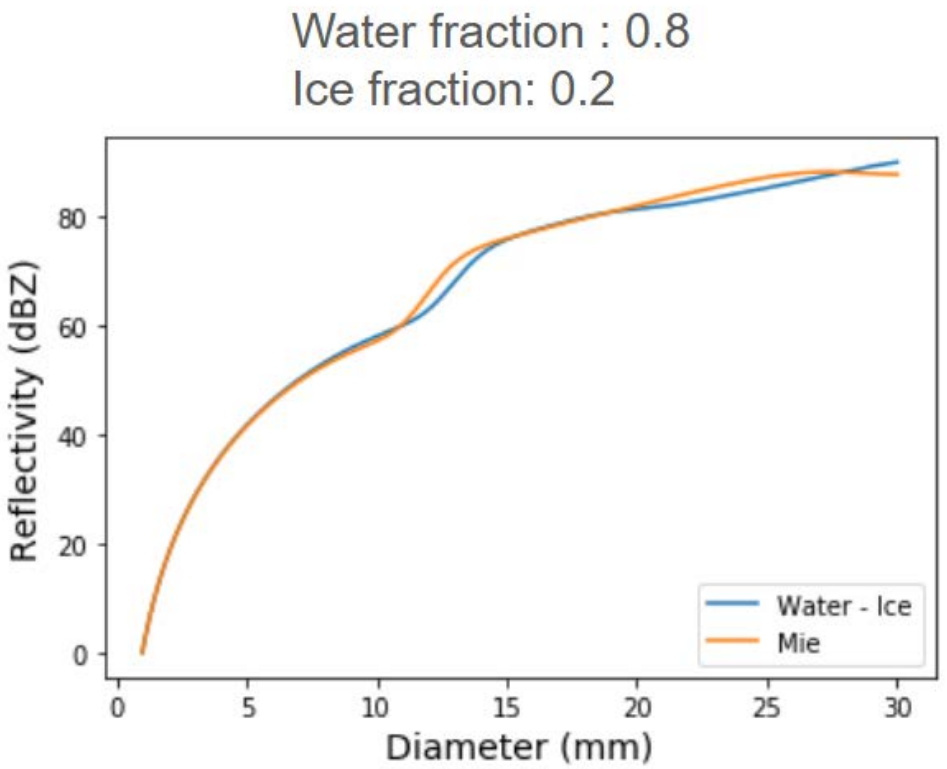


Scattering simulations and comparison with radar



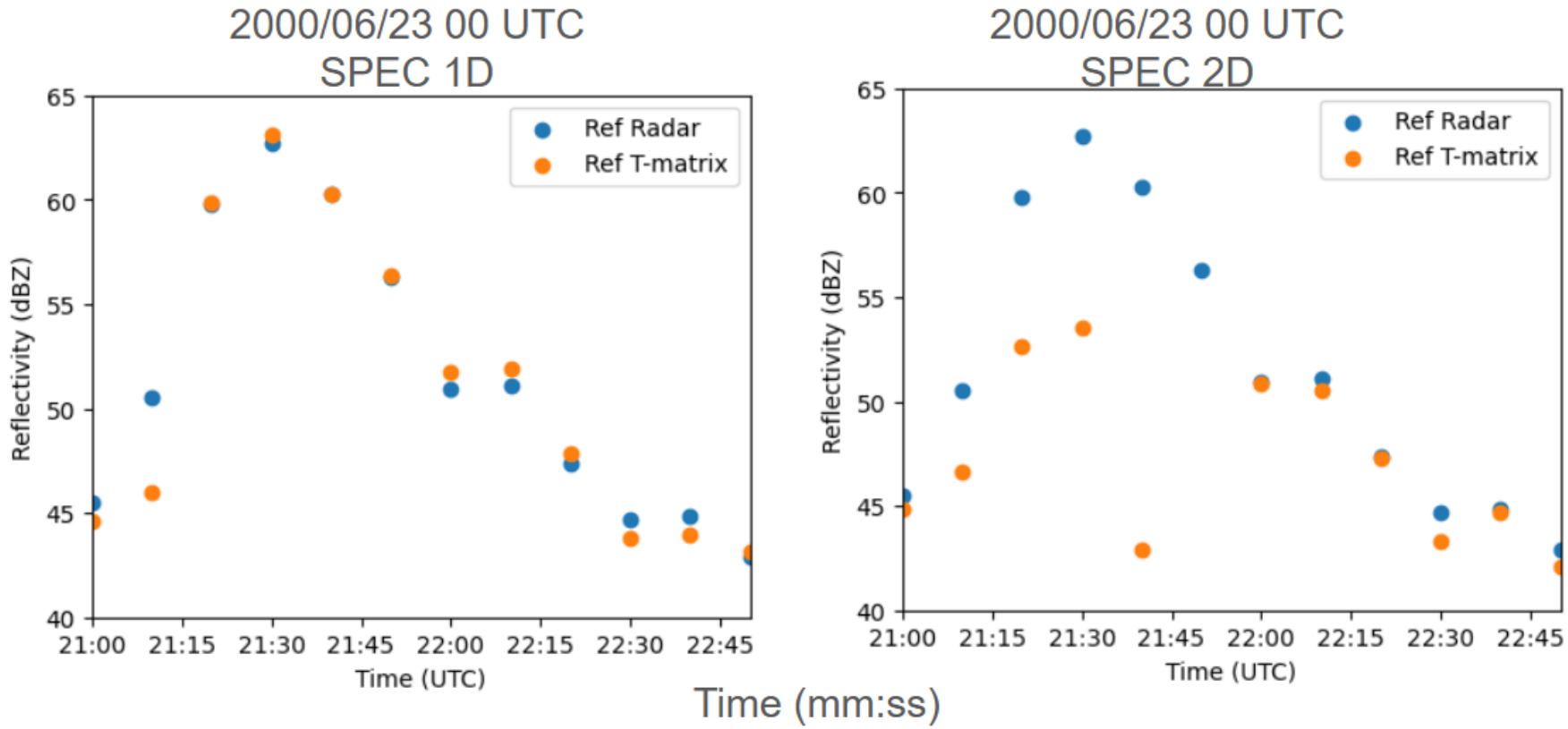






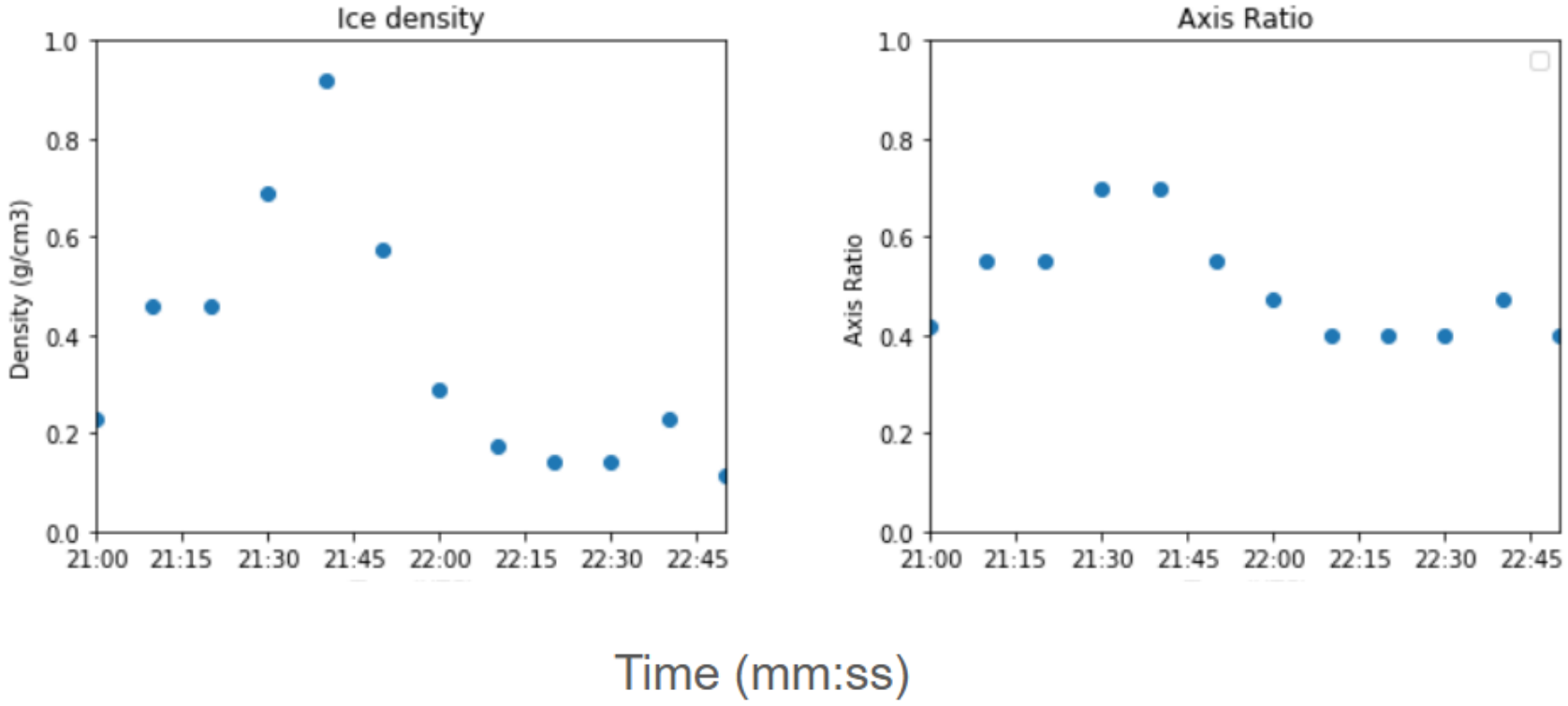
Matching radar observations

Matching reflectivity changing the bulk density from radar observations and scattering simulations



Microphysical retrievals

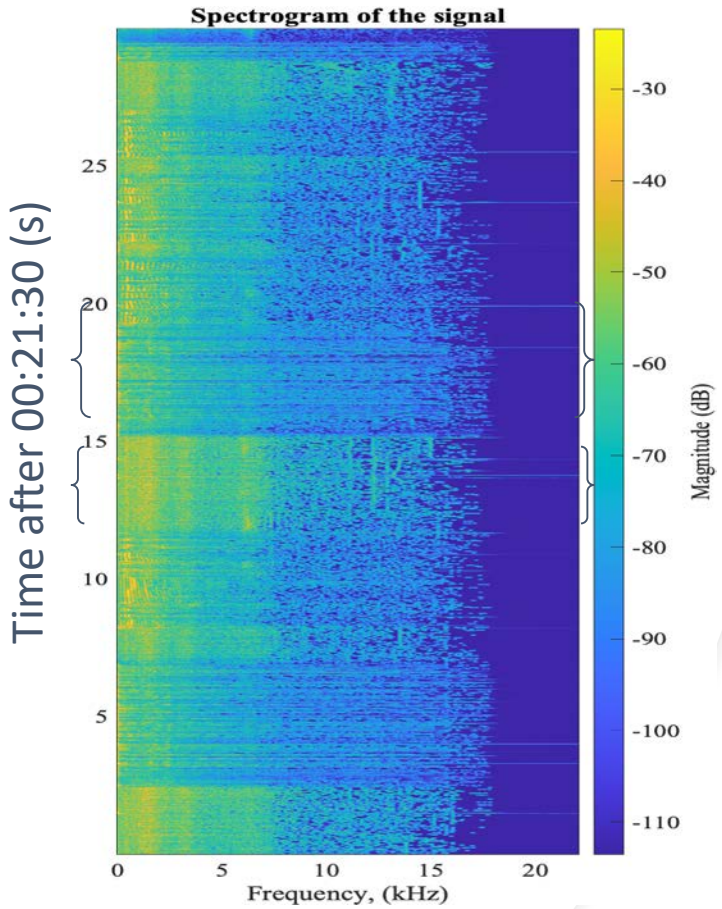
2000/06/23 00 UTC



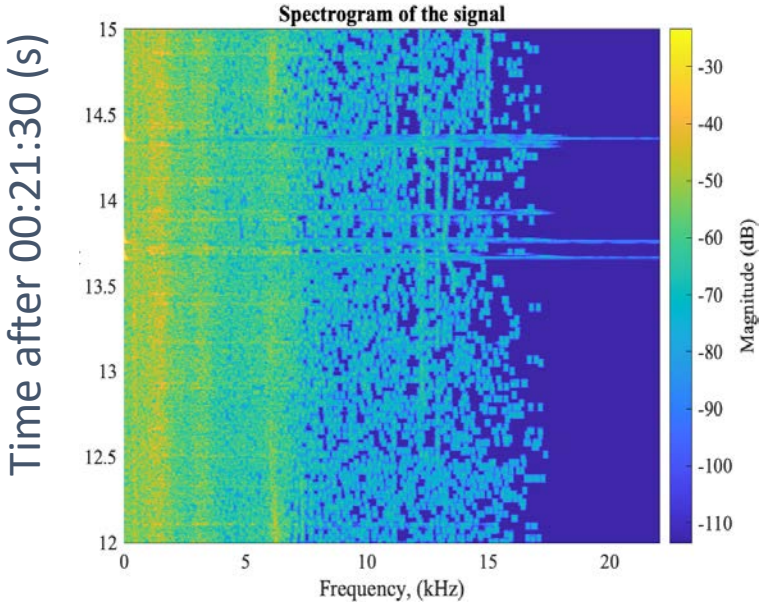
Acoustic signal

Pilot reporting hail

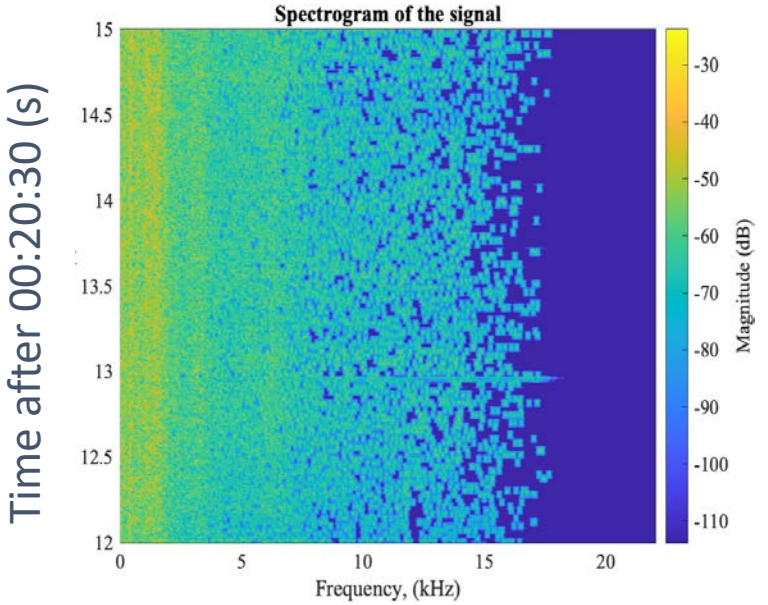
Hail impacts sound



Period with hail impacts



Period without hail impacts



Summary

- Bulk density of the volume is derived by matching radar observations and scattering simulations
- This is done by adding air to the mixture in order to match the radar reflectivity
- The period with solid ice coincide with the time when the pilot report hail impacts and had to turn

Future work

- Including water to the mixture
- Matching other polarimetric measurements
- Analyze other time periods

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