

# Rain Enhancement with Commercial Agricultural Aircraft

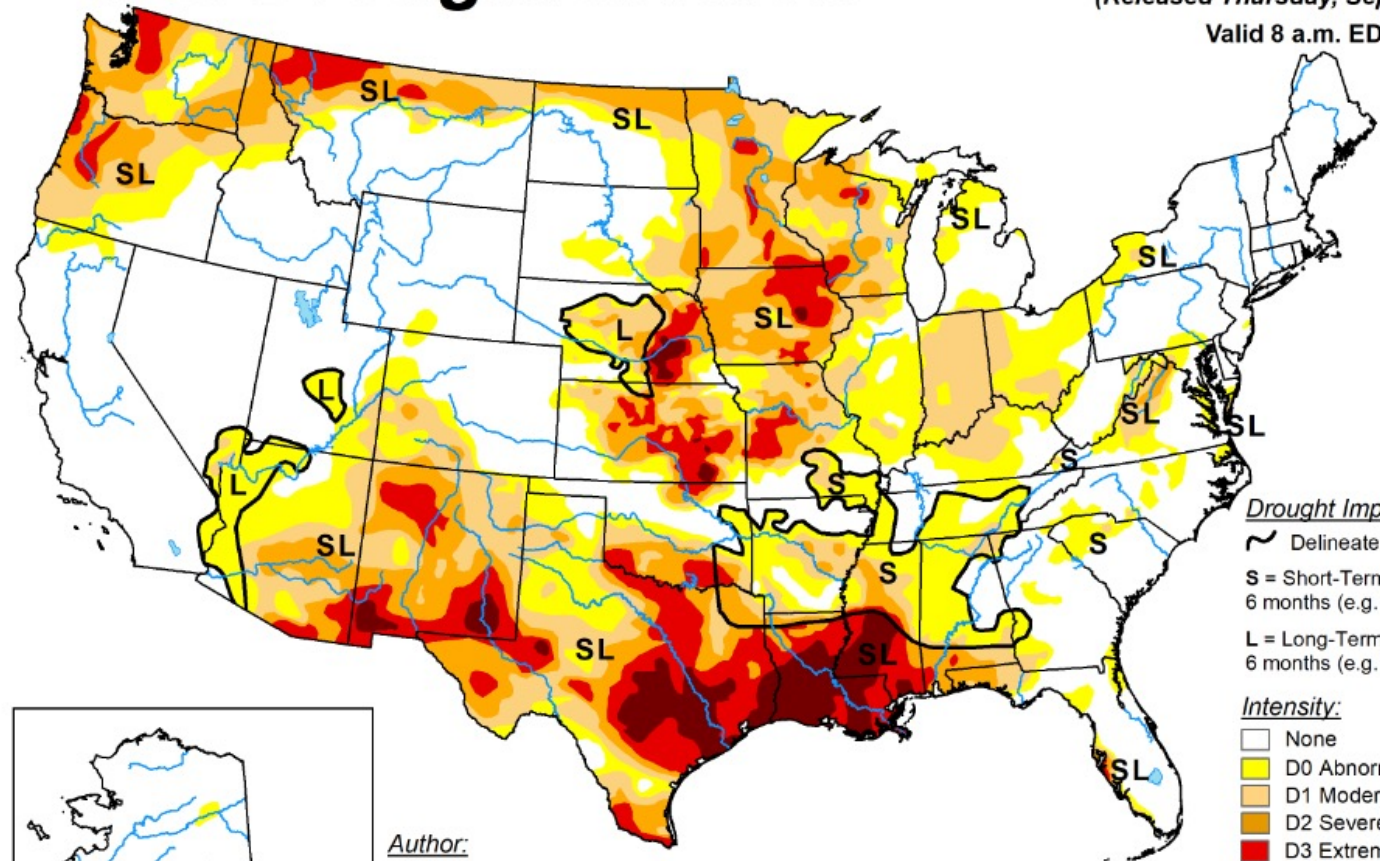
“Relegating Drought to the Dustbin of History”



# 2023 Drought

## U.S. Drought Monitor

September 26, 2023  
(Released Thursday, Sep. 28, 2023)  
Valid 8 a.m. EDT



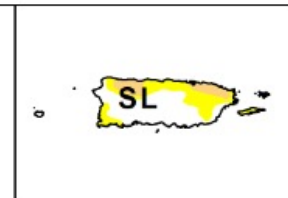
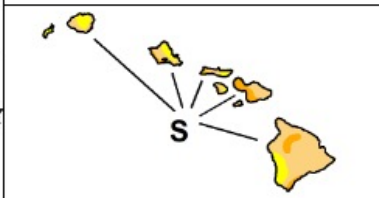
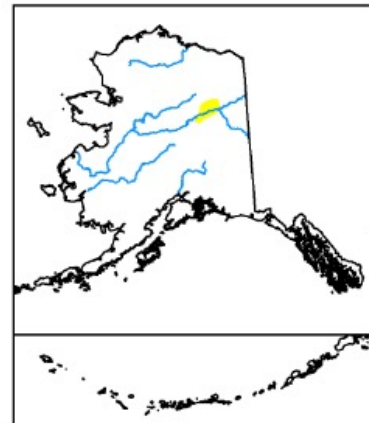
### Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

### Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:  
Richard Heim  
NCEI/NOAA



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>



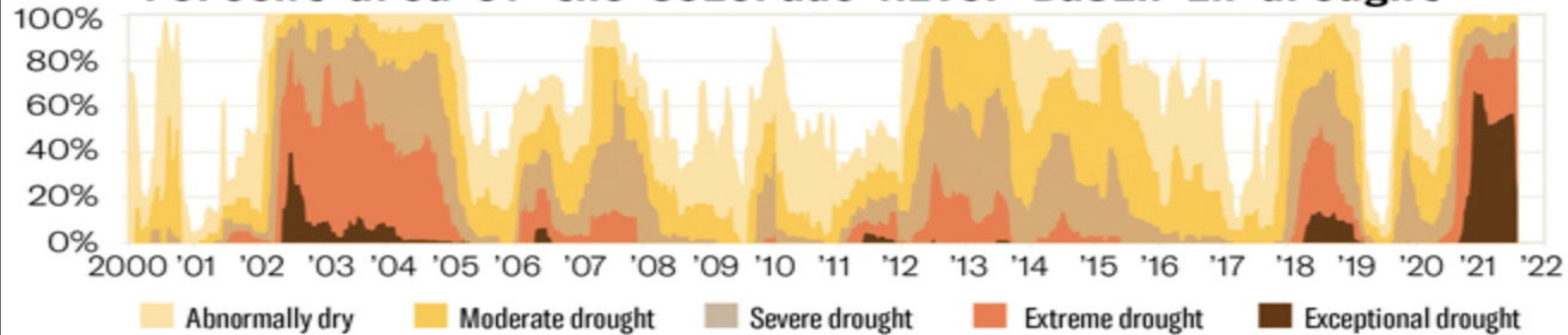
[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)







**Percent area of the Colorado River Basin in drought**







# Glaciogenic & Hygroscopic Flares

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The Solution





Spectram  
TRAVICAR



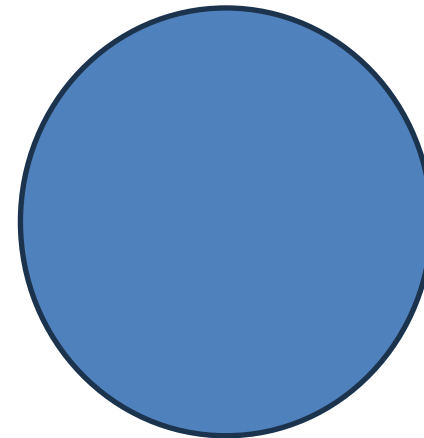
CUMULUS  
CLOUD

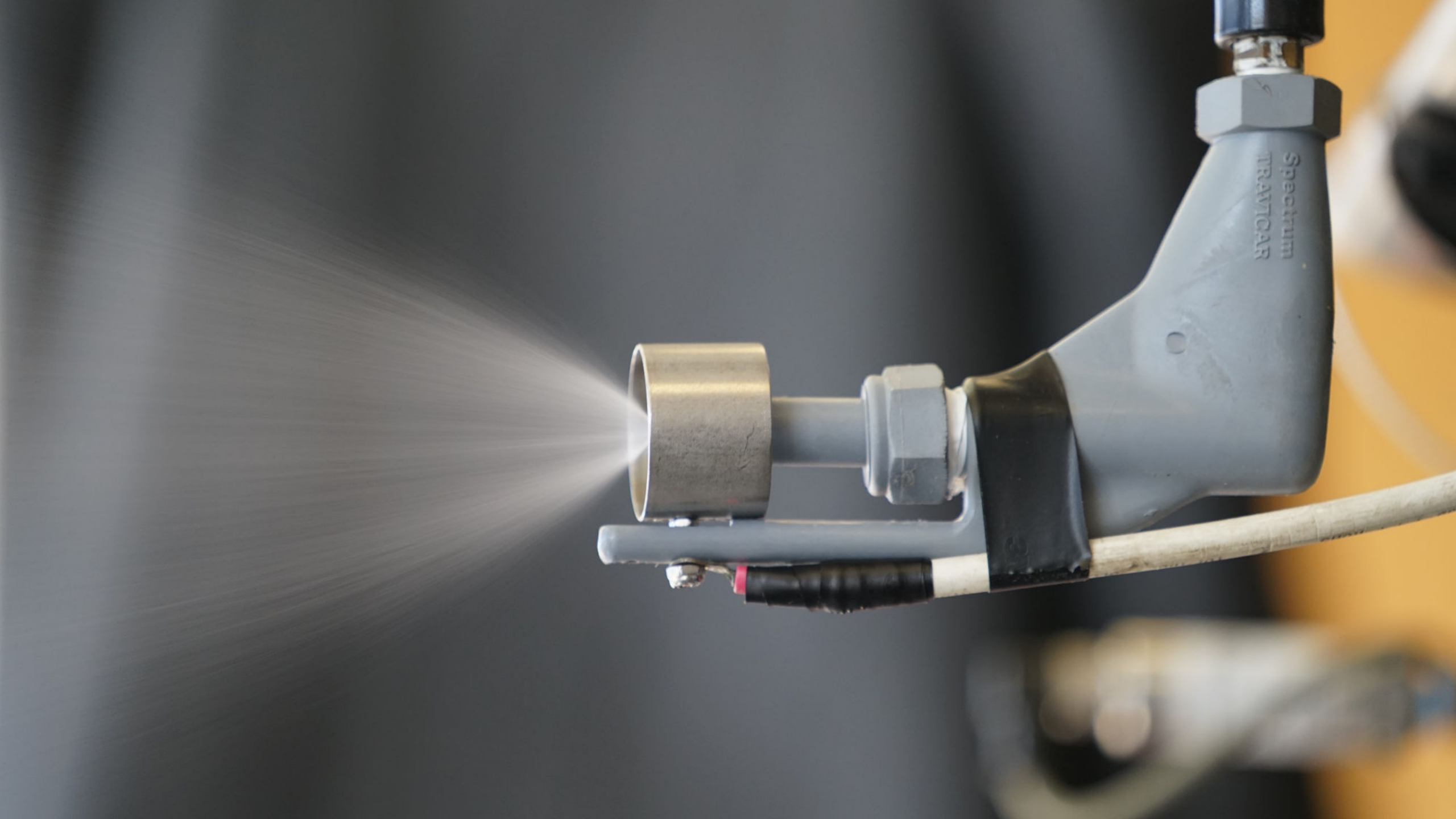
# Main Driving Factors

Collision

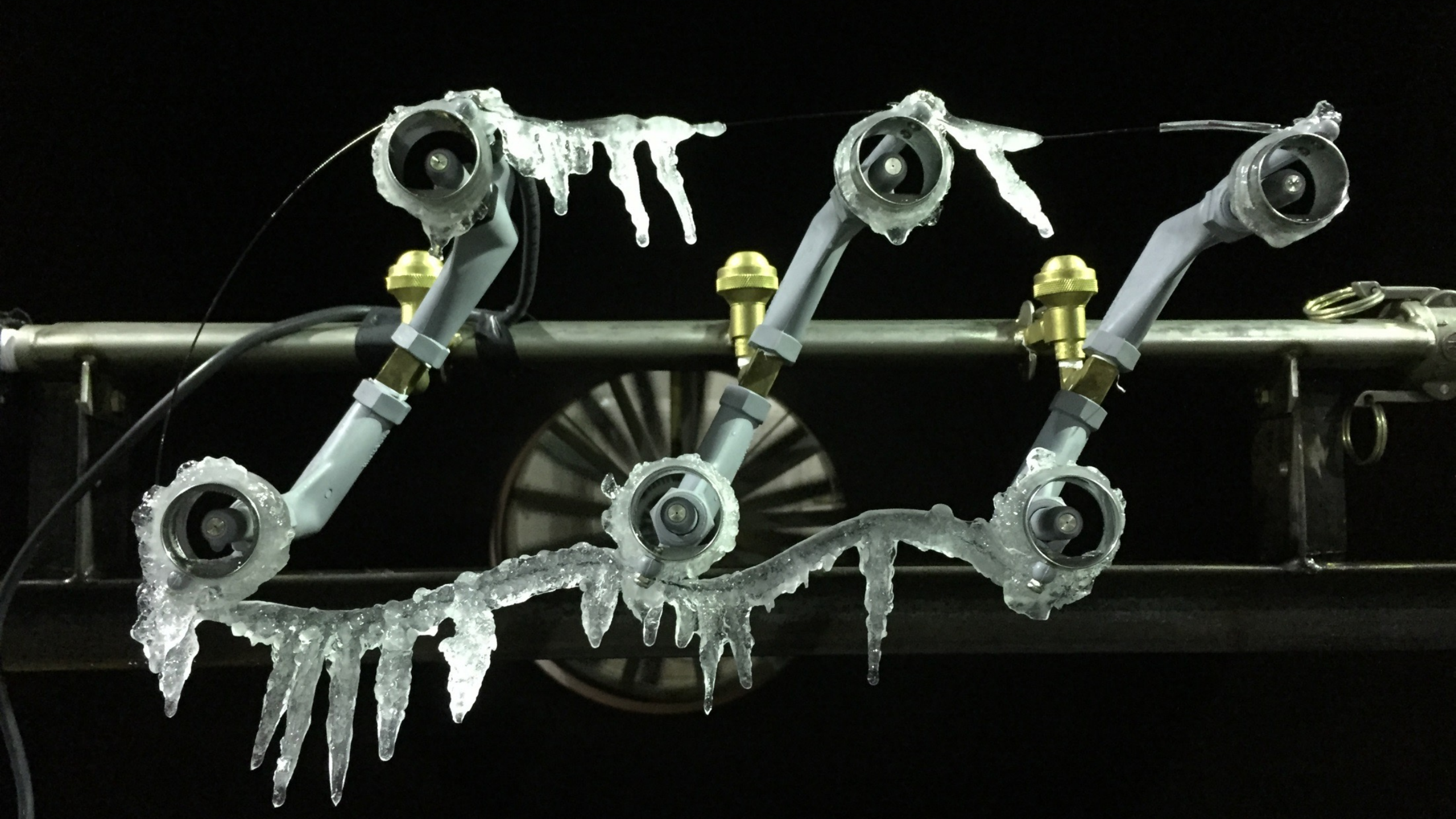


Coalescence





Spectrum  
TRAVTQAR





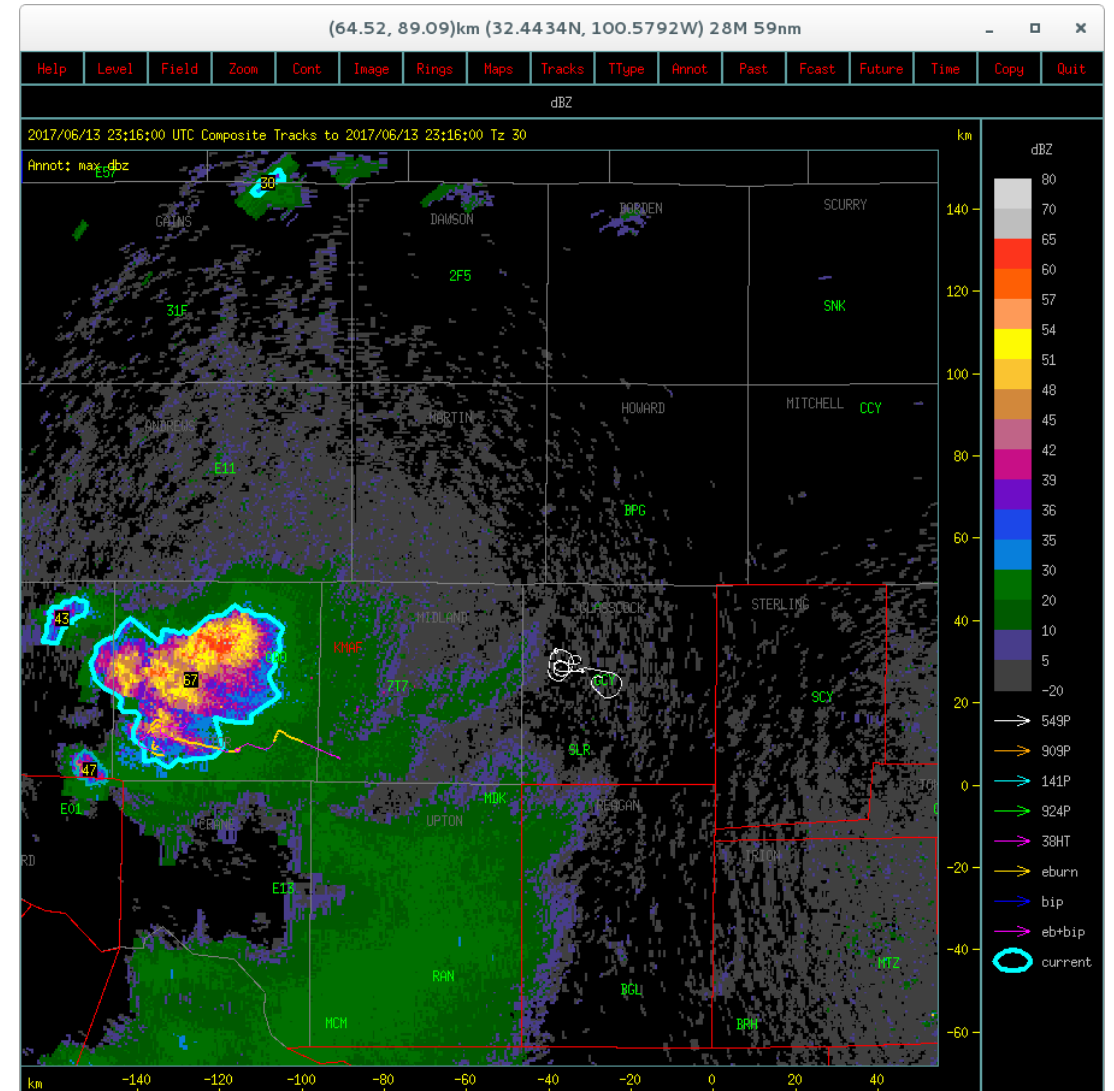
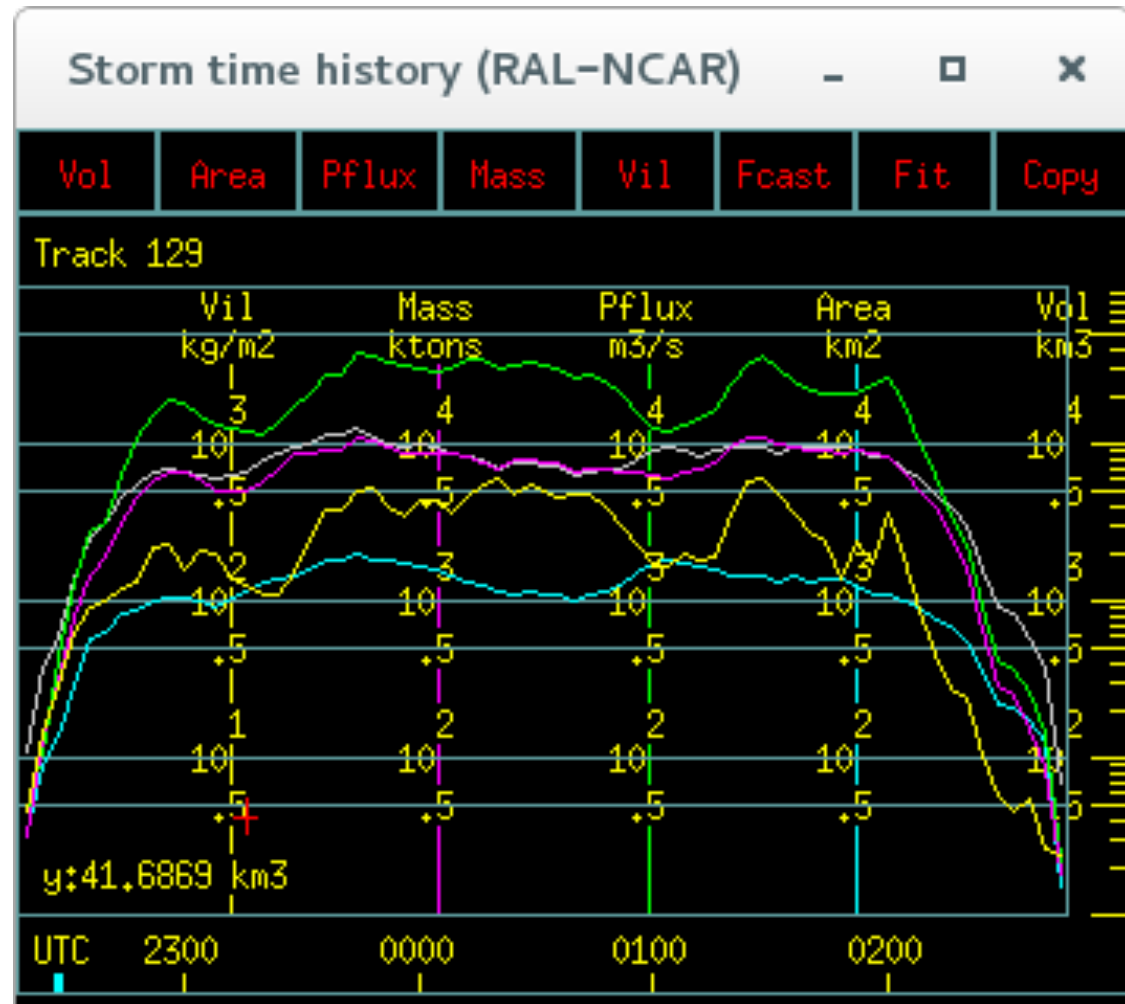


RESTRICTED



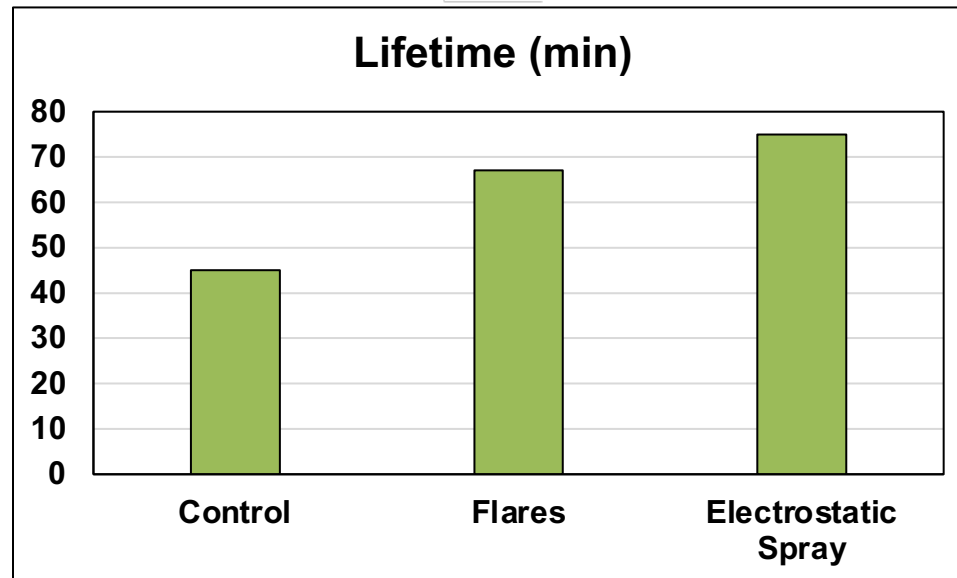
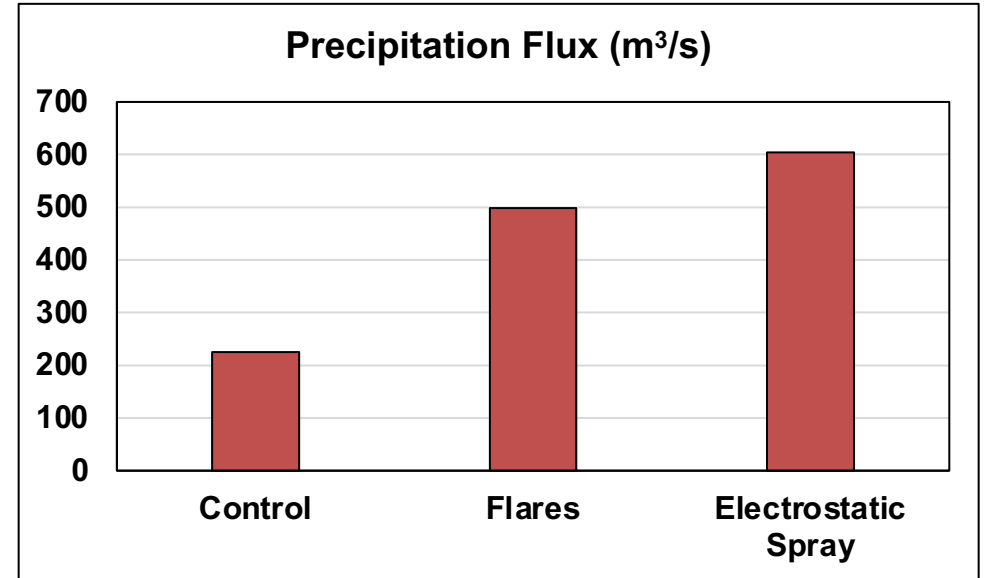
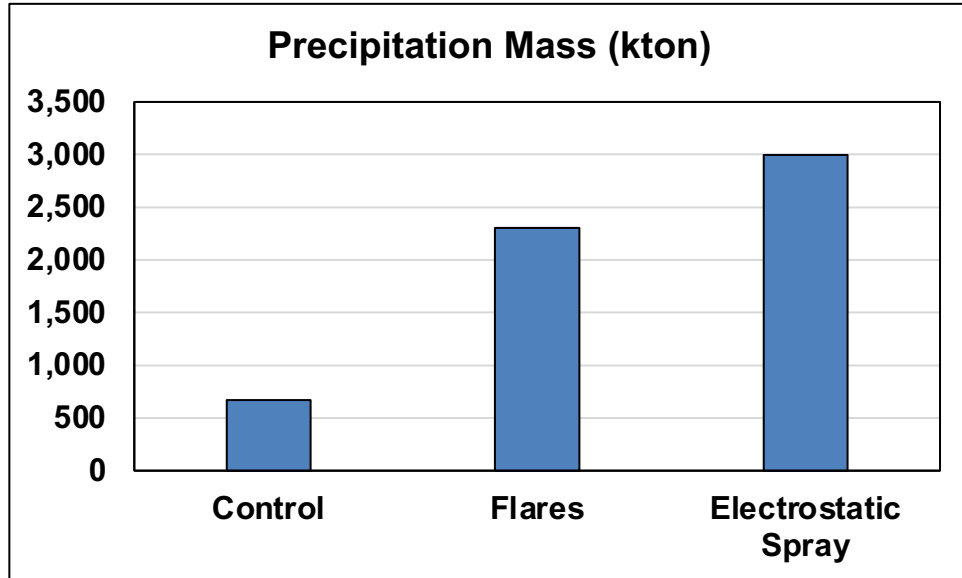
# Initial Results from Preliminary Study

Using the software program TITAN

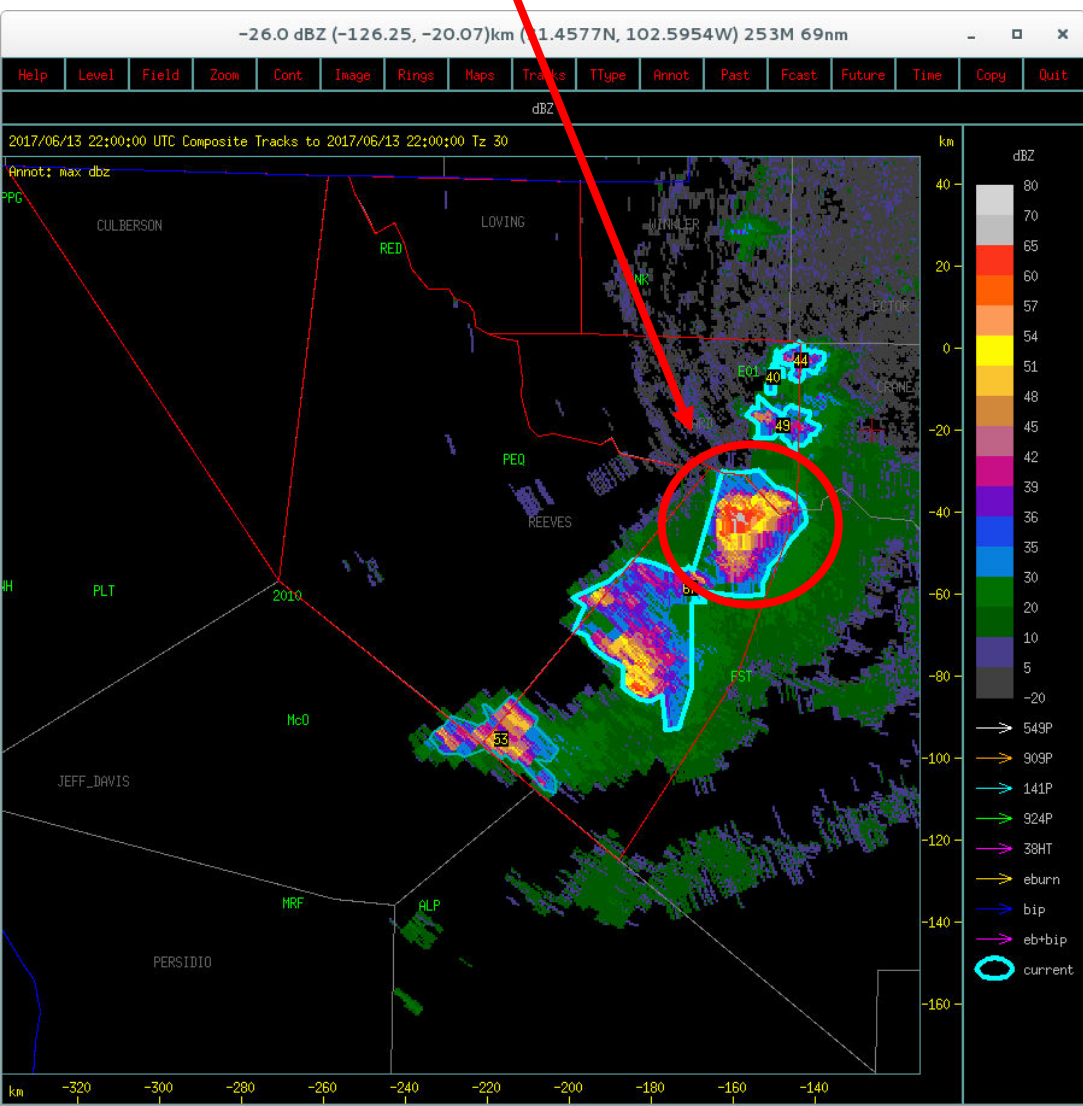




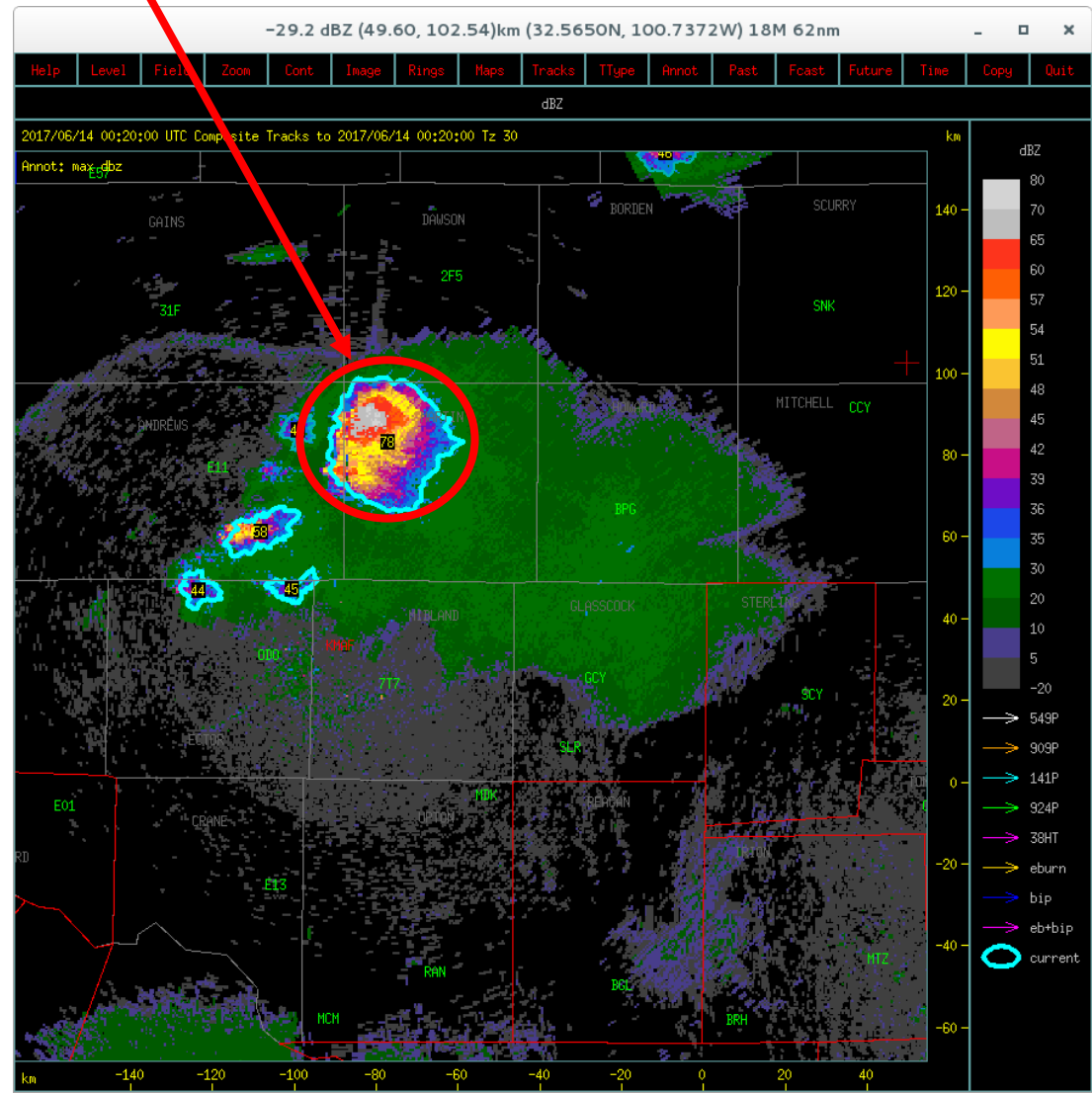
# Key Findings



Trans-Pecos Storm  
seeded with 16  
glaciogenic flares.

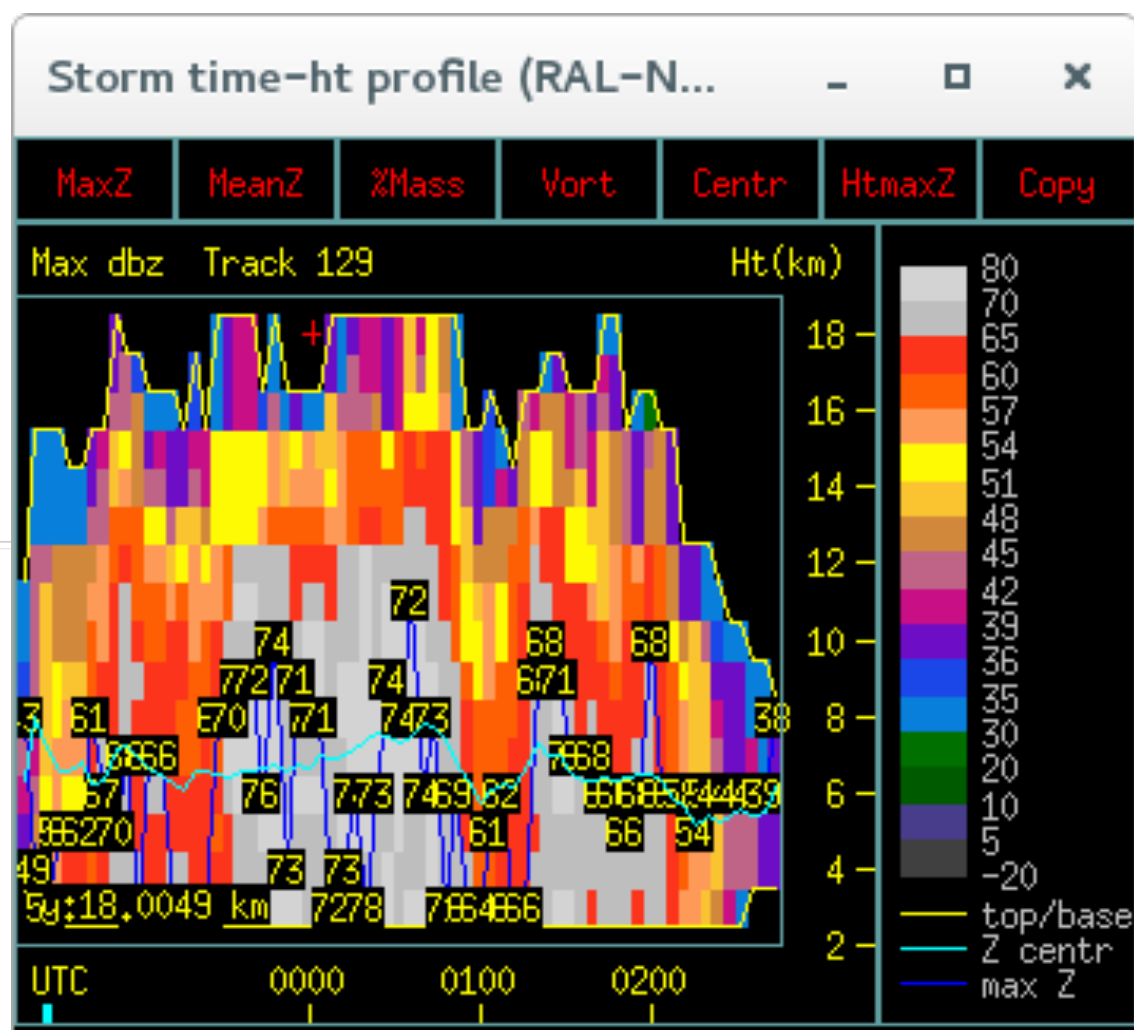
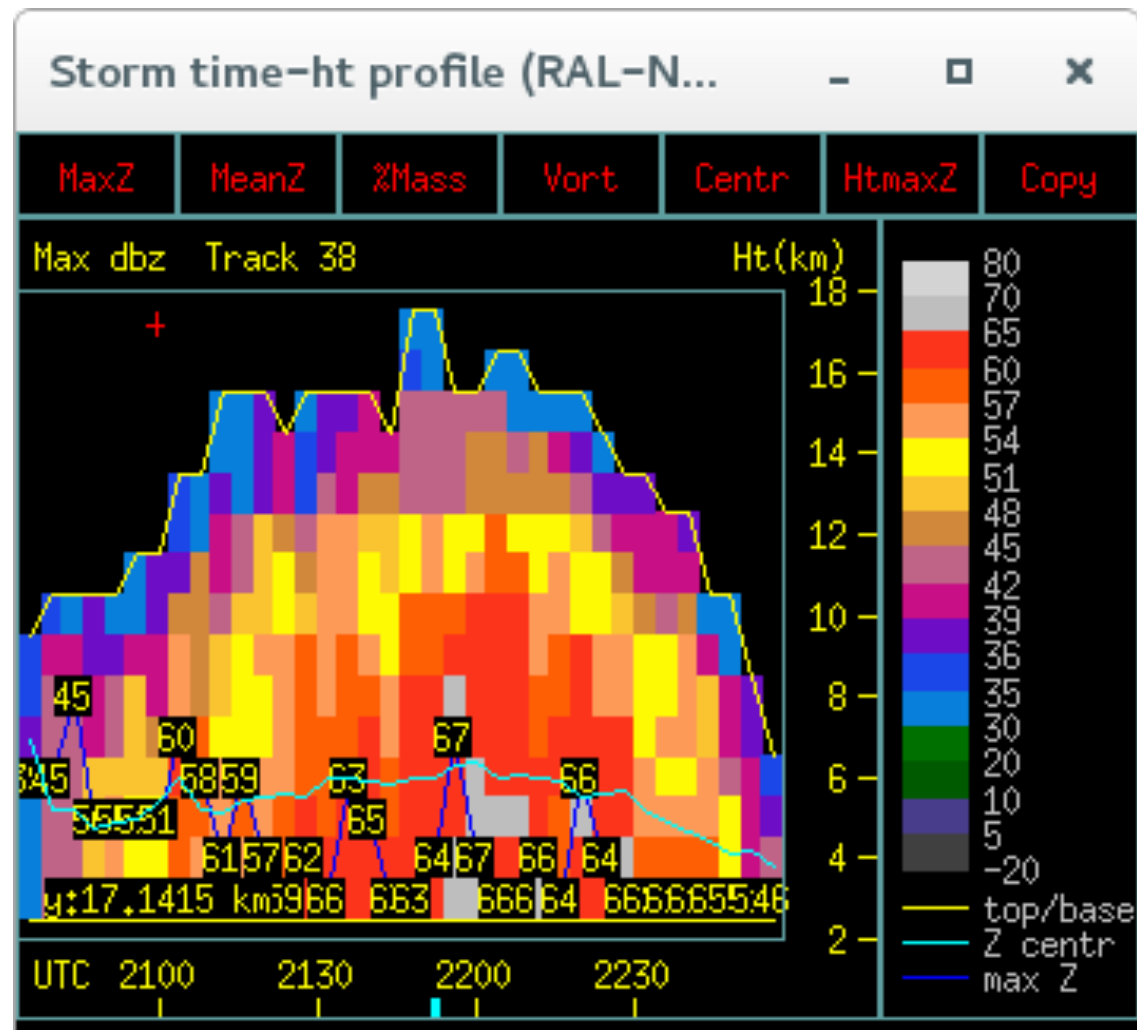


Case study number storm  
seeded with 110 gallons of  
charged droplets



# Key Findings (Case Study)


Seeded storm with flares (left) vs. seeded storm with electrostatic spray (right)



# Key Findings (Case Study)

Raw Data from TITAN show how the two cells compared.

Parameter	Dual Seeded Cell	Spray Seeded Cell	Delta
dBZ Max Mean	59 dBZ	65 dBZ	6 dBZ
dBZ Max	67 dBZ	77.5 dBZ	10.5 dBZ
<b>Precip. Flux</b>	<b>6,144 m<sup>3</sup>/s</b>	<b>18,057 m<sup>3</sup>/s</b>	<b>11,913 m<sup>3</sup>/s</b>
Volume	3,600 km <sup>3</sup>	6,809 km <sup>3</sup>	3,209 km <sup>3</sup>
<b>Mass</b>	<b>2,619 kton</b>	<b>6,156 kton</b>	<b>3,537 kton</b>
Area	713 km <sup>2</sup>	1,109 km <sup>2</sup>	396 km <sup>2</sup>
<b>Lifetime</b>	<b>3 hr</b>	<b>6.5 hr</b>	<b>3.5 hr</b>

A close-up, low-angle shot of a yellow aircraft wing. A long, black boom extends from the wing, carrying a series of white, cylindrical nozzles. The background is a bright blue sky filled with large, white, fluffy clouds. The image is framed by a white circular border on the right side.

# What does this mean for the Aerial Application Industry?

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- Increased business opportunities
- Agricultural Aircraft
- Experienced Aerial Applicators

# Enhancing Rainfall with Charged Water Droplets

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**Dr. Dan Martin**

**979.229.6055**

**Dan.Martin@usda.gov**