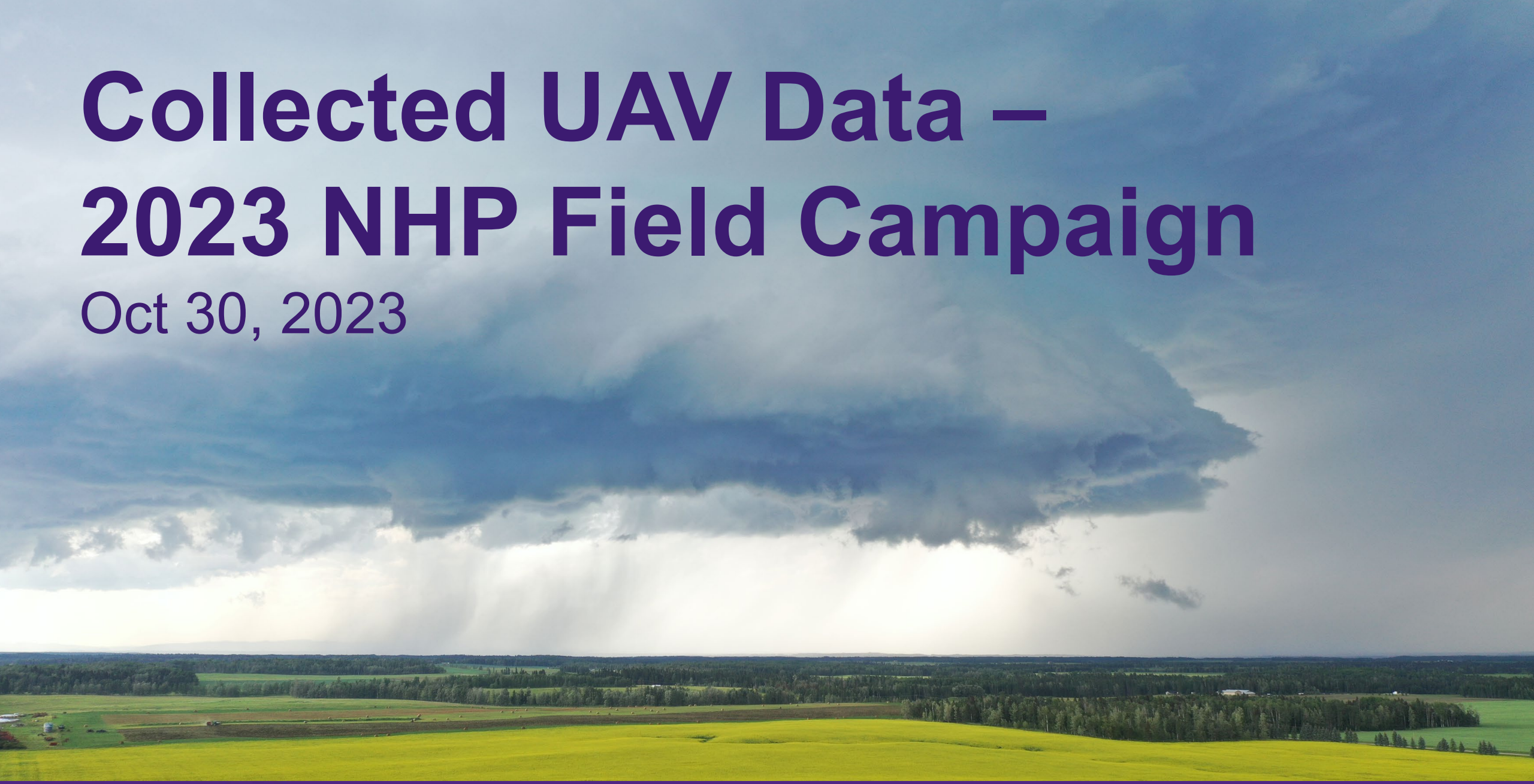
Collected UAV Data – 2023 NHP Field Campaign

Oct 30, 2023



Western

Francis Lavigne-Thériault (MESc student) - NORTHERN HAIL PROJECT

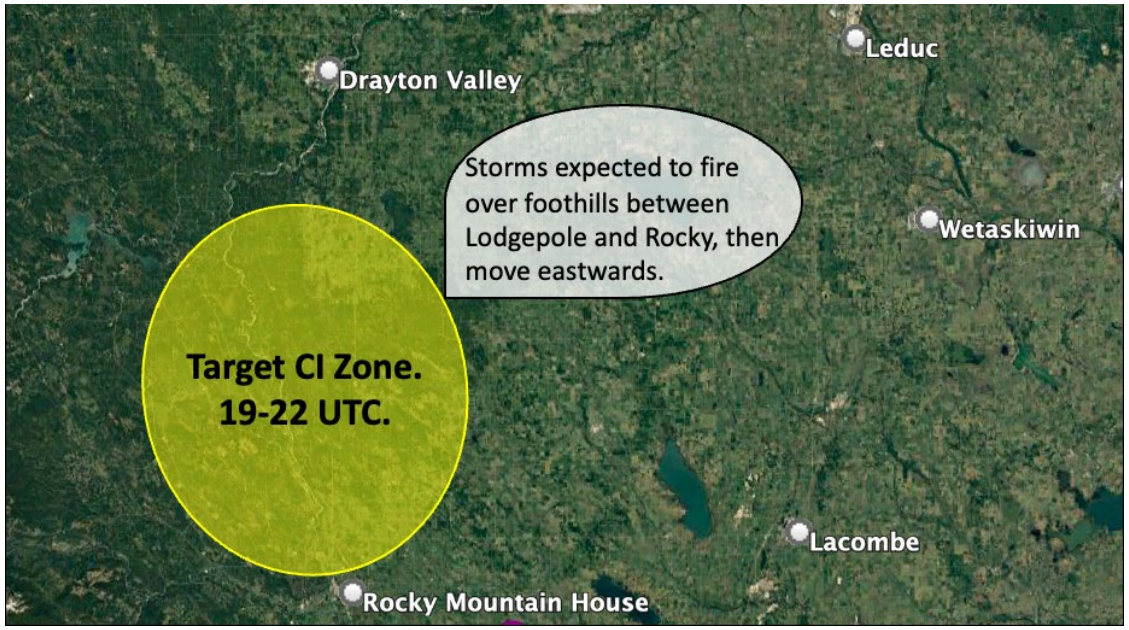
UAV Objectives

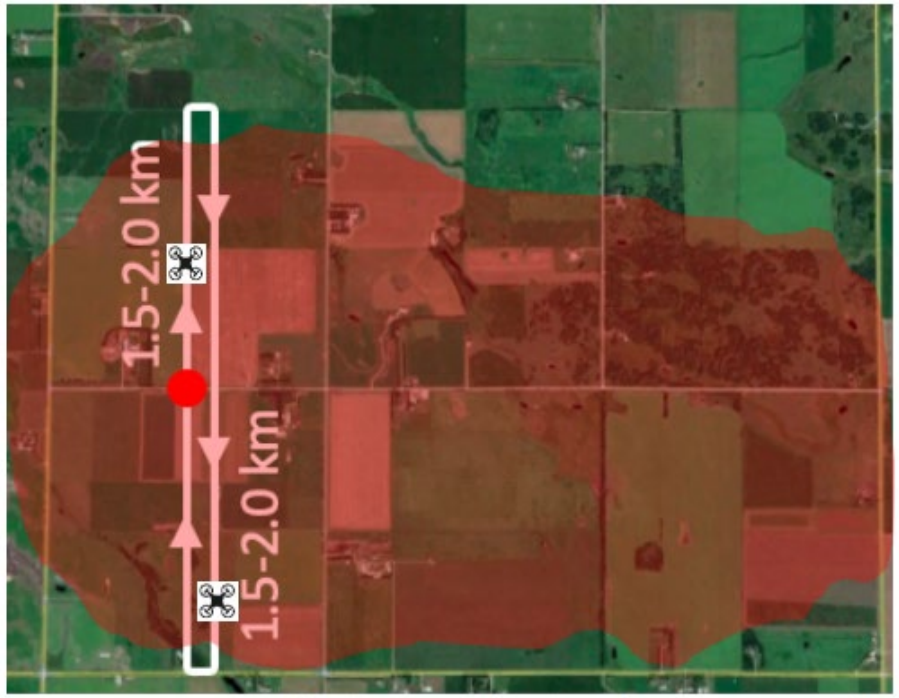
Task 1-2 (from NSERC Alliance grant):

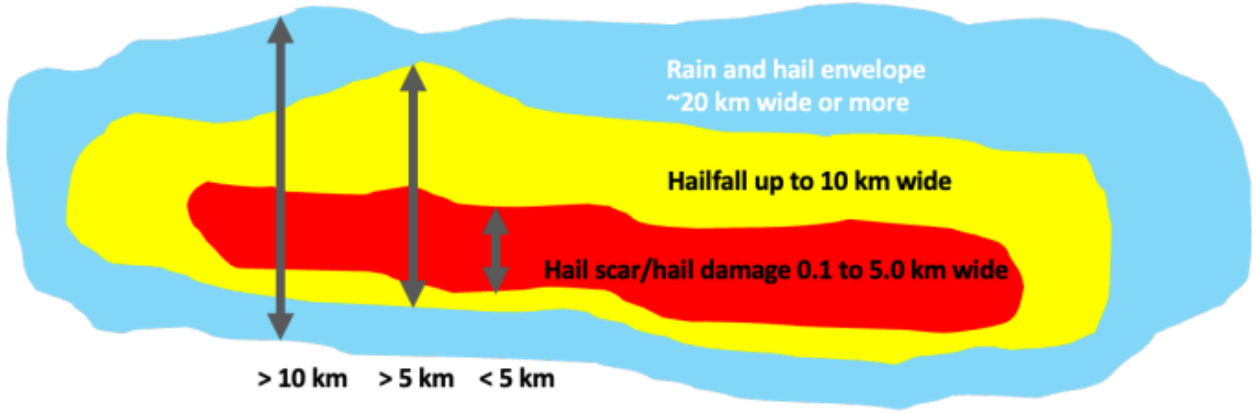
- Working with Kopp and Sills, develop methods to collect high-resolution data using UAVs
- Complete UAV transects to measure the variability of hail properties across hailswaths
- Sample hailswaths using a UAV equipped with a multi-spectral camera

Plus

- Compare UAV-sampled hailswaths to ground collection and radar data







Credit: Dr. Julian Brimelow / NHP

Image credit: https://www.dji.com/ca/support/product/mavic-2

2 x DJI Mavic 2 Pro

Image credit: https://ageagle.com/drones/ebee-x/

eBee-X (fixed-wing)

DJI M300 with multi-spectral camera

UAV Overview

UAV Flights 2023

		OPERATION DAY						
		Jun 25th	Jul 16th	Jul 22nd	Jul 27th	Jul 29th	Jul 30th	Jul 31st
UAV FLIGHTS	DJI Mavic 2 Pro	1	2	1	2	-	-	2
	eBee-X	-	-	-	-	3	1	1
	DJI M300	-	1	1	1	-	1	1

- *Total drone images captured:* ***23,639***
- *Hailswath transects (across width):* ***3***
- *Largest observed hail within a swath (measured by hand):* ***78mm***

June 25th

Scouting – Oblique view

Box (2.9cm/px resolution) - 120m flight

Turner Valley, AB

July 27, 2023 Hailswath

Est. length: 9km (ground measurements)

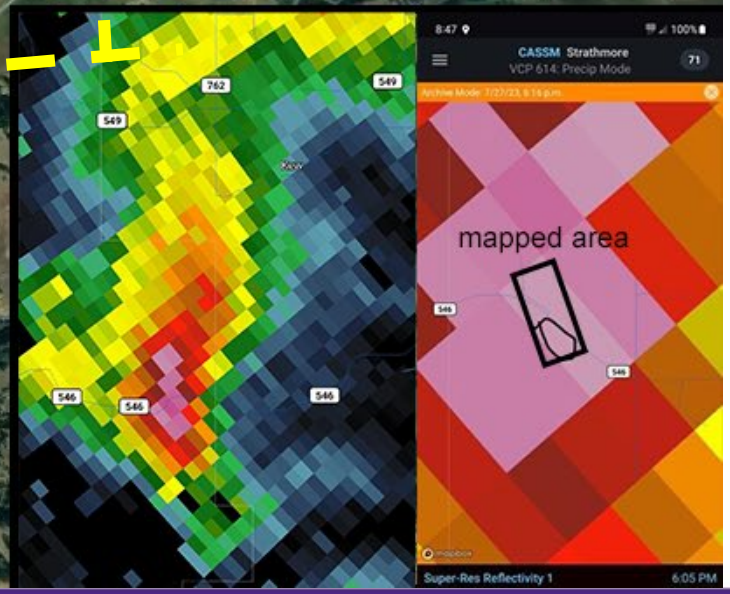
Est. width: 1.5km (drone transect)

Thermal, IR + RGB imagery captured

Max hail size: 16mm

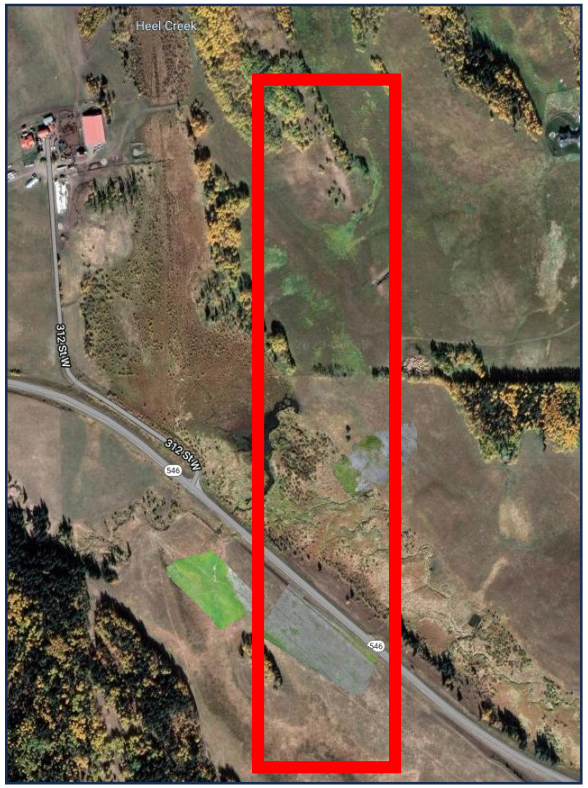
Approximate location of swath

Radar depiction +
bin mapping with Mavic 2 Pros

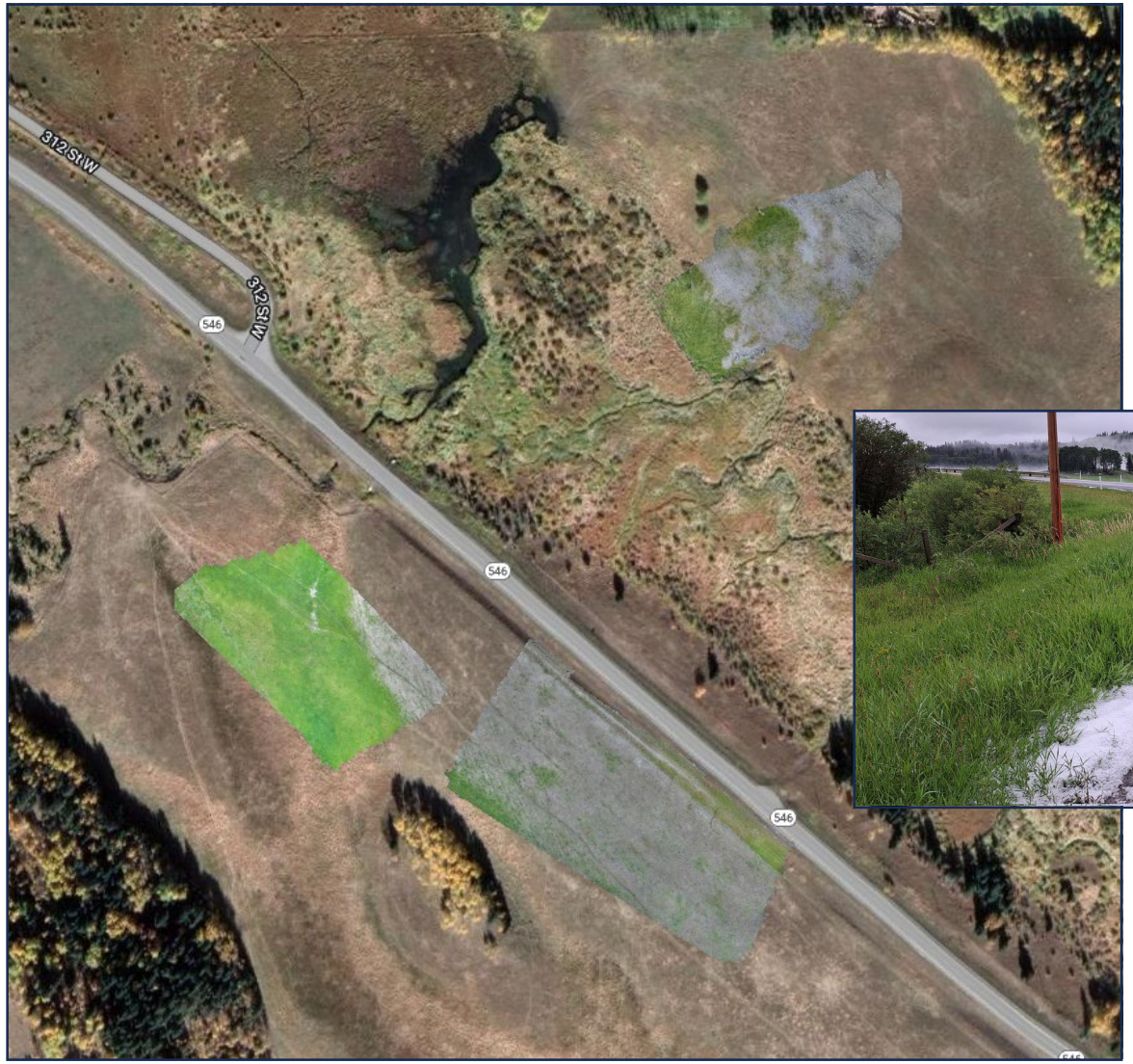


July 27th

July 27th



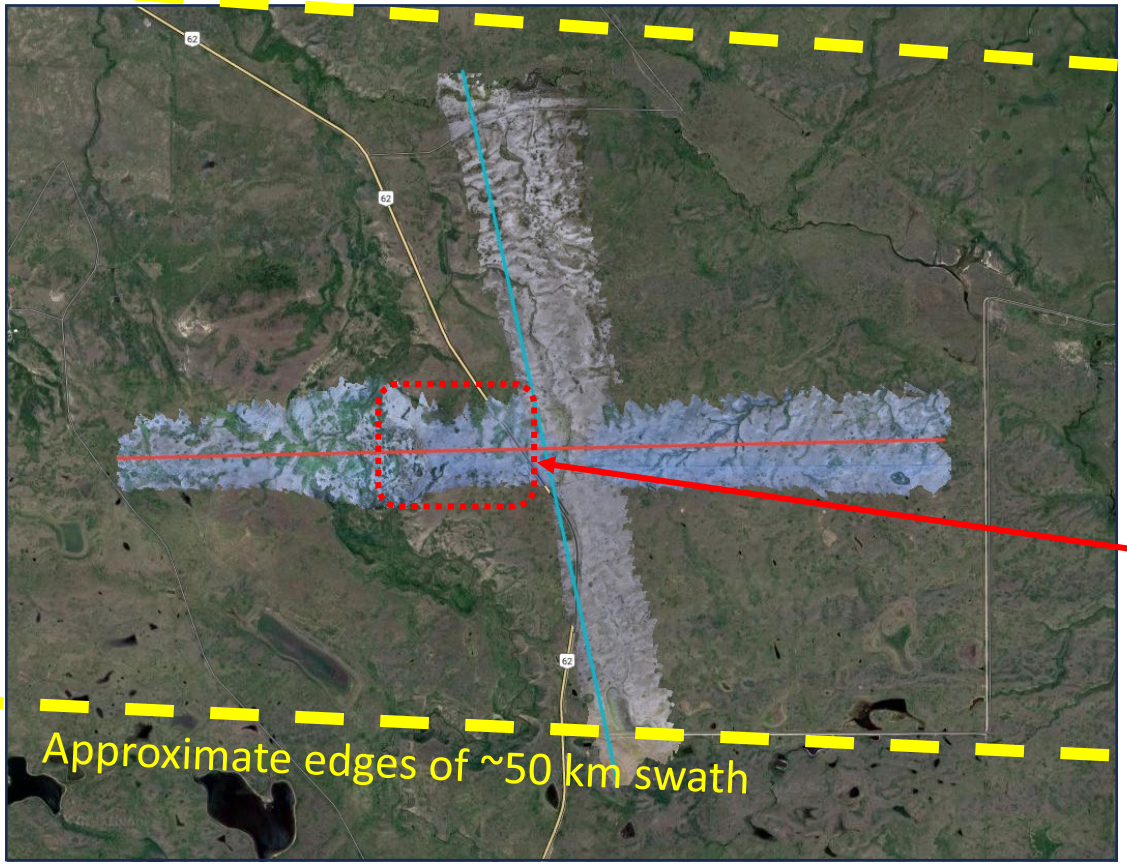
N/S Transect DJI M300
(resolution/processing pending)
- 350ft (106m) flight



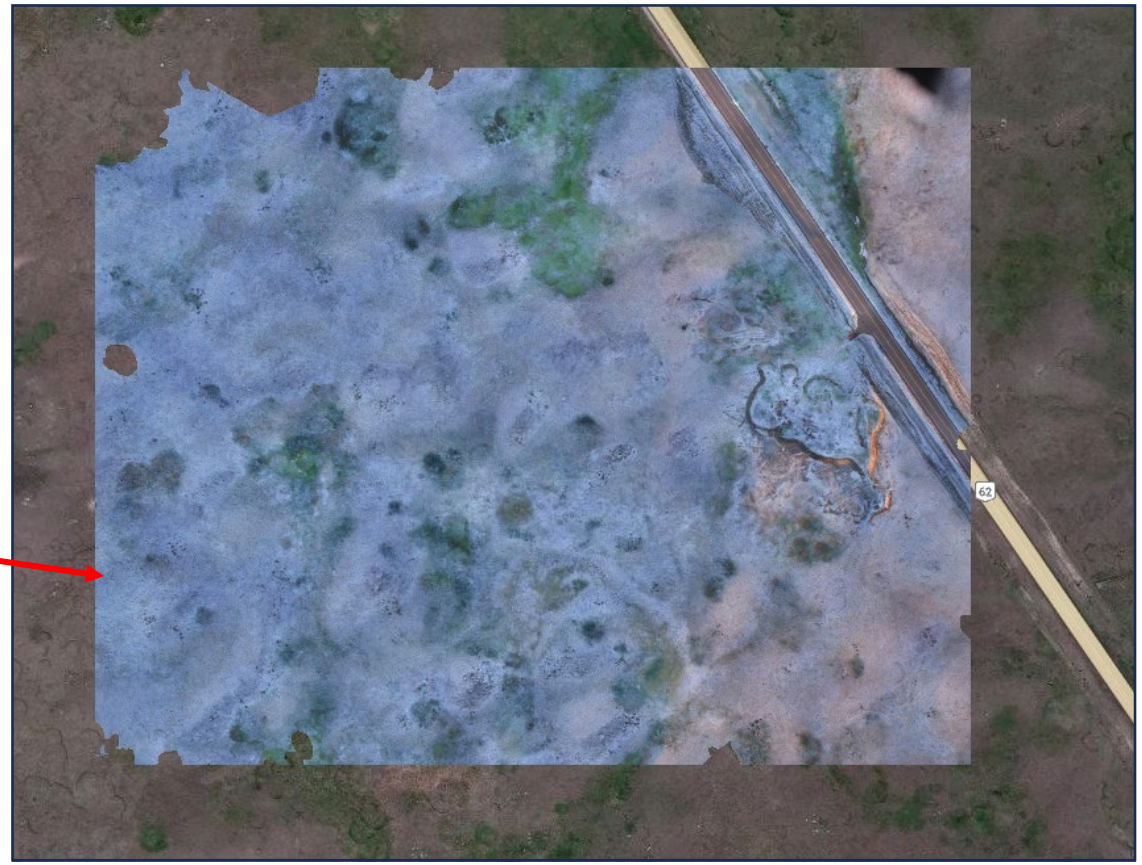
Ground View

Box Flights Mavic 2 Pro's Radar Bin Mapping
(0.6cm/px - 10m flights)

July 29th



N/S & W/E (3.1cm/px resolution) – two 114m flights

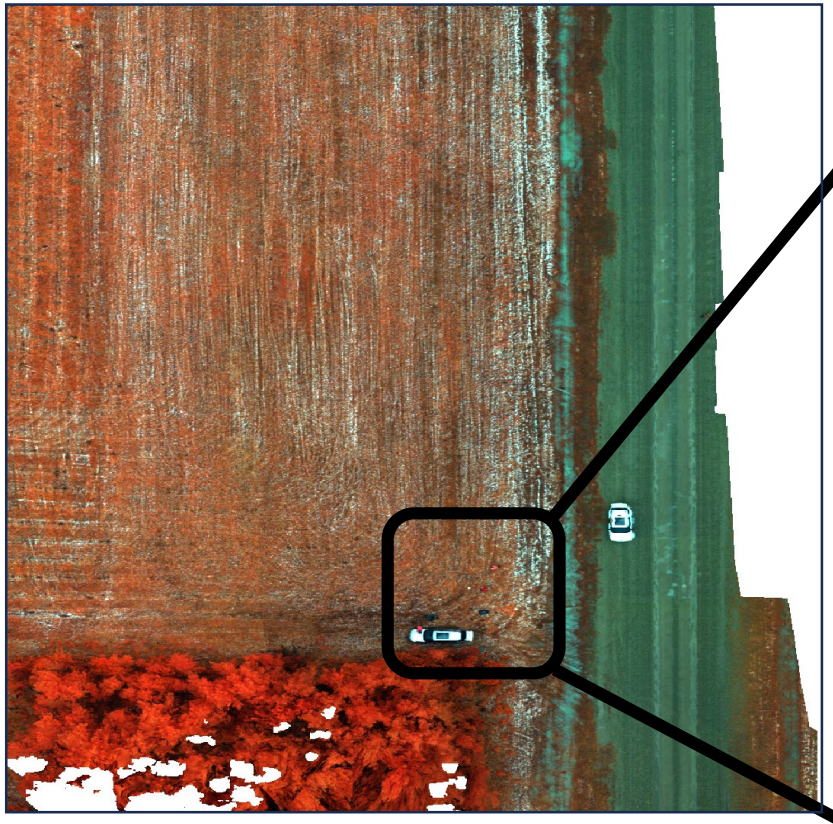


Box (1.5cm/px resolution) - 66m flight

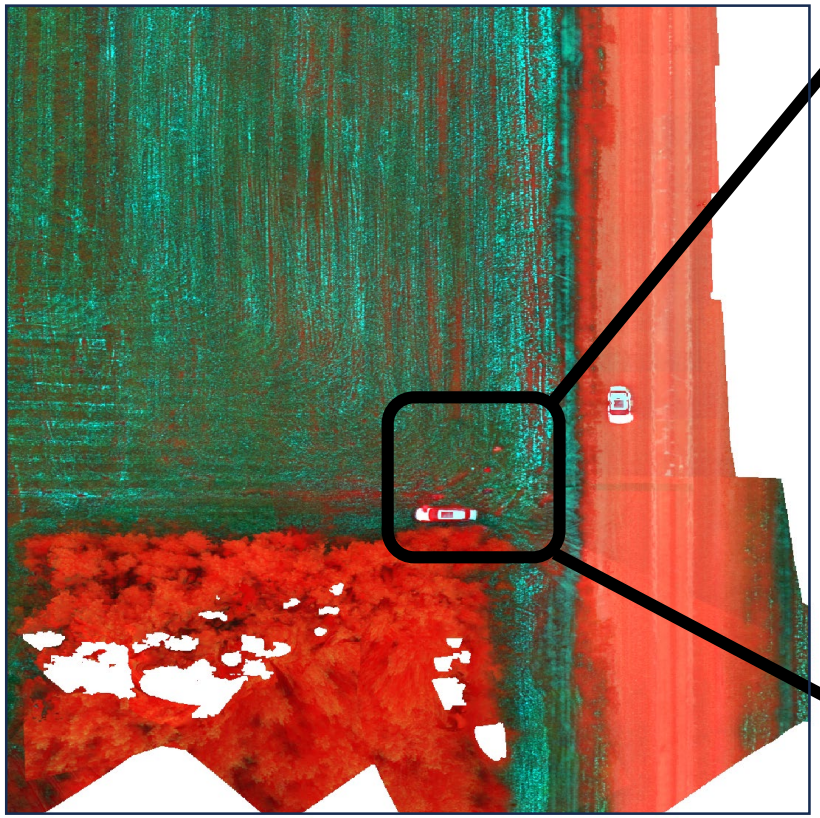
July 29th


MESc FLT > Whiskey Gap, AB
You're in Editor Mode
FLY
UPLOAD
EXPLORE
REPORT
Share
Jul 30, 2023
N-S + W-E
Compare
Length: 4.57 km
Horizontal Length: 4.40 km
Surface Length: 4.39 km
Slope: 1.11°, 1.94%
Vertical Height: 1.23 km
Surface Profile
Export CSV
Elevation (m)
1,300
1,200
1,100
0 750 1500 2250 3000 3750
Horizontal Length (m)
Add Issue
Add a comment
4.57 km
Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length: 6,642.52 Meters
Ground Length: 6,644.81
Heading: 149.15 degrees
Mouse Navigation
Save
Clear
McIntyre Ranch
6.6 km wide
Groud Survey

July 30th



July 30th

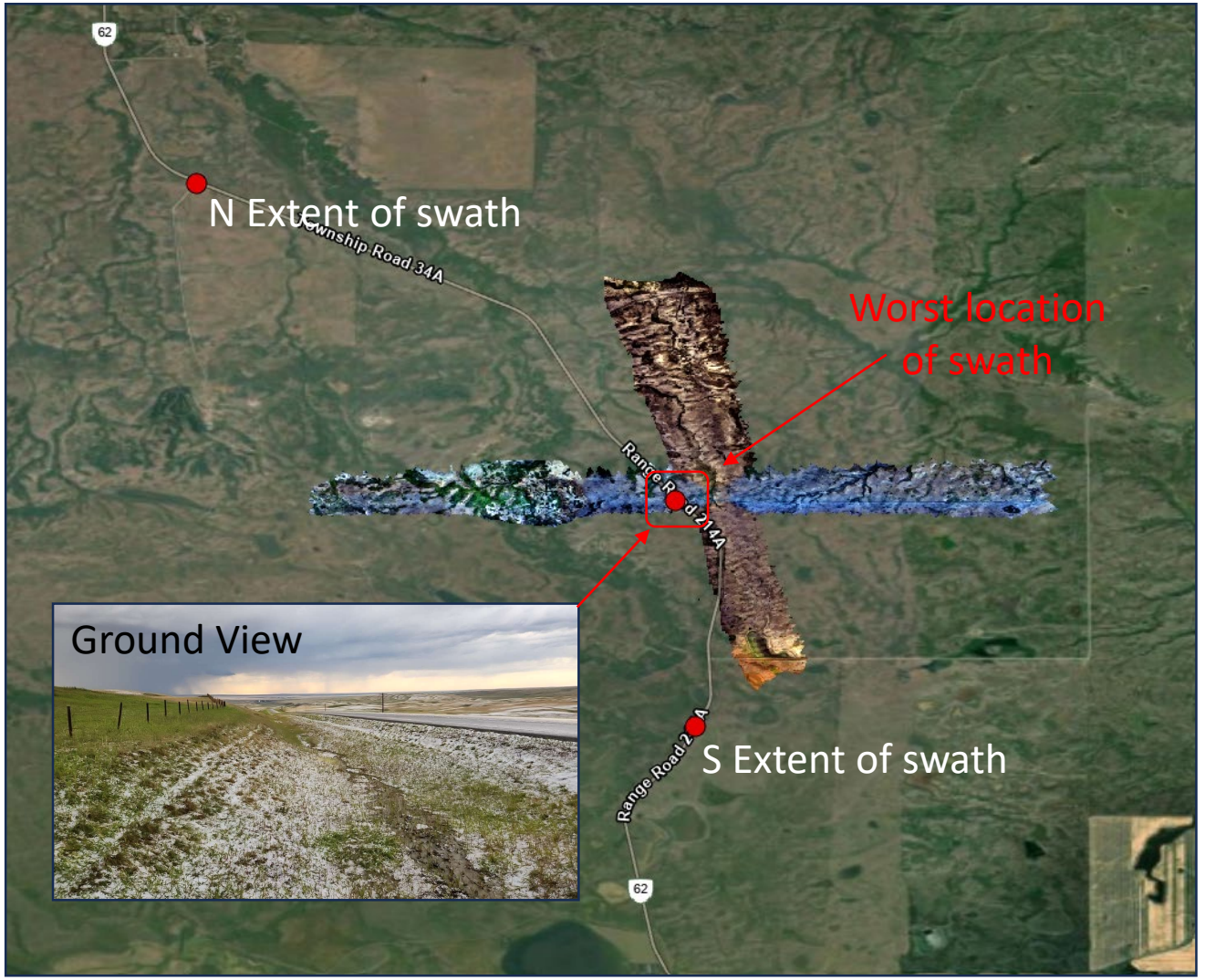


Next Steps

Ground Truth vs UAV Data

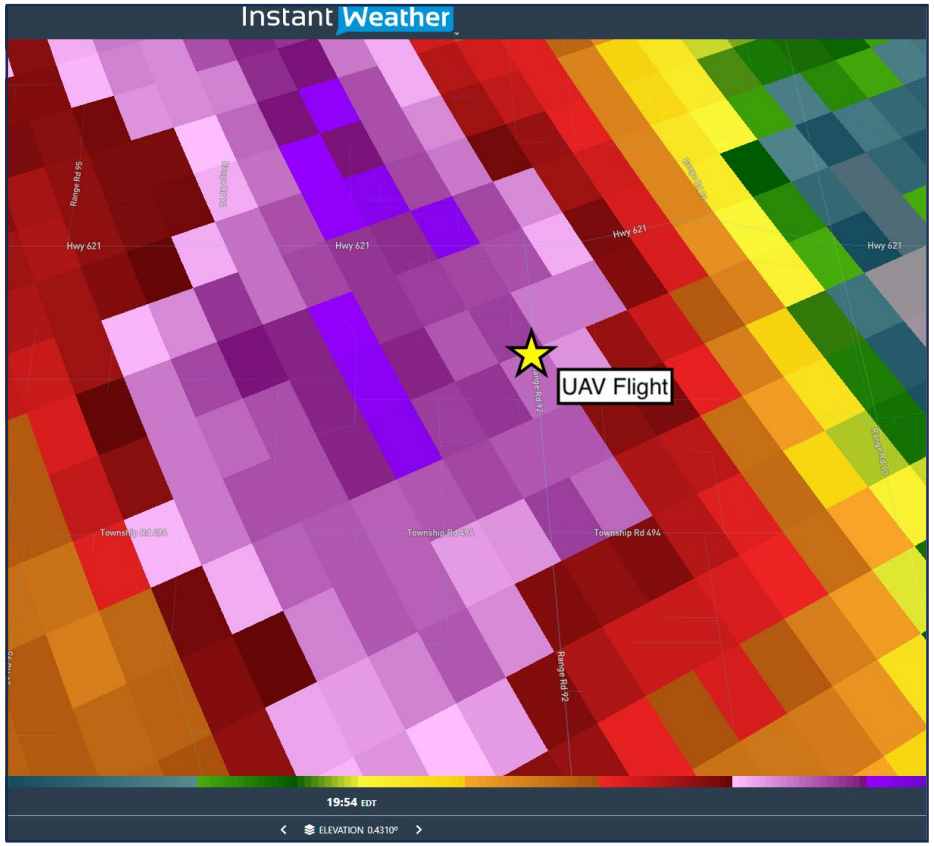
NHP Survey123 Data - flavign ‘Worst Location’ Survey123 Point

OBJECTID	238
ObjectID	565
GlobalID	8a640eec-37ae-4ab4-8166-2
To map out the length of the hail swath on your mobile device in the app CLICK HERE.	<Null>
To map out the length of the hail swath on your web browser CLICK HERE.	<Null>
Date & Time of Observation	7/30/2023 1:43:00 AM
Time of Observation in UTC/Z	<Null>
Observer Name	flavign
Event Name	Whisky Gap
Sampling Location for the Day	<Null>
Dimensions of Largest Hail Stone (in mm)	<Null>
Minimum Dimension (mm)	10
Maximum Dimension (mm)	42
Mass of Largest Hail Stone (in g)	<Null>
Percentage Ground Cover	seventysix_to_hundred
Depth (in cm)	3
Raining at time of collection?	no
Hail Sample Collected?	no

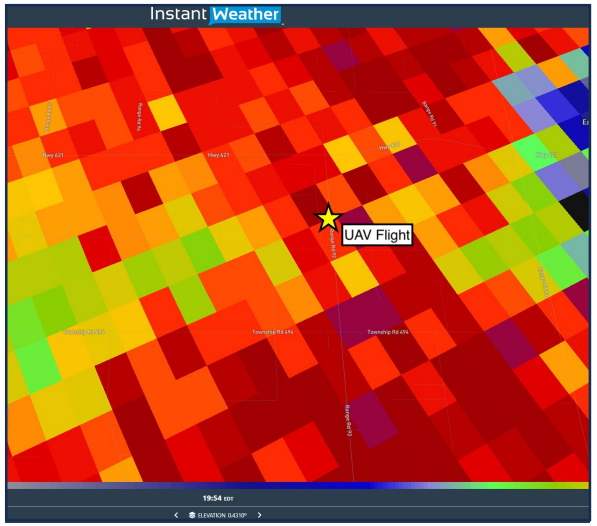


UAV Data vs Radar

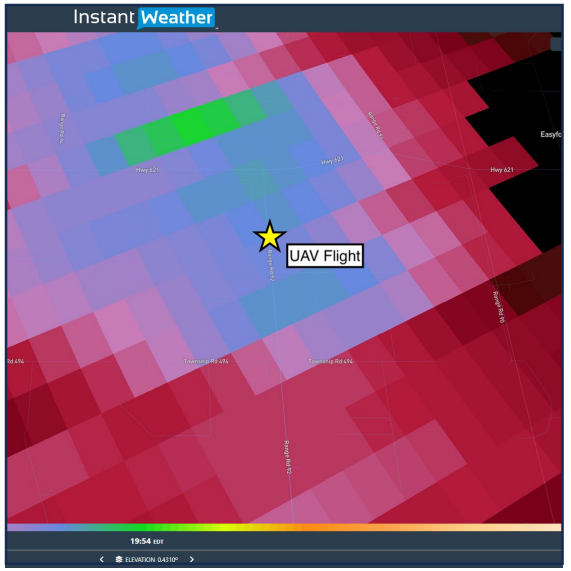
DJI M300 – 0.969cm/px resolution



Reflectivity



Correlation Coefficient



Specific Differential Phase

Summary

- Ultimately, UAVs are a great tool to capture hailswaths!!
- UAVs were used during 6 missions of the NHP field campaign + once during a ‘down’ day (July 29th)
- The most comprehensive dataset of a hailswath (UAVs + ground observations) was on July 27th (DJI Mavic 2 Pro and DJI M300 flights)
- The best dataset documenting the width of a hailswath with a UAV was on July 29th (eBee X flights)
- Methodology for optimally capturing hailswaths will be developed
- The UAV data collected will be compared against ground-based and radar-based observations of hail

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