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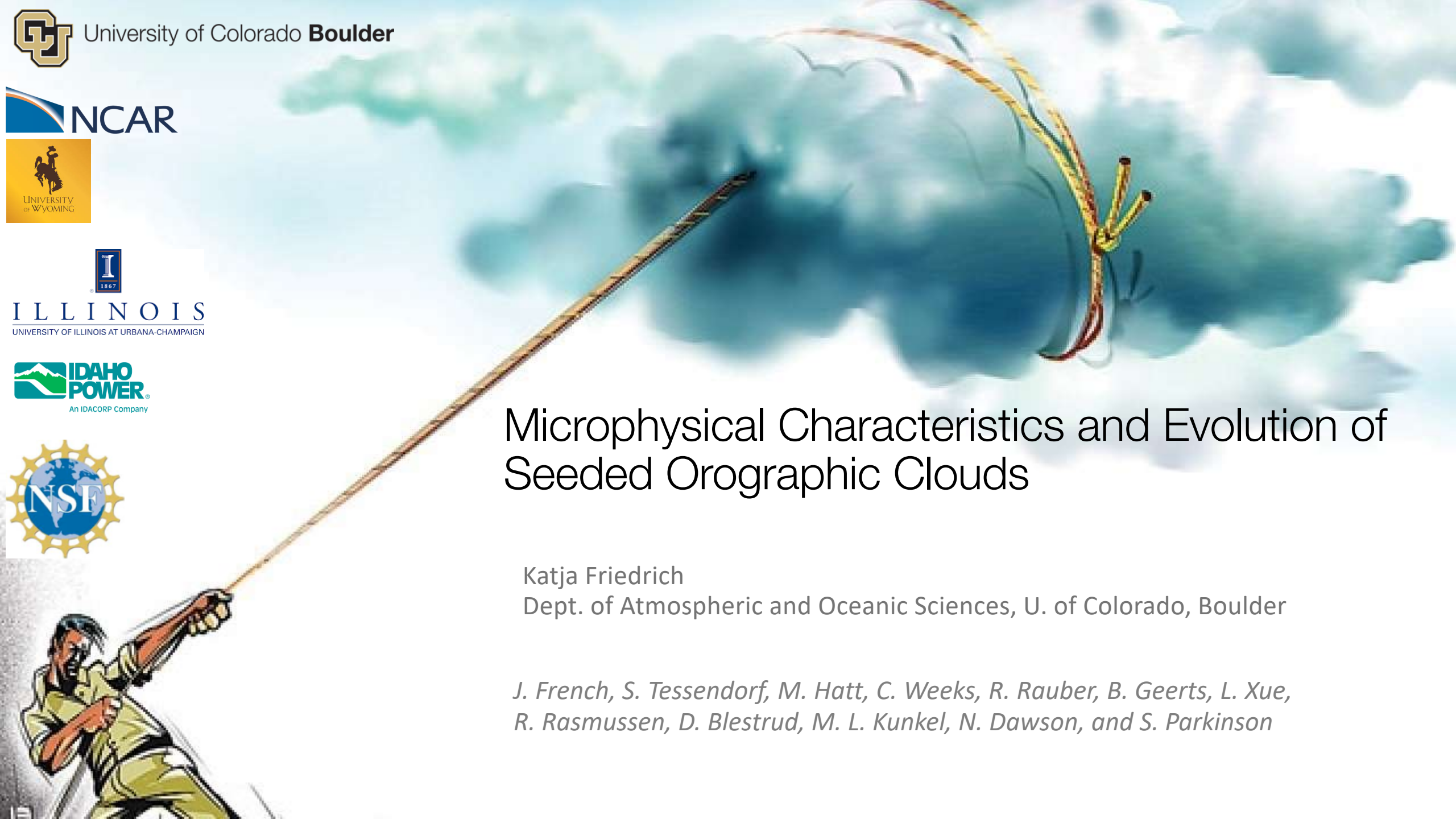

Microphysical Characteristics and Evolution of Seeded Orographic Clouds

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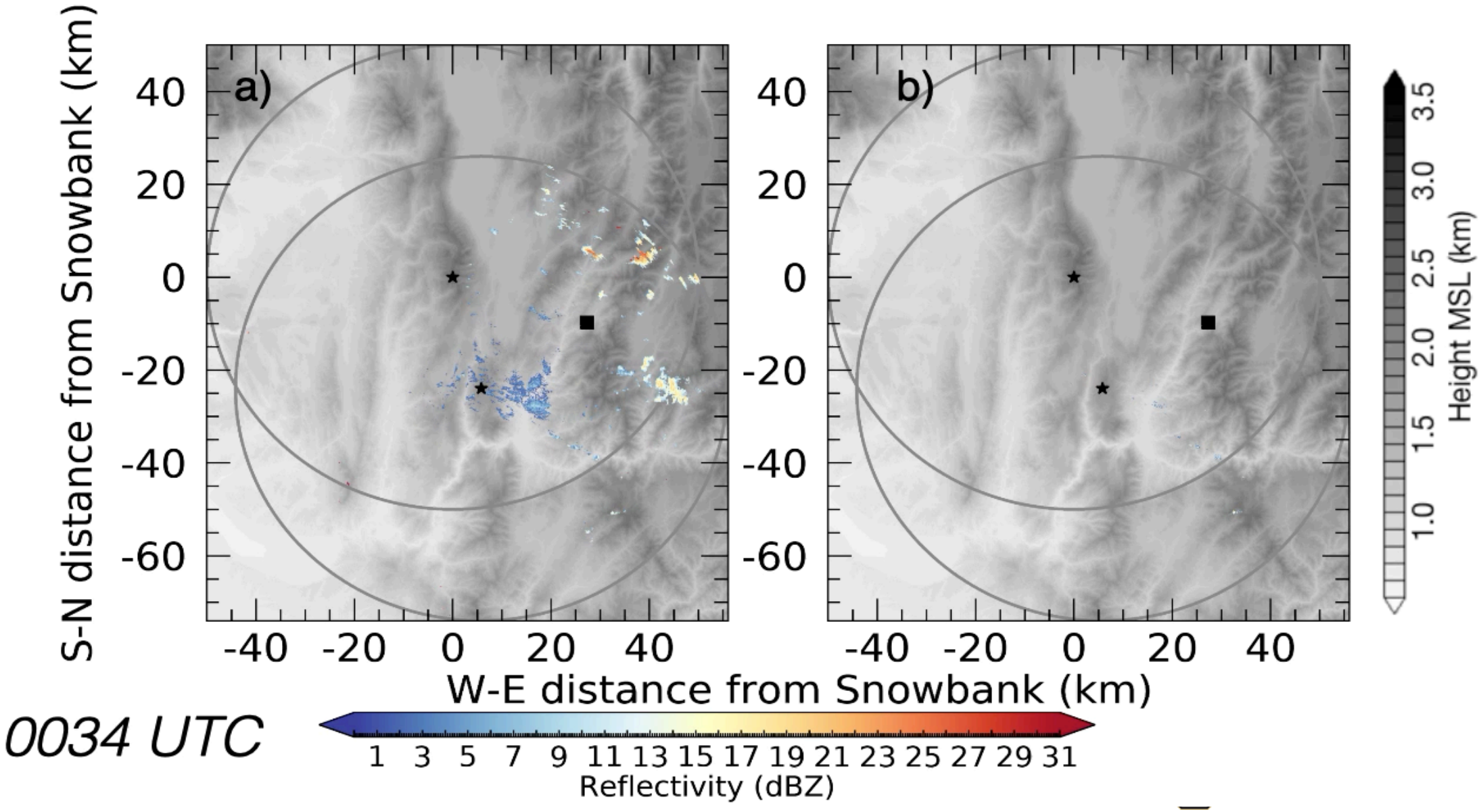
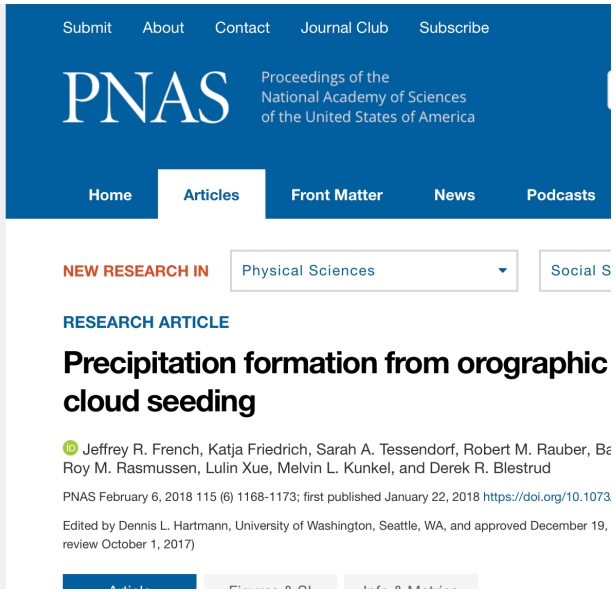
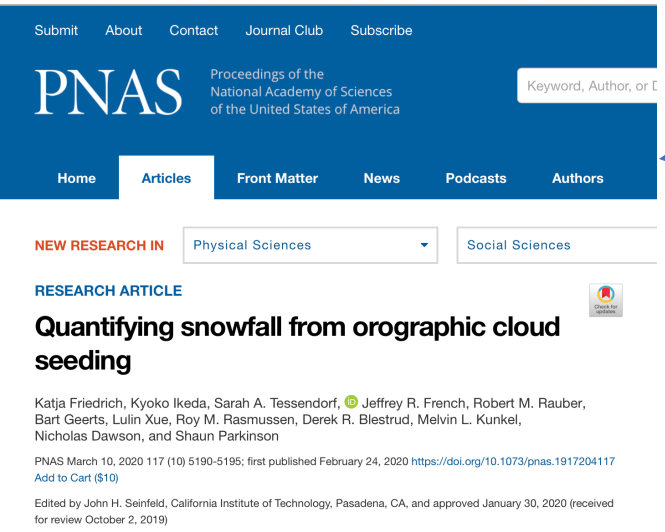
J. French, S. Tessendorf, M. Hatt, C. Weeks, R. Rauber, B. Geerts, L. Xue, R. Rasmussen, D. Blestrud, M. L. Kunkel, N. Dawson, and S. Parkinson

MOTIVATION


a)
b)
S-N distance from Snowbank (km)
W-E distance from Snowbank (km)
40
20
0
-20
-40
-60
Height MSL (km)
1.0
1.5
2.0
2.5
3.0
3.5
0034 UTC
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
Reflectivity (dBZ)

MOTIVATION





Can significant amounts of ice be initiated in cloud? (French et al. 2018)

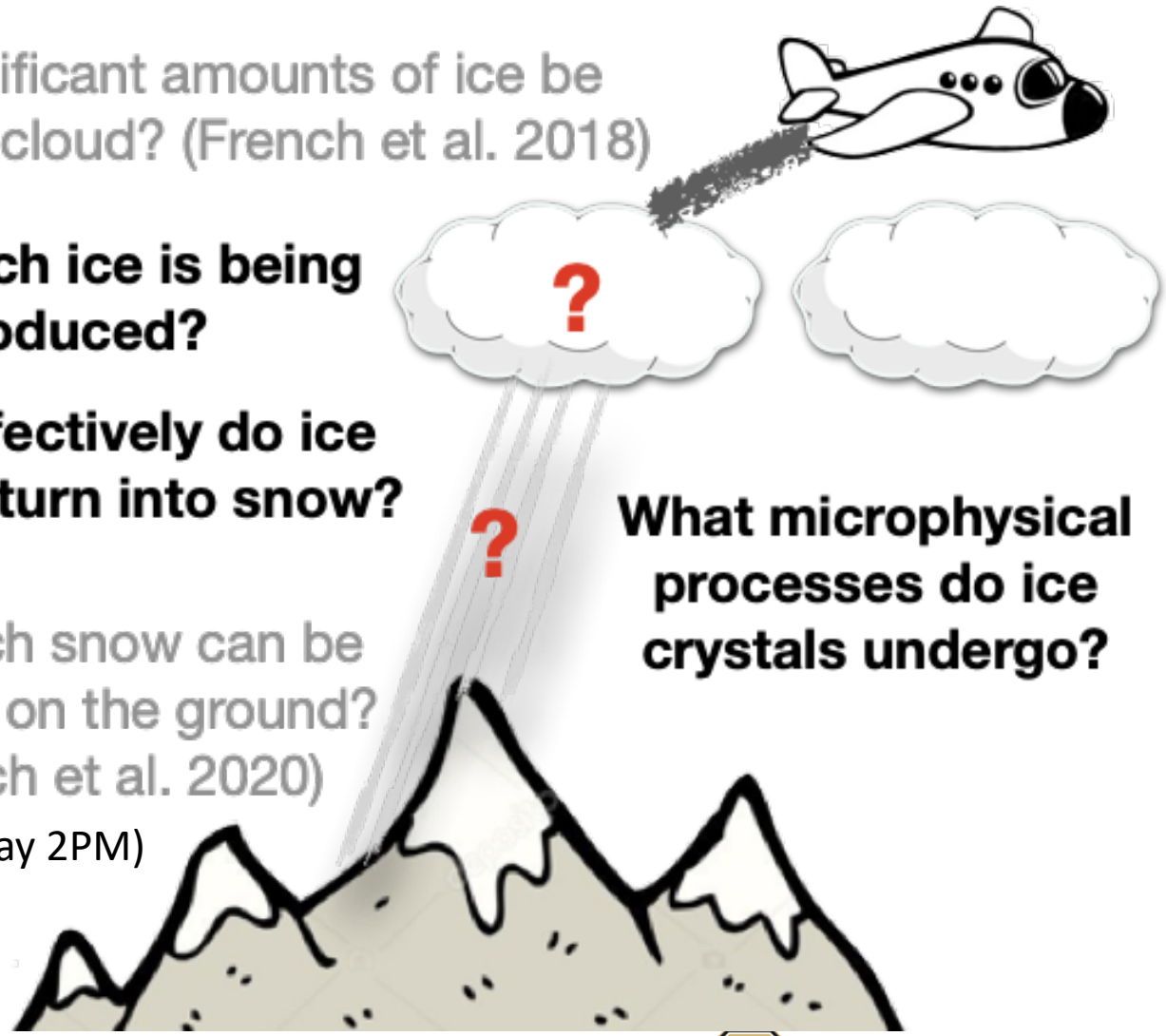
How much ice is being produced?

How effectively do ice crystals turn into snow?

What microphysical processes do ice crystals undergo?

How much snow can be produced on the ground? (Friedrich et al. 2020)

(Poster Tuesday 2PM)



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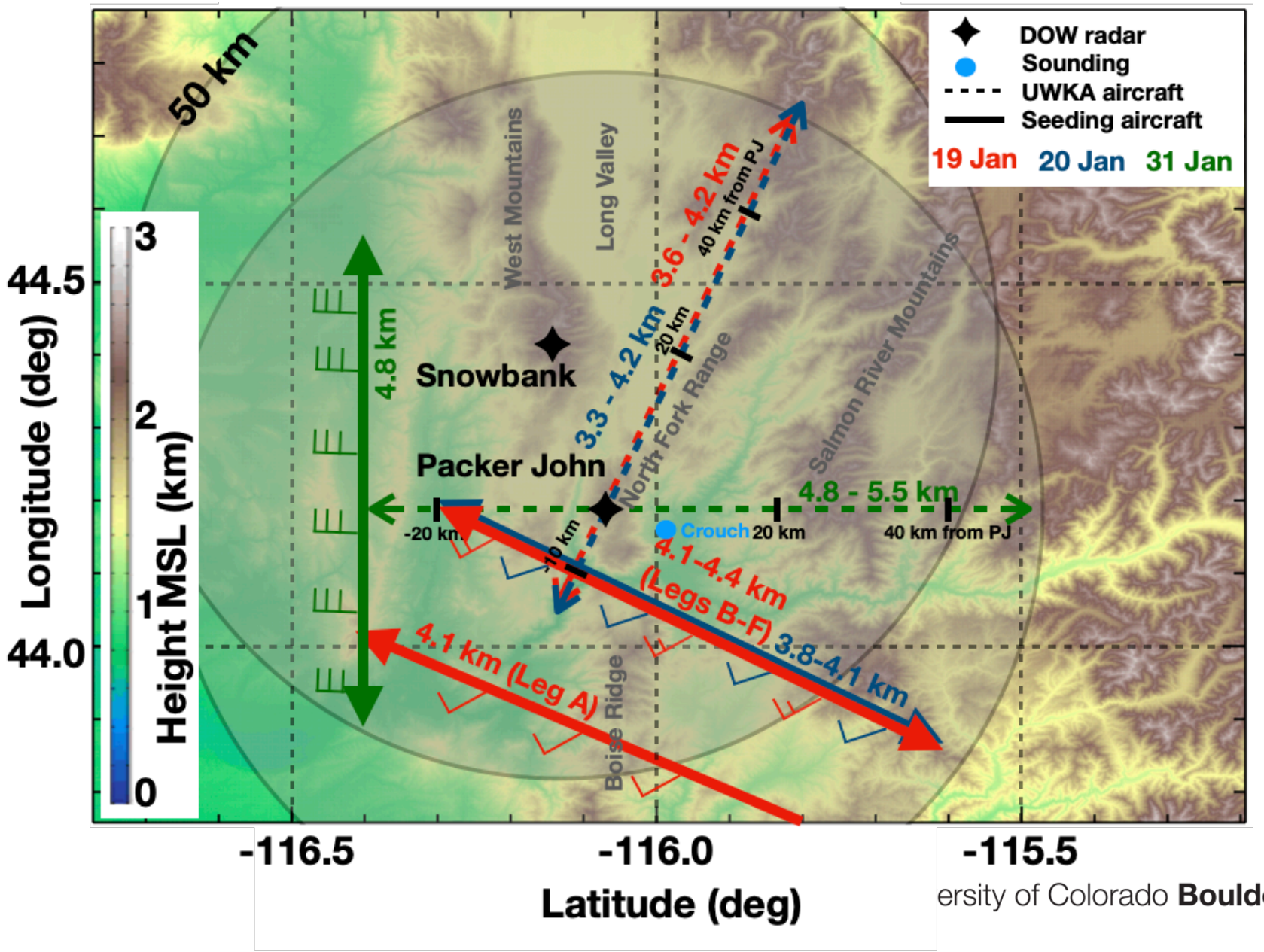
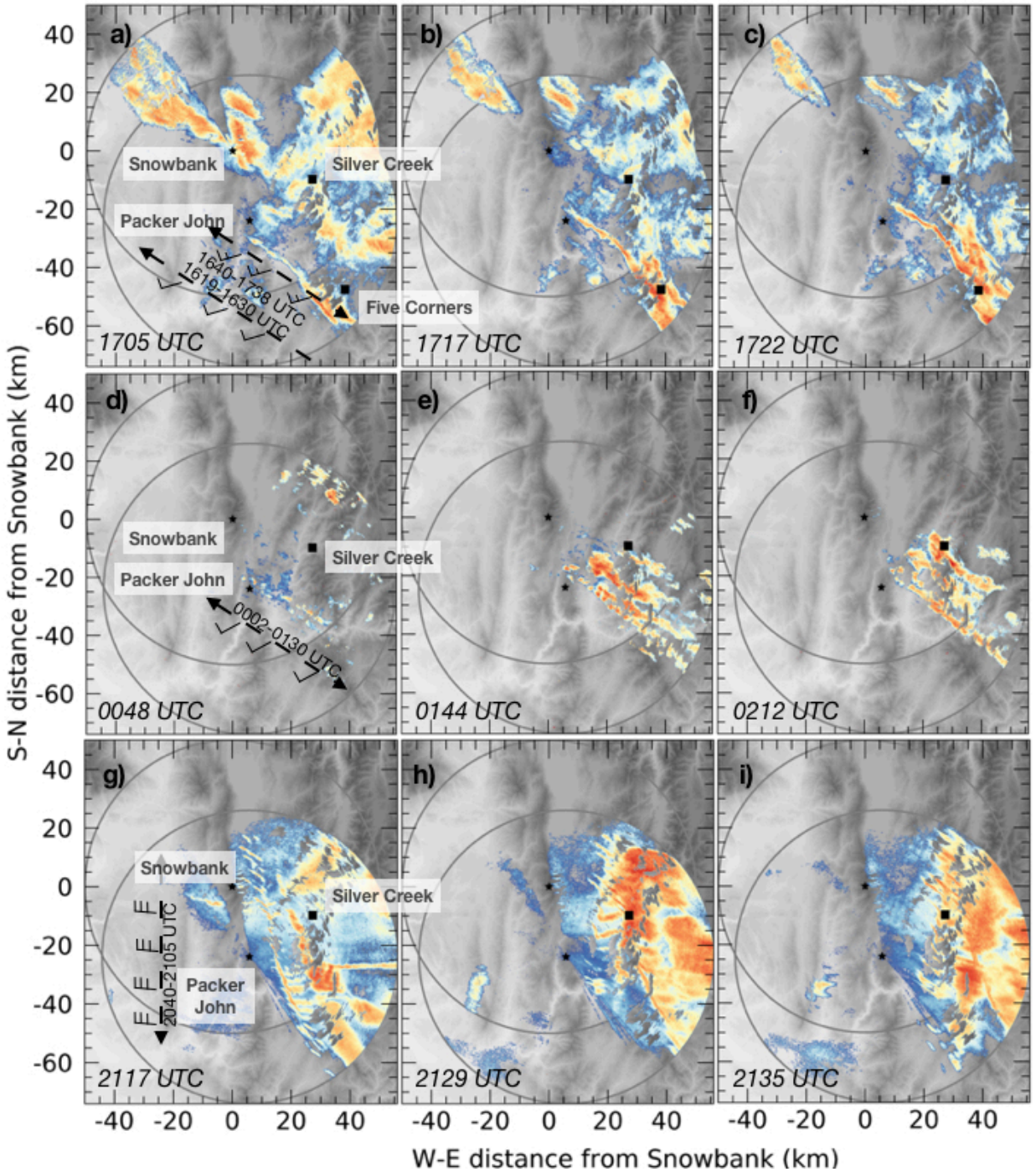
DATA & METHOD

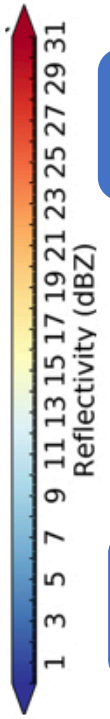
SNOWIE (Seeded and Natural Orographic Wintertime Clouds: The Idaho Experiment)

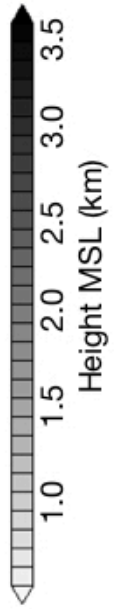
Jan-March 2017
in Idaho

- Seeding aircraft flew legs perpendicular to the wind upwind of domain
- 2 x X-band scanning radars @ Packer John, Snowbank
- 2 x precipitation gauges @ Silver Creek, Five Corners









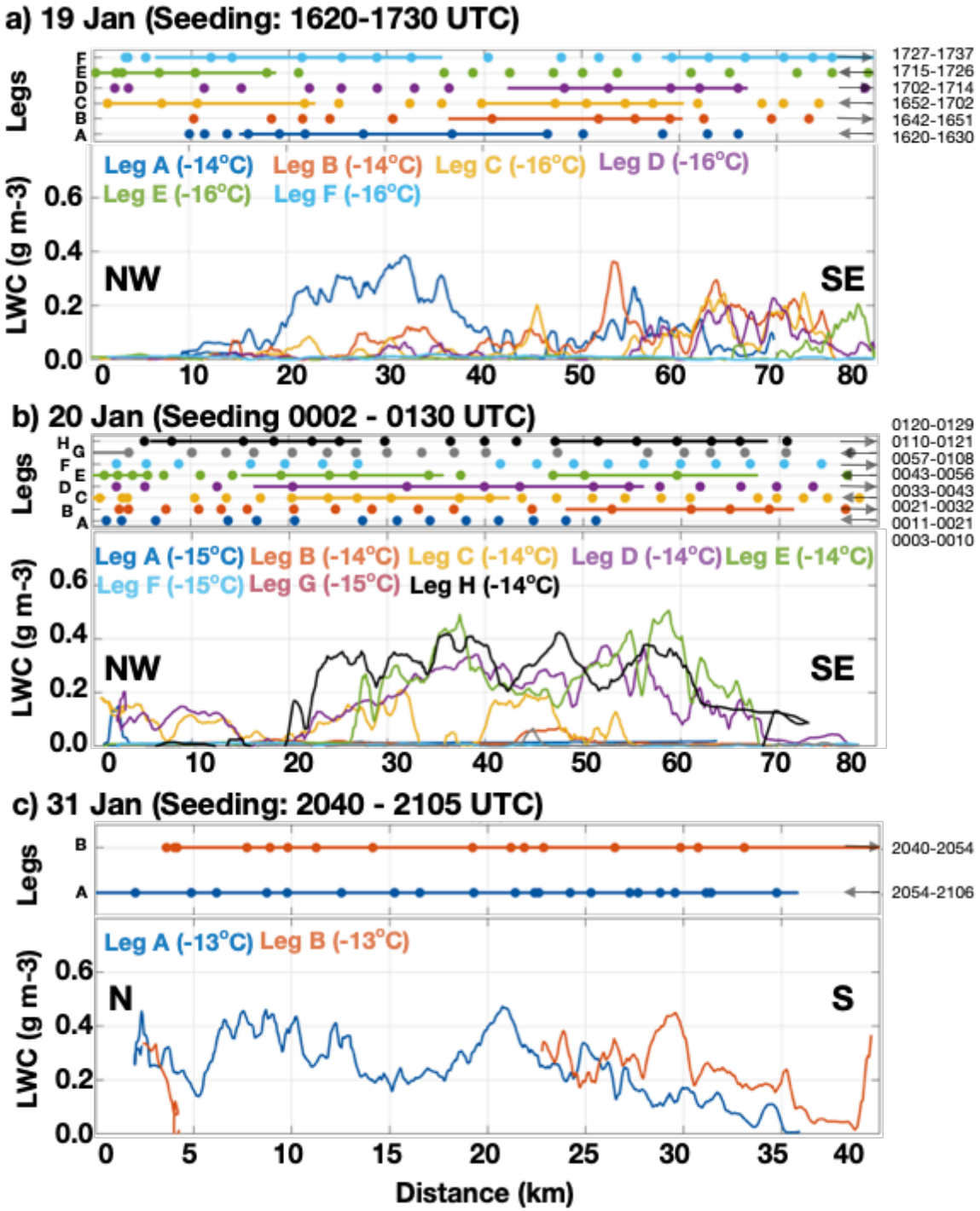
Case1

Case2

Case3

3 Cases with seeding lines with no/little natural precipitation

ENVIRONMENTAL CONDITIONS & SEEDING



	19-Jan (Leg A-B)	20-Jan	31-Jan
Environmental conditions (outside of the seeding lines)			
Seeding Aircraft			
Mean LWC (g m^{-3})	0.11-0.17	0.04-0.3	0.23-0.24
Wind speed (m s^{-1})	15-18	10	30-40
Temperature (degC)	-16 to -14	-15 to -14	-13
IWC (L^{-1})	1	1-5.	N/A

Case1 -3

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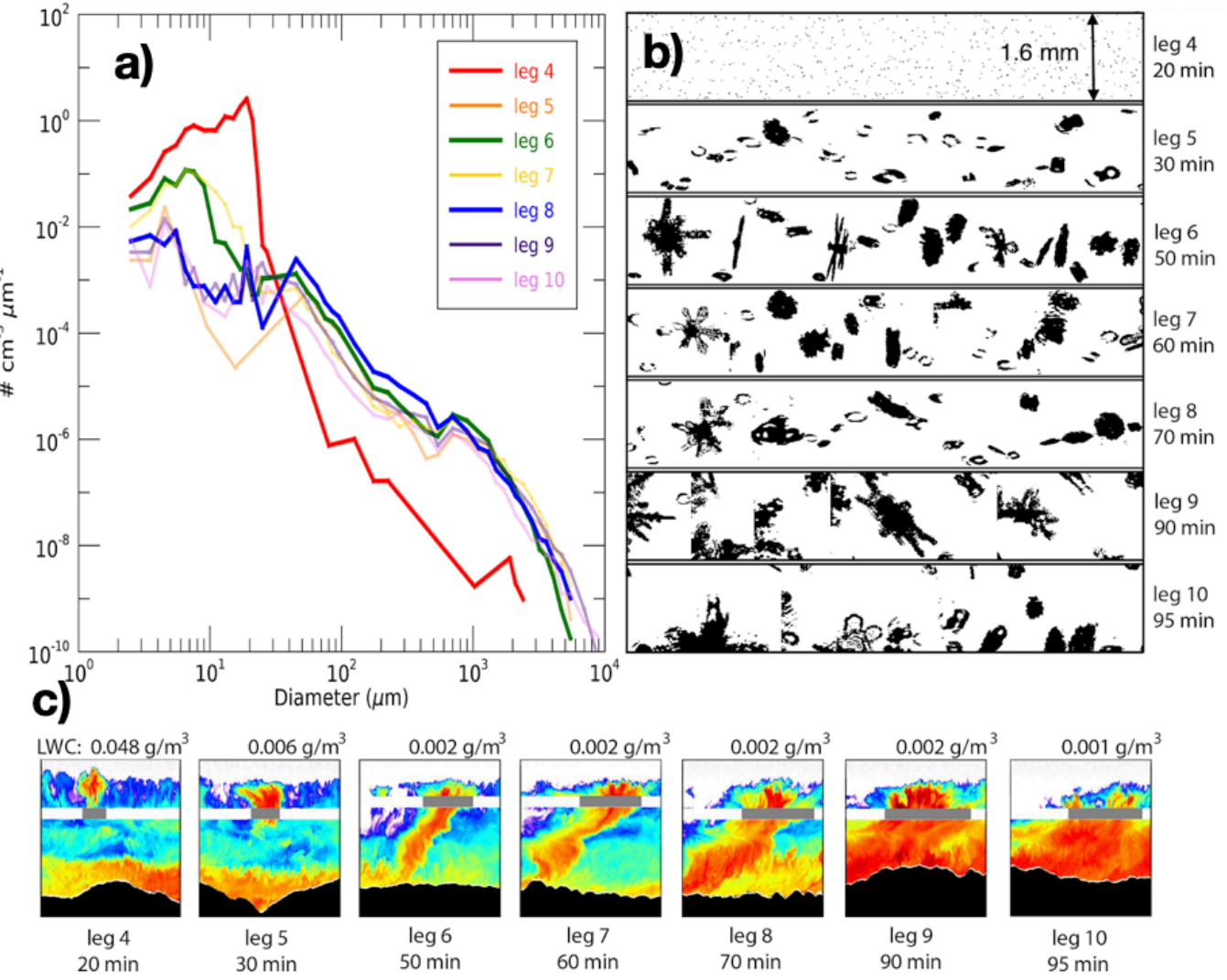
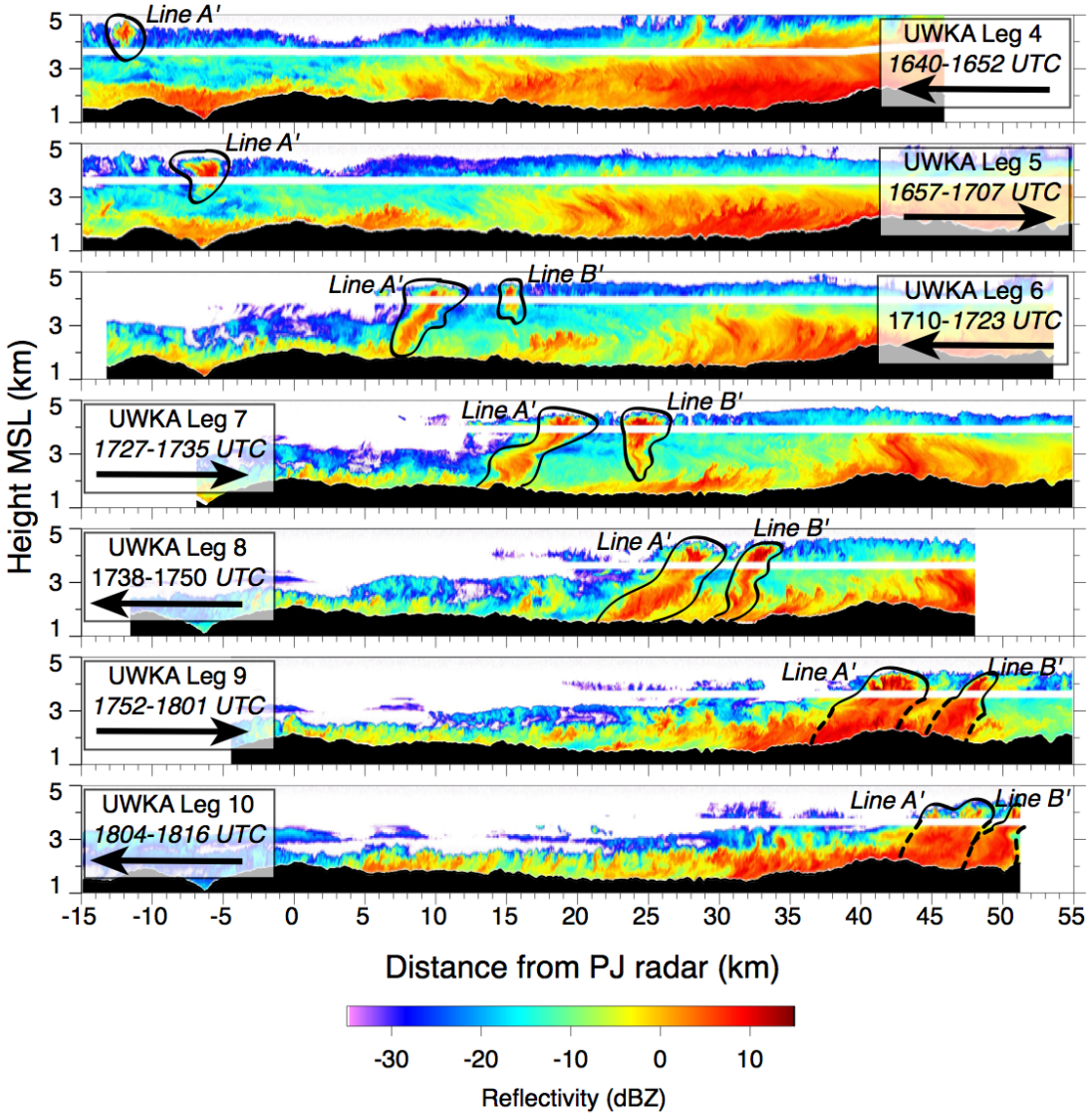
Case1

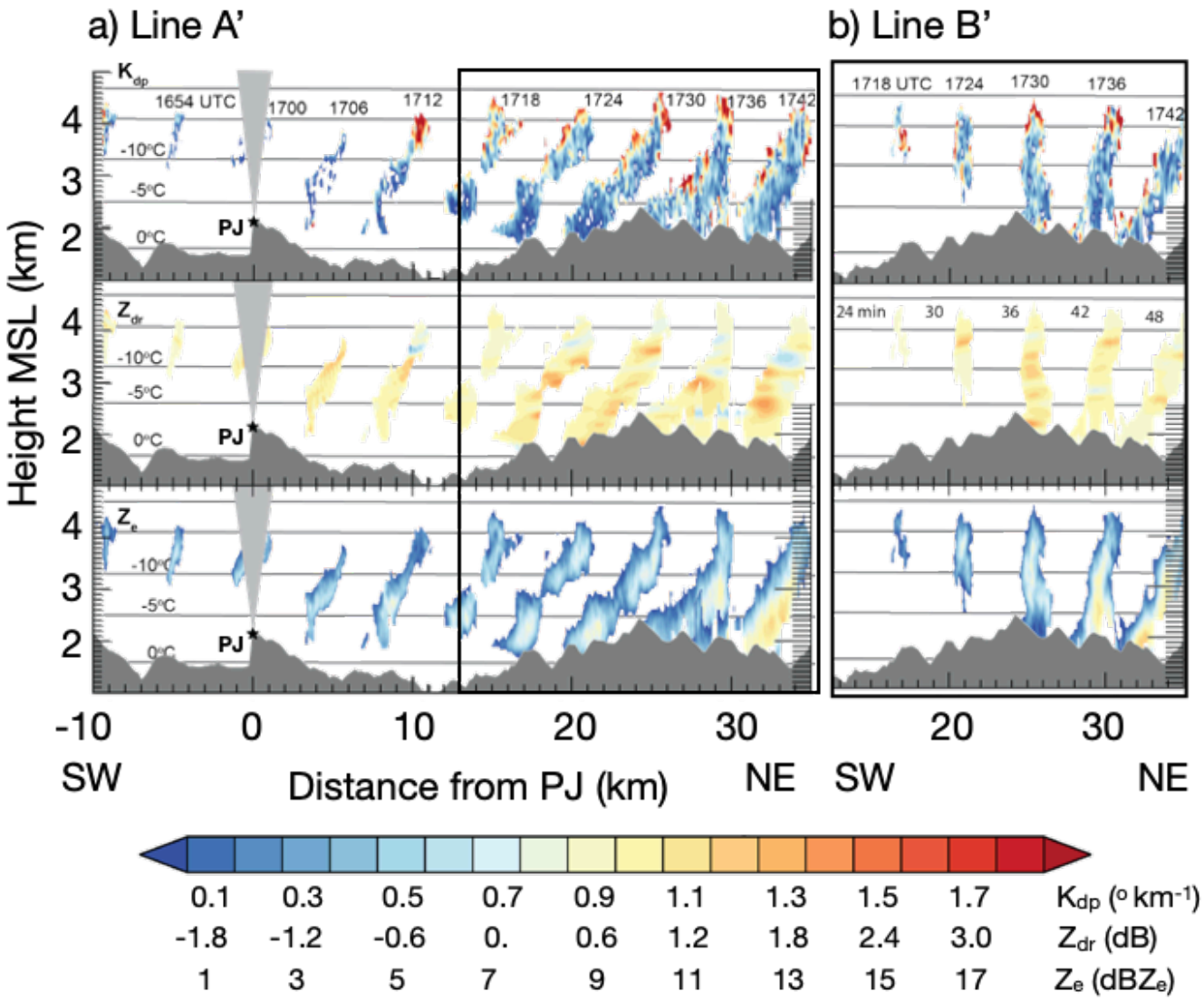
Ice initiation

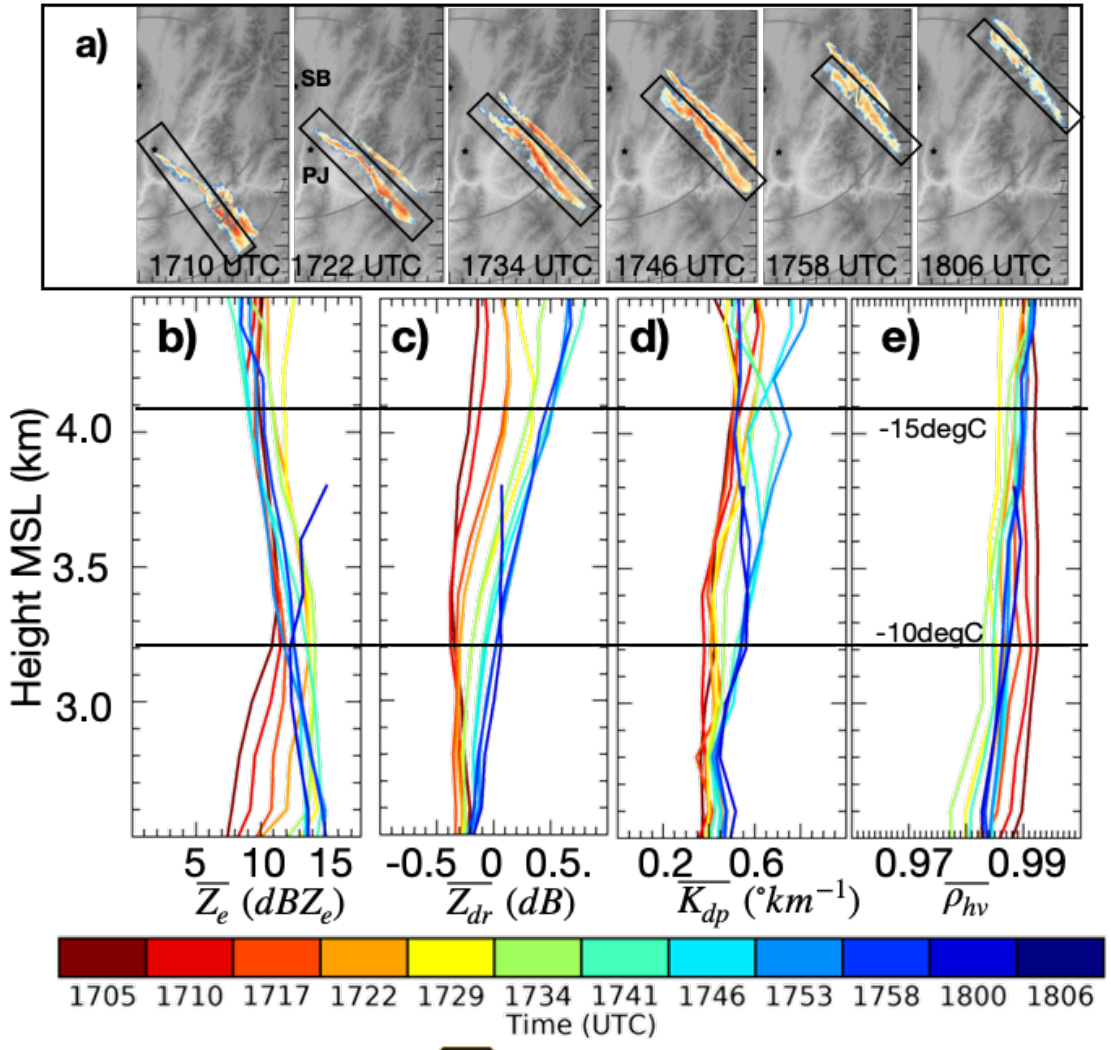




Case1

Snow Growth





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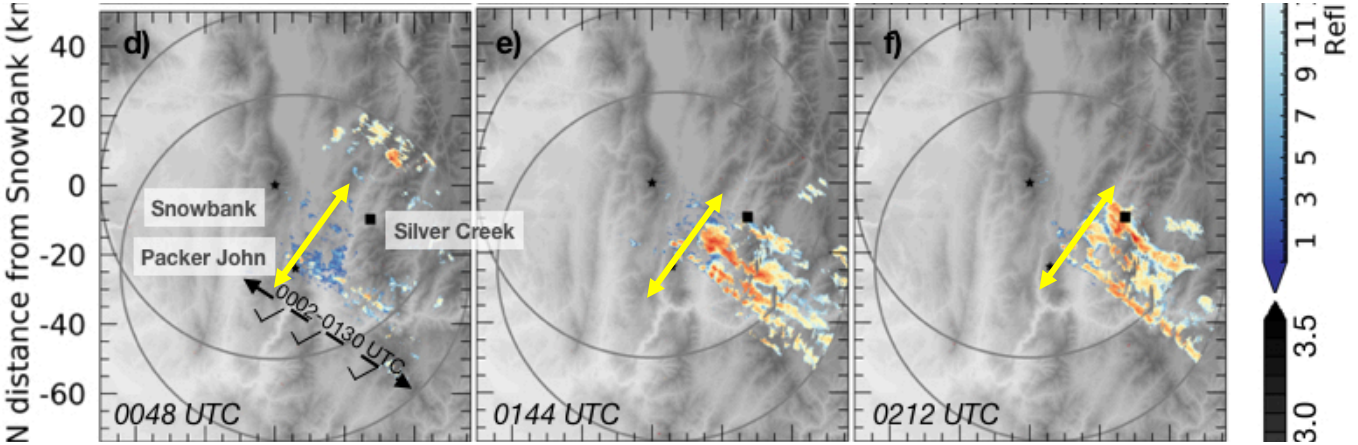
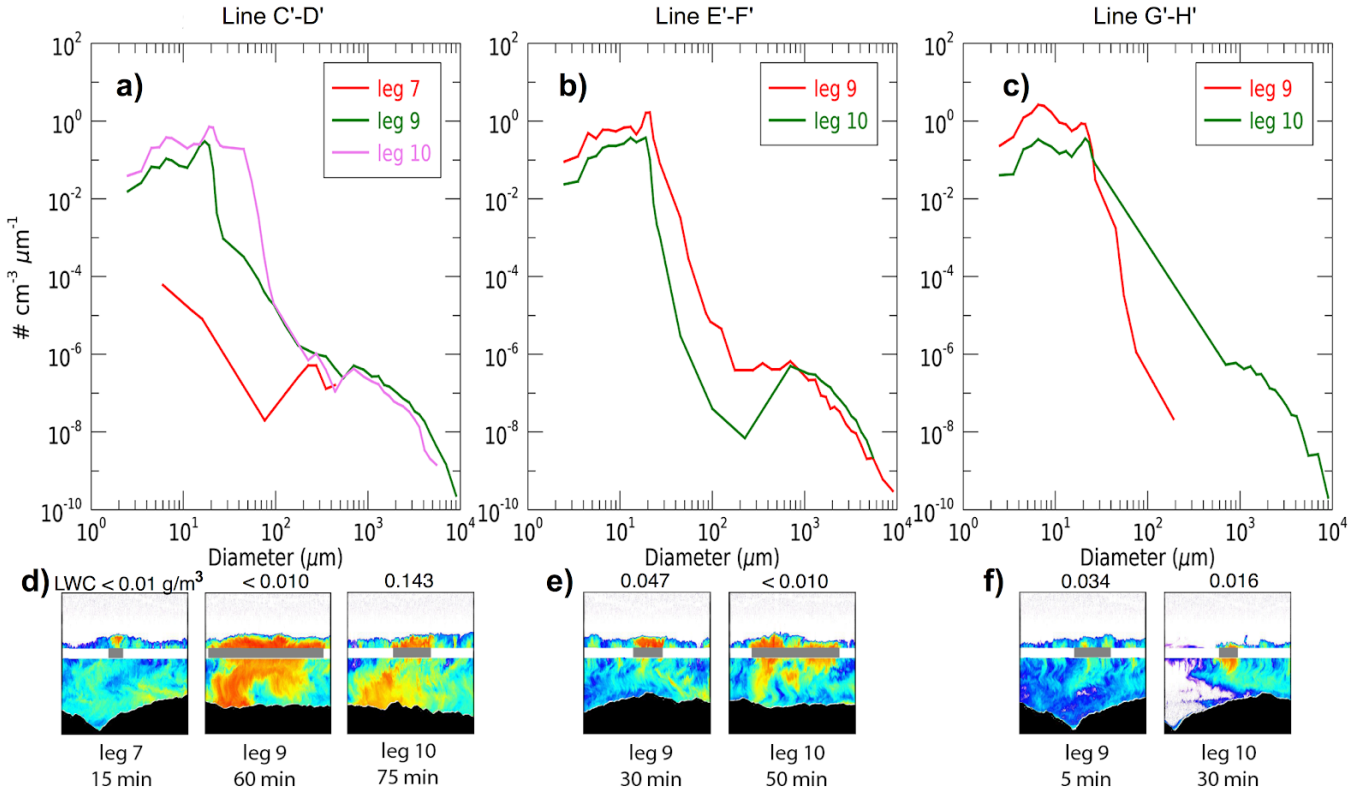
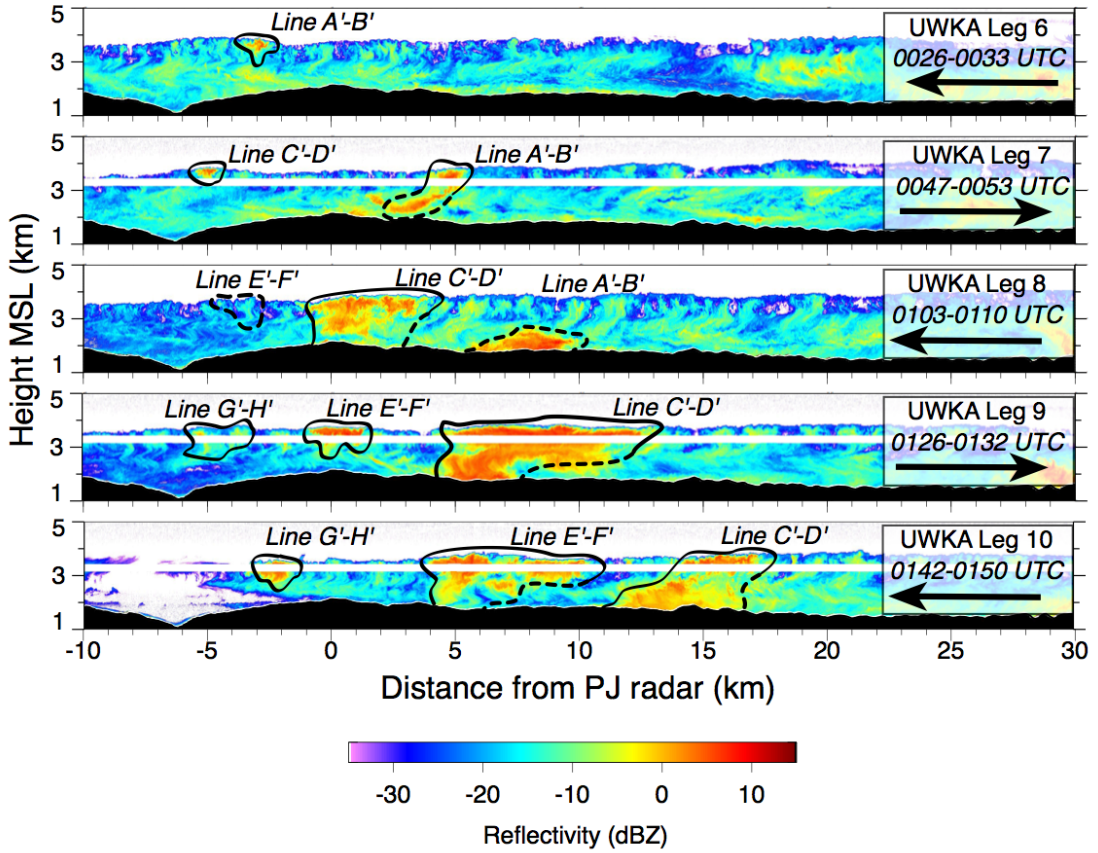
Case2

Ice initiation

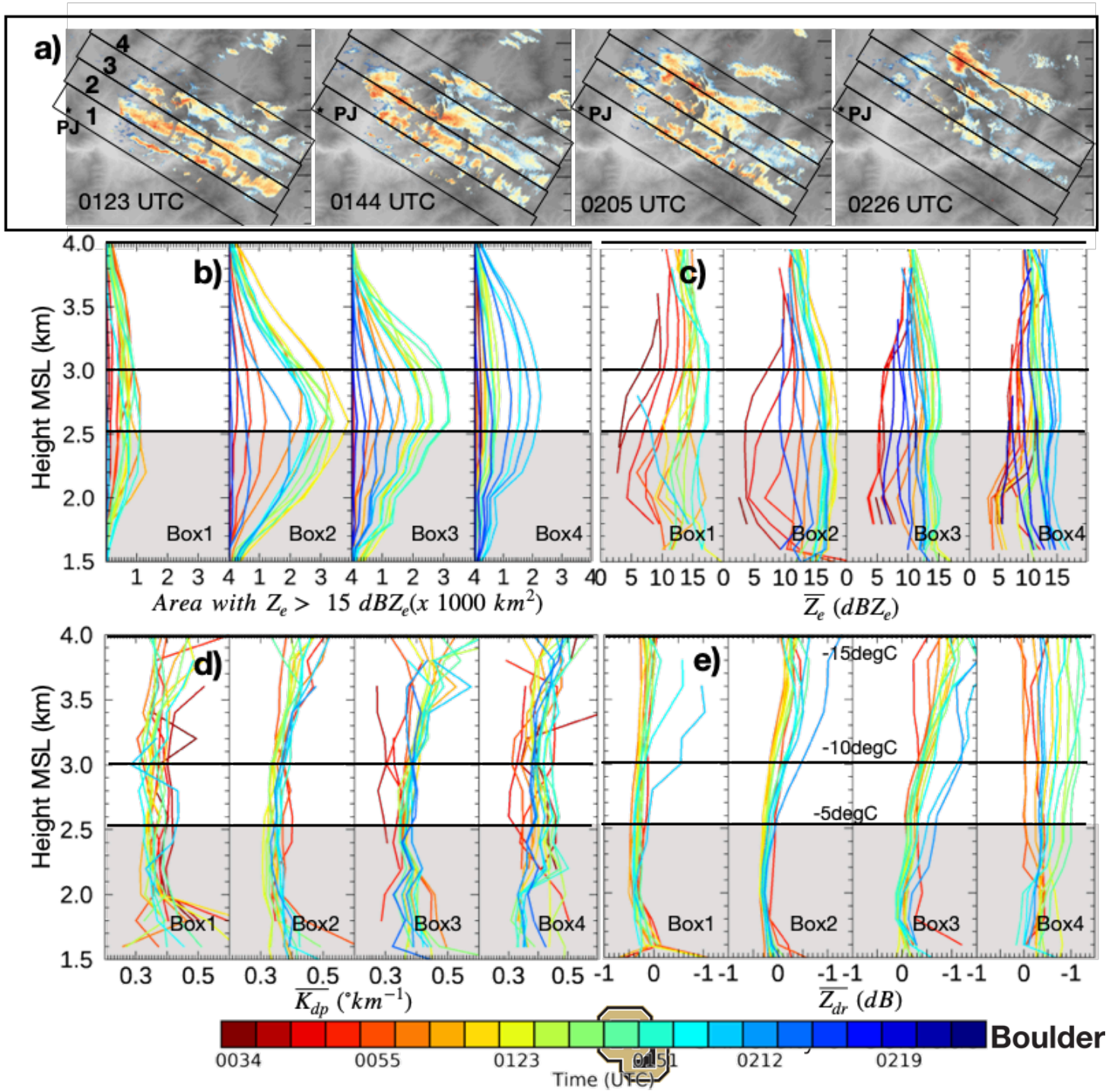


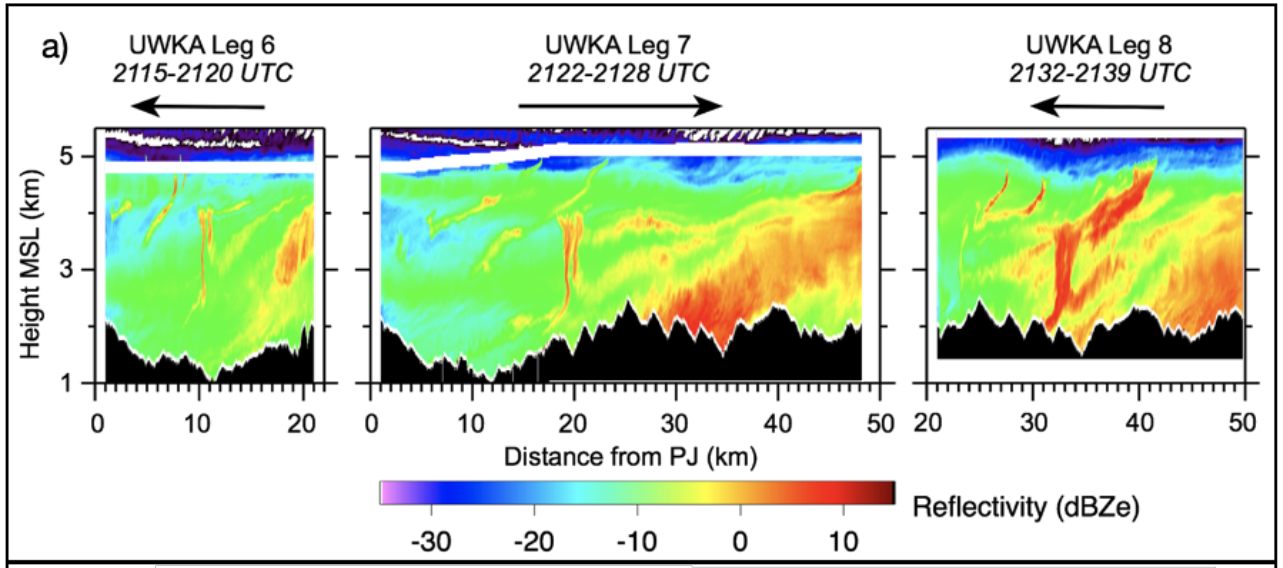


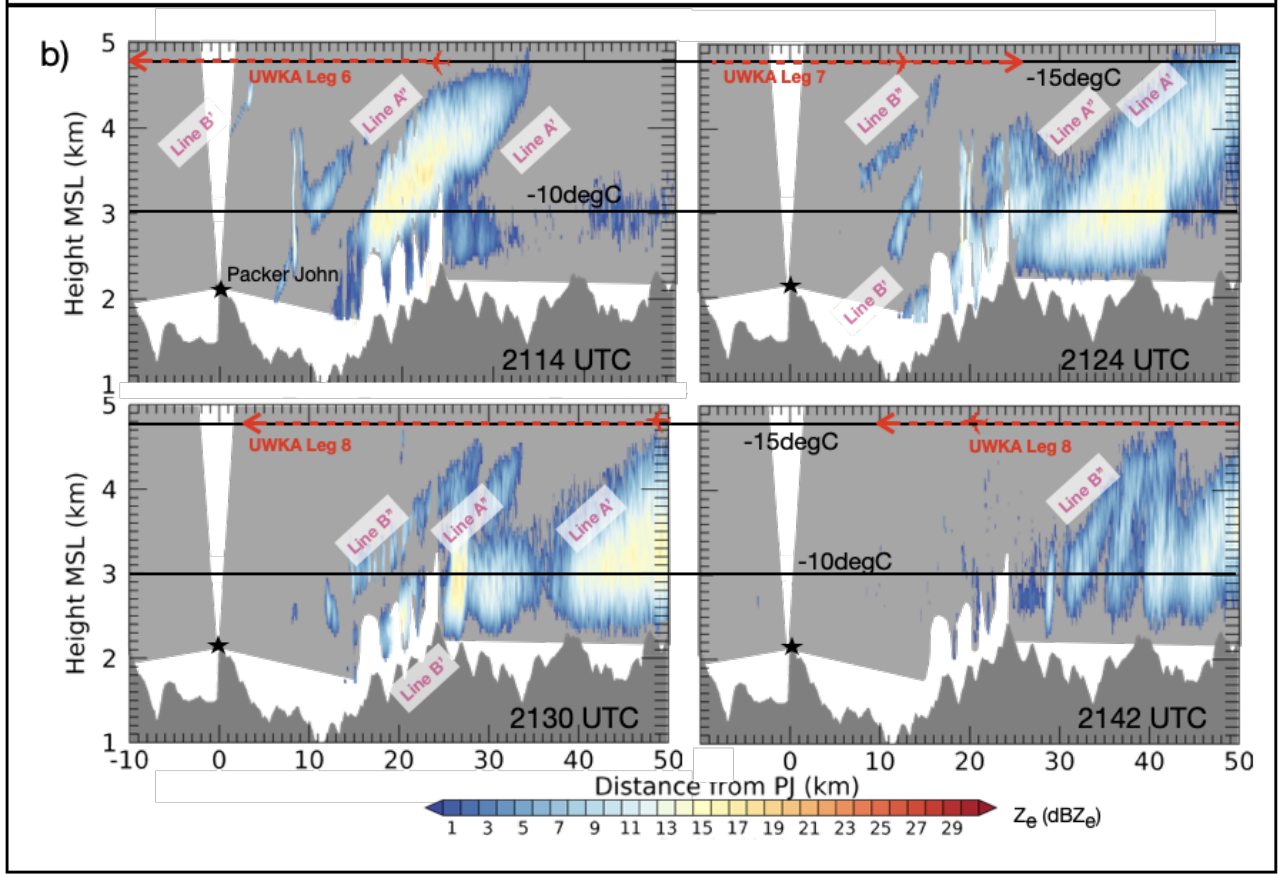


Case2

Snow Growth







Case3

Snow Growth

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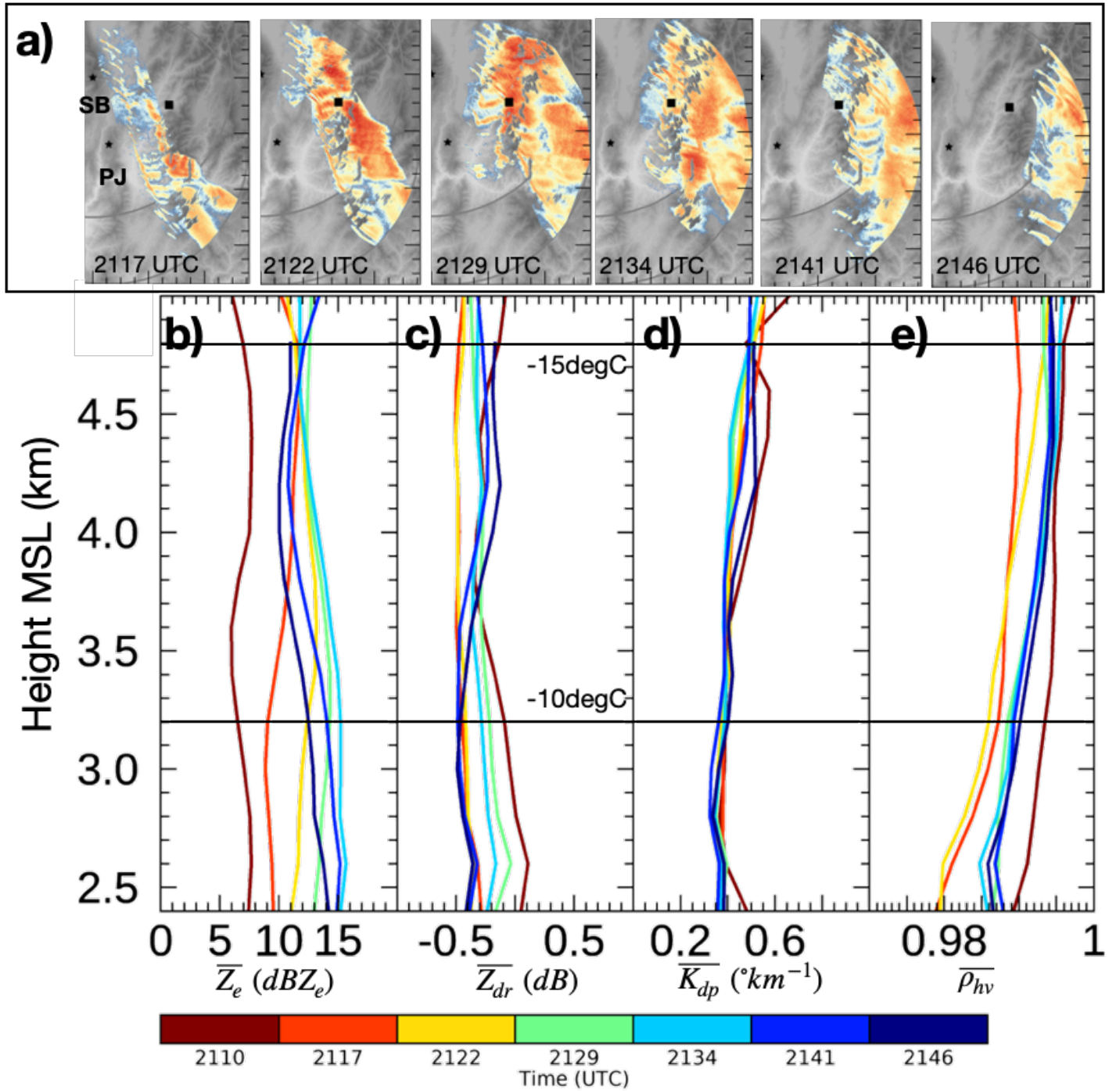
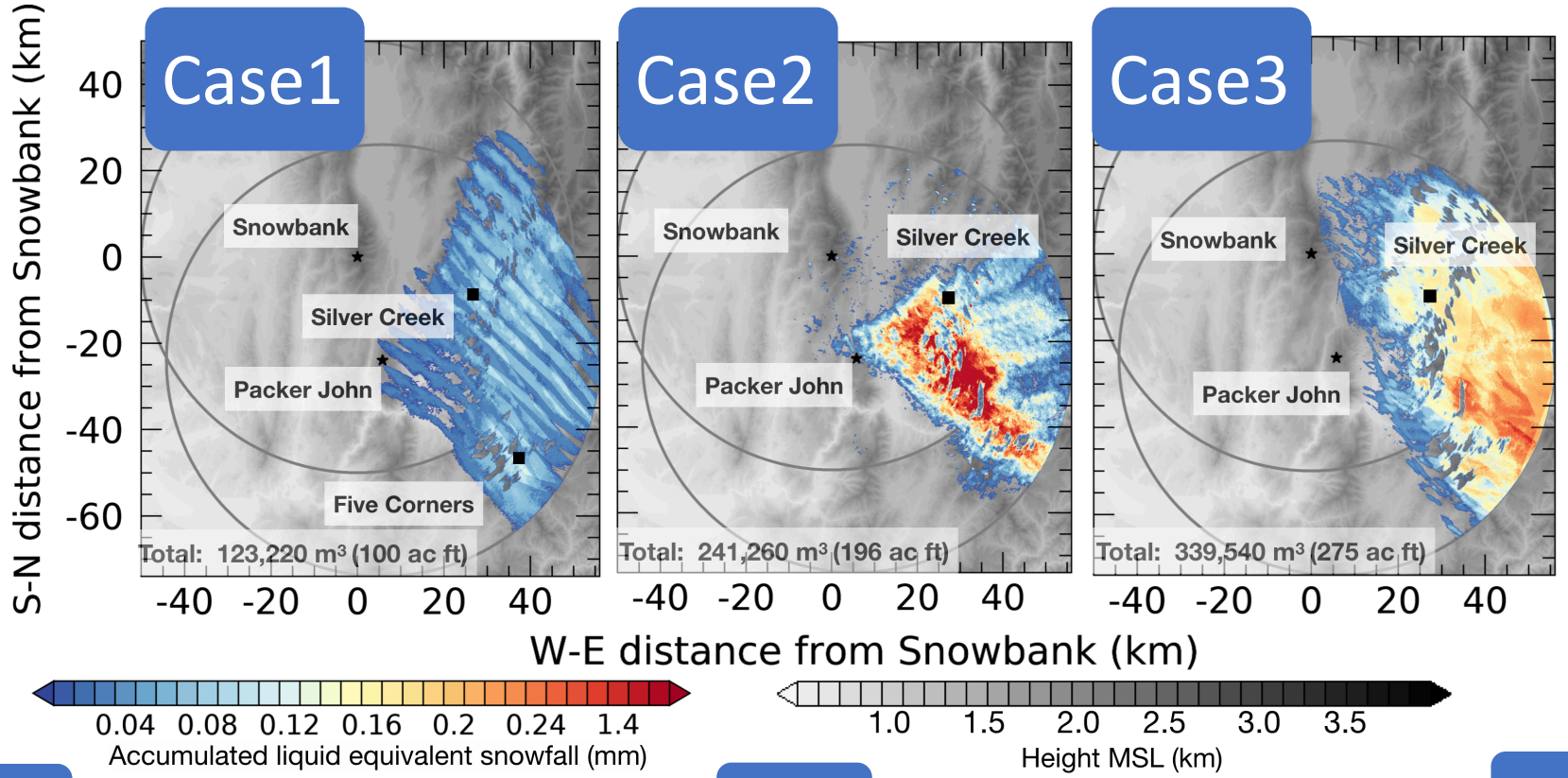
Case3

Snow Growth



SUMMARY



Case1

- Strong winds transport snow downwind
- Lowest LWC+ lowest IWL + largest amount of AgI (like case 2);
- Wide spread dendritic growth with AgI plumes remain at cloud to => regenerating ice initiation

Case2

- Second highest total snowfall over 600 km2) from 8 seeding legs
- Weak winds keep and fast fall out keep snow over small area
- Pockets of supercooled drizzle; dendritic growth
- Largest snowfall from selected legs

Case3

- Highest total snowfall over largest area (1800 km2) from 2 seeding legs
- strong shear disperses AgI well (BIP better than EJ); strong winds transport it downstream covers largest area
- Highest LWC + largest q + widespread drizzle + largest amount of AgI