Measuring snow characteristics with the dual-polarization Doppler on Wheels (DOW) radar during ASCII

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1. Motivation
- What is the 3-dimensional structure of radar reflectivity and dual-polarization parameters in orographic snowstorms?
- How does atmospheric stability, wind speed, and liquid water content impact snowfall intensity and the 3-dimensional radar structure?
- Does glaciogenic cloud seeding of wintertime orographic snowfall modify radar parameters and effectively increase surface precipitation?

2. ASCII Field Experiment
- 17 Total IOPs
- January – March 2012
- Sierra Madre Mountain Range, WY
- AgI Cloud Seeding Experiment

3. Selected Instruments
- Mobile, Dual-Polarization X-band Doppler On Wheels (DOW-7) Radar
  Measures:
  1. Reflectivity (Z)
  2. Doppler velocity (V)
  3. Differential reflectivity (ZDR)
  4. Differential phase (DP)
  5. Co-polar Correlation Coefficient (ρHV)
- Microwave Radiometer
  Measures:
  1. Integrated Liquid Water Content (LWC)
  2. Integrated Water Vapor (WV)
  3. Temperature Profile
  4. Humidity Profile
- Microwave Rain Radar (MRR)
  Measures:
  1. Particle Fall Velocity Distribution
  2. Particle Size Distribution

4. What is the 3-dimensional structure of radar reflectivity and dual-polarization parameters in orographic snowstorms?

5. How does atmospheric stability, wind speed, and LWC impact snowfall intensity and the 3-dimensional radar structure?

6. Does glaciogenic cloud seeding of wintertime orographic snowfall modify radar parameters and effectively increase surface precipitation?

7. Preliminary Conclusions
- Precip increases near ridge of the mountain, indicating the presence of orographic forcing.
- Heaviest snowfall at leeward side; windward side higher reflectivities aloft.
- A high occurrence of oblate particles near ridge, likely high density, horizontally-oriented particles.
- Precip increases after frontal passage ~ 3HUTC, stable, no LWC, weaker winds, stratiform precip.
- Neutral stability, high LWC, and stronger winds with cellular precip structures prior to front.
- Strongest winds not correlated with heaviest snowfall.
- Heaviest snowfall at Battle Pass postfrontal during seeding period.
- No increase in cloud depth observed during seeding period.
- More convective precip structure during non-seeding period with high Z at higher altitudes.
- More stratiform precip structure during seeding period with highest Z at lower altitudes.

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ETI Gauge Comparison
- All ETI Gauge Comparison
- 17 Total IOPs
- January – March 2012
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Battle Pass (DOW-7)

Dixon Airport