Atmospheric Influences on New Snowfall Density in the Southern Appalachian Mountains, USA

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Introduction and Background

- Variations in new snowfall density have a significant influence on new snowfall totals, as the same liquid equivalent precipitation forecast from numerical model output can yield wide differences in actual snowfall.
- New snowfall density variability and the associated atmospheric influences remain poorly understood, particularly in mountainous regions where orographic effects predominate.
- The research objectives of this poster are to:
  - Analyze the atmospheric influences on snow density and within snowfall events.
  - Summarize new snowfall densities on Pogo Mountain, NC, during a two-year period.
  - Compare new snowfall densities by low-level wind direction and surface temperature.

Field Site, Instrumentation, and Methods

- Snowfall and SWE measurements were taken at 002, 1Z2, and 1Z2 during snow events at 1018 m using a snowboard and a 10-cm diameter precipitation gauge to extract a core.
- Meteorological data were obtained using a portable station at 1137 m while a vertically-pointing Ku-band MicroRainRadar, Parsivel disdrometer, and Pluvio weighing precipitation gauge provided additional data at 1018 m.
- During the 2007-2008 snow season, the research team also released rawinsondes every three hours during snow events from 1018 m.

Surface Analyses for Selected Snowfall Events

Result

- Twenty-four (88%) of the snowfall events during the study period were associated with low-level northwest flow at event maturation, ranging between 270 and 315 degrees.
- Fifteen events (56%) exhibited new snowfall densities between 25 and 75 kg m⁻³, with 8 events (30%) greater than 100 kg m⁻³.
- Surface temperature and new snowfall density are moderately correlated (R = 0.67).
- The mean new snowfall density for all events was 69 kg m⁻³, with cold (< 2 °C) northwest flow events having the lowest (55 kg m⁻³). Both warm (> 2 °C) northwest flow events and the small sample (n = 3) of other synoptic types had the highest new snowfall densities (149 kg m⁻³).

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