Sounding-based Experiment on Mixed Precipitation Events for 2022-2023

The Sounding-based Experiment on Mixed Precipitation Events for 2022-2023 ($SEMPE_{2223}$) is a continuation of past winter observational efforts conducted by personnel at UNC Asheville (UNCA) in an effort to better understand the impact of the southern Appalachian Mountains on modifying the weather forced by synoptic-scale weather features. Specifically, the ***purpose*** of the sounding-based observations associated with $SEMPE_{2223}$ is to provide insight on potential mesoscale mountain-forced phenomena that can improve the diagnosis and prediction of winter weather events whose societal impacts are exacerbated by the presence of mountains. Examples of the scenarios of interest involve situations in which precipitation during the cool (winter) season can lead to the loss of property or the endangerment of lives within Buncombe County, North Carolina such as; ice storms, synoptic-scale cyclone-driven snowstorms (e.g., Miller A cyclones), and northwest flow snow.

The ***goals*** of $SEMPE_{2223}$ represent a combination of educational, research, and operational objectives, to

[1] provide UNCA students a learning experience of collecting observations during an event-driven field experiment as the synoptic-scale event unfolds,
[2] provide UNCA students a learning experience of the multiple steps required for collecting vertical profiles of temperature, moisture, wind, pressure, and altitude through the launching of rawinsondes,
[3] collect vertical atmospheric profiles allowing the evaluation of important parameters such as Froude number, low-level moisture, stability, and wind shear to examine evidence of mesoscale mountain-forced enhancements during the event of interest,
[4] collect vertical profiles of low-, mid-, and upper-level winds, moisture, and temperature to examine environmental conditions near the mountains for diagnosing or interpreting precipitation-related parameters (e.g., snow-to-liquid ratio, type, and efficiency),
[5] collect and display (http://www.atms.unca.edu/sempe/rt_sempe2122.html ; last year's link) vertical profiles of temperature, moisture, wind, pressure, and altitude in real-time for the public sharing of information that can impact local (e.g., UNCA) and regional (e.g., National Weather Service [NWS]) operations and assist in decision support and forecasts related to the saving of lives and property, and
[6] communicate in real-time via NWSChat with forecasters at the forecast office in Greer, SC to provide alerts for dangerous and/or dramatically changing conditions in Asheville, NC related to winter weather.

The decision to hold an Intensive Observation Period (IOP), in which weather balloons are launched every three hours, is dependent on a moderate probability of occurrence of [1] an ice storm accumulating ice thick enough to impede travel on I-26 and I-40 in Buncombe County near Asheville, [2] a snowfall accumulation in Asheville of one inch or greater, or [3] a snowfall accumulation in the nearby TN/NC border counties, Haywood and Madison, meeting the NWS winter warning criterion, with a chance of spillover into the Asheville region of the French Broad River Valley. The "go/no go" decision to run a $SEMPE_{2223}$ IOP will occur within 12-24 hours of the first weather balloon launch. The budget of $SEMPE_{2223}$ is based on an estimate of four IOPs during which an average of five balloon launches will take place during each IOP.

In the event of an 'inactive' winter season in which IOPs are rare or non-existent (only one or no IOP has occurred by the end of February 2023), the focus will shift to examination of the impact of the local mountains on potential flooding (high intensity 'warm' or liquid precipitation) and wind storm events during the months of March and April 2023.

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