Observation and Analysis of 19 Winter Storm Events in the North Carolina Mountains

Casey D. Burleyson (1), M. Tai Bryant (1), Sandra E. Yuter (1), L. Baker Perry (2)
(1) Department of Marine, Earth, and Atmospheric Sciences, NC State University
(2) Department of Geography and Planning, Appalachian State University

I. Introduction and Background

The purpose of this project is to obtain and analyze observations of the physical characteristics of precipitation during snow events in the southern Appalachians. To conduct our observations we assembled a meteorological tower on Poga Mountain, located on the western slopes of the Appalachians. During the 2006-2007 snow season we collected data on temperature, pressure, humidity, wind speed and direction, and soil moisture for 19 snow events. Collocated with the instrument tower is a vertically pointing Ku-band radar to observe the profile of storms as they pass overhead. Results from the analysis of these events will be used to improve understanding of the physics of snow and to better forecast snow events.

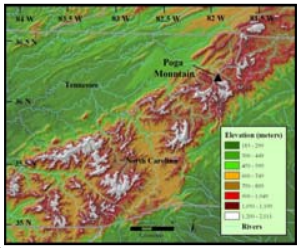


Figure 1: Regional topographic map showing location of the Poga Mountain, NC observation site 16 miles west of Boone, NC. For this project the main instrument tower was placed on top of the mountain at an elevation of 1137 m. The location of Poga Mountain on the western slopes of the NC Appalachians makes it an ideal location to study orographically enhanced precipitation.

II. Instrumentation

Figure 2: Meteorological tower on the top of Poga Mountain

Figure 3: Precipitation instruments during a heavy snow event

III. Summary of the 2006-2007 Winter Season

Year	Month	Day	Start Time (UTC)**	Duration (hrs)**	Min Temp (C)	Max Temp (C)	Wind Direction	Snow Depth (in)	SWE (in)
2006	11	12	07:00	11	-1.00	0.79	NW	0.3	0.14
2006	11	19	12:00	15	-2.55	0.80	NW	1.2	0.23
2006	12	07	19:00	6	-9.63	-0.45	NW	2.0	0.09
2006	12	25	22:00	19	-1.22	9.96	NW	0.5	--
2007	01	09	15:00	20	-4.41	1.40	NW	4.0	0.27
2007	01	21	06:00	12	-2.62	0.31	SE	0.1	0.10
2007	01	22	00:00	6	2.15	5.38	NW	0.3	0.05
2007	01	25	14:00	7	-6.37	-4.82	NW	1.0	0.03
2007	01	28	12:00	15	-9.81	3.78	W	2.2	0.14
2007	02	01	08:00	10	-6.62	-3.65	SE	1.8	0.12
2007	02	02	17:00	18	-5.25	1.64	NW	0.4	0.05
2007	02	04	14:00	7	-6.83	-3.93	NW	0.4	0.01
2007	02	06	19:00	5	-5.89	0.91	S	0.3	0.02
2007	02	09	18:00	5	-8.01	-4.26	NW	0.2	0.01
2007	02	14	12:00	21	-13.30	0.43	NW	1.3	0.05
2007	02	17	15:00	29	-10.10	-3.20	NW	5.5	0.23
2007	03	04	05:00	13	-9.85	-4.07	NW	0.8	0.01
2007	03	16	22:00	18	-7.54	-1.39	NW	1.8	--
2007	04	07	00:00	18	-10.67	-2.49	NW	5.8	0.32

** Start and duration of snow portion of storm

Results

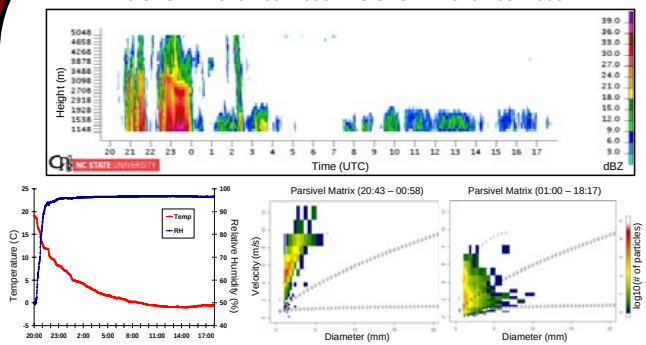
• Storm top heights in snow events can be very shallow even during moderate and heavy snowfall. A majority of the snowstorms we observed were less than 2 km deep. Storms this shallow will often be missed by traditional scanning radar.

• 15 of the 19 snow events during the 2006-2007 season occurred when the prevailing winds were out of the northwest and flowing up the mountain slopes. Winds from this direction bring in cold arctic air that is then lifted up the side of the mountain to produce snow.

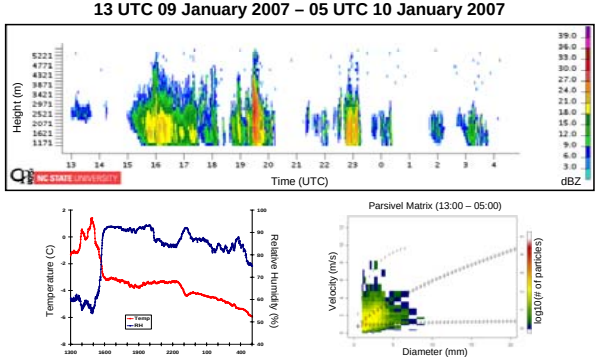
• Ratios of snow liquid water equivalent to snow depth ranged from 0.0125 to 0.5 with most values < 0.1. Resolving accurate values for this conversion will help hydrologists better forecast flooding from heavy snow runoffs.

IV. Four Significant Events

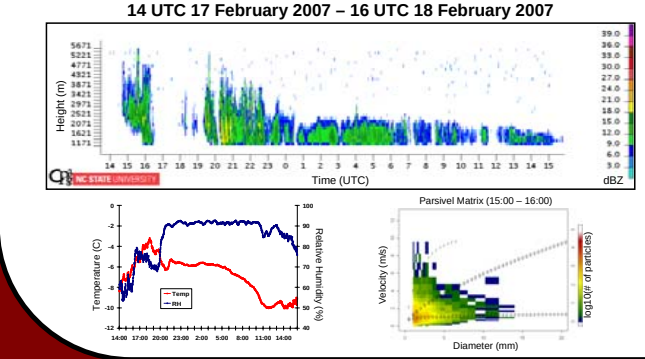
20 UTC 11 November 2006 – 18 UTC 12 November 2006



13 UTC 09 January 2007 – 05 UTC 10 January 2007



14 UTC 17 February 2007 – 16 UTC 18 February 2007



00 UTC 07 April 2007 – 18 UTC 07 April 2007