Summit-to-Shore Snow Observatory Network in Vermont

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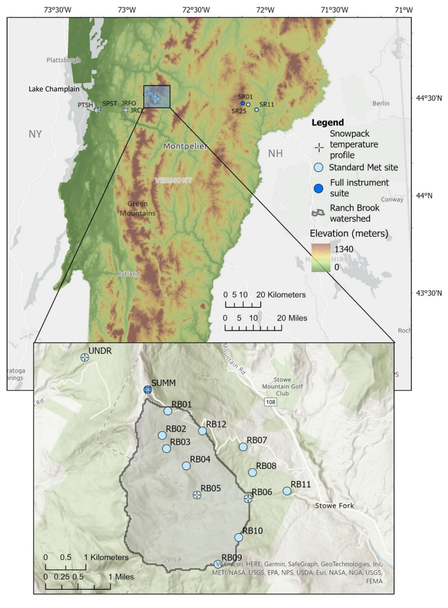
INTRODUCTION

This Summit-to-Shore (S2S) observatory network aims to monitor snowpack characteristics and meteorological variables at a high spatial and temporal resolution across an elevational transect in the Vermont. Traditional meteorological measurements combined with detailed snowpack measurements will provide high resolution observational data as forcings and validation for computational snowpack models. In addition to these data, remotely sensed snow depth collected via UAV and LiDAR will provide further insight to characterize snowpack evolution in response to varying forest cover, topography, and meteorologic drivers. This will help augment research in a low-elevation montane environment that is understudied with respect to snowpack dynamics.

STUDY AREA



PTSH	Potash Brook (45m)
SPER	Spear St (87m)
JRCL	Jericho Clearing (199m)
JRFO	Jer. Forested (196m)
SUMM	Mansfield Summit (1169m)
UNDR	Underhill (698m)

RB##	Ranch Brook (390m-1170m)
SR01	Sleepers River (552m)
SR25	Sleepers River (356m)
SR11	Sleepers River (225m)
PROC	Proctor Maple (418m)

PRELIMINARY RESULTS

Seasonal snow depth measurements were captured across an elevational gradient. These snow depths are stratified elevationally for the most part, depicting elevation as a major contributing variable to snowpack depth.

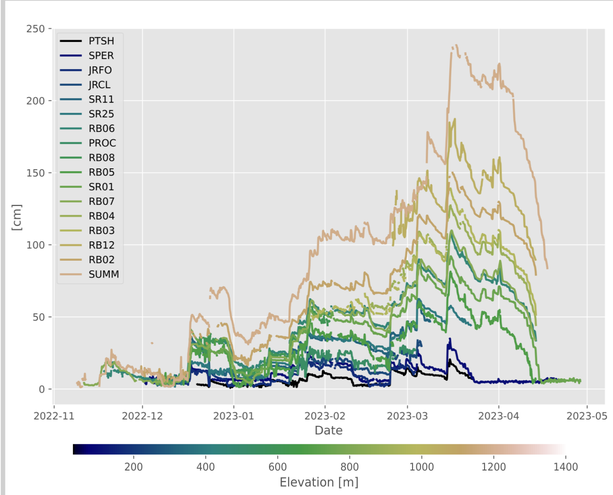


Figure 1: Seasonal snow depth evolution

Snowpack accumulation and ablation as a function of elevation is shown below. Accumulation is largely elevation dependent, but this relationship is variable across different events.

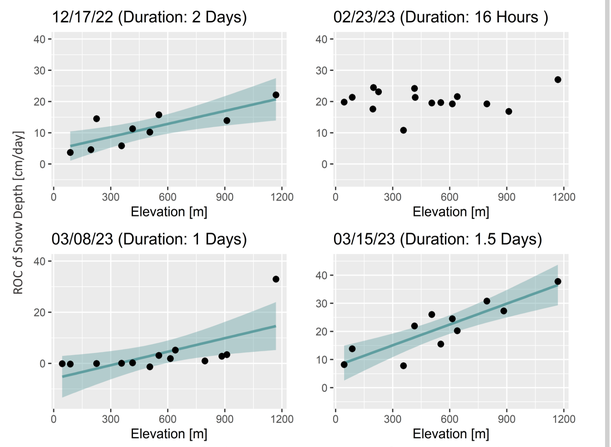


Figure 2: Rate of change (ROC) of snowpack accumulation across an elevational gradient

Ablation events are highly event-specific and are dependent on factors other than just elevation.

Met Station at Site RB12

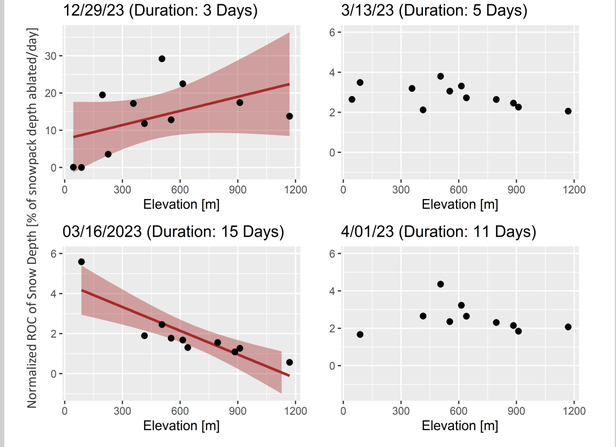


Figure 3: Normalized ROC of snowpack ablation across an elevational gradient

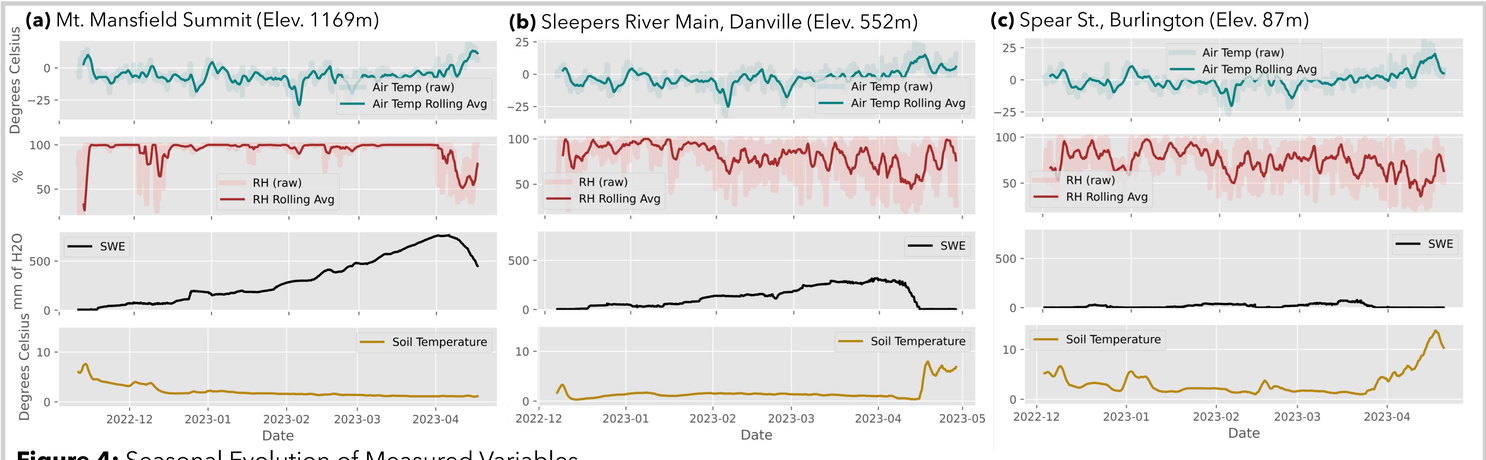


Figure 4: Seasonal Evolution of Measured Variables

In addition to snowpack depth, other meteorological and hydrological were documented across each site. Figure 4 shows the seasonal evolution of temperature, relative humidity, SWE, and soil temperature at upper, middle, and lower elevation sites.

Mt Mansfield Summit

FUTURE WORK

Future work will involve the leveraging of these high-resolution data to drive and validate a distributed snowpack model, which will be used to address the following research questions:

- What are the major landscape determinants of snowpack distribution in Vermont?
- How is snowpack ablation occurring across an elevational gradient, and what are the meteorological and climatological drivers?
- How well does a model represent anomalous mid-winter warming events and their effects on snowpack ablation? How can we characterize these events and their impact on SWE?