Towards Snowpack Runoff Decision Support

Anne Heggli[a,*], Benjamin Hatchett[a], Andrew Schwartz[b], Tim Bardsley[c] and Emily Hand[d]
[a]Division of Atmospheric Sciences, Desert Research Institute, 2215 Raggio Parkway, Reno, 89512, Nevada, USA
[b]University of California, Berkeley, Central Sierra Snow Laboratory, Soda Springs, 95728, California, USA
[c]National Weather Service, Reno, 1000 Dandini Road, Reno, 89512, Nevada, USA
[d]Department of Computer Science, University of Nevada, Reno, 1664 North Virginia Street, Reno, 89503, Nevada, USA

Rain-on-snow (ROS) events are commonly linked to large historic floods in the United States. Projected increases in the frequency and magnitude of ROS multiply existing uncertainties and risks in operational decision making. Here, we introduce a framework for quality-controlling hourly soil moisture, precipitation, and temperature data to guide the development of an empirically-based snowpack runoff decision support framework at the Central Sierra Snow Laboratory for water years 2006-2019. The snowpack runoff decision support framework considers the potential for terrestrial water input from the snowpack through decision tree classification of rain-on-snow and warm day melt events to aid in pattern recognition of prominent weather and antecedent snowpack conditions capable of producing snowpack runoff. Our work demonstrates how (1) present weather and (2) antecedent snowpack risk can be "learned" from hourly data to support eventual development of basin-specific snowpack runoff decision support systems aimed at providing real-time guidance for water resource management. The development of this framework is aligned with NASA's Science Mission Directorate (H.3) Earth Science Division by integrating observations of precipitation and seasonal snowpack for improved hydrological forecasts, which could guide water resource planning through integrated decision support system emphasized in the Earth Science Decadal Survey (National Research Council, 2007).

National Research Council. (2007). Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond. Washington, DC: The National Academies Press. https://doi.org/10.17226/11820.