



## **Can snow and soil moisture be measured simultaneously using cosmogenic neutrons?**

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Measuring snow at the hectometer scale is difficult using conventional methods. The cosmogenic neutron method, first developed for soil moisture, has the potential to solve this problem, but it is fraught with difficulties. One is that the neutron intensity above the snow surface depends not only on the amount of snow, but also on the moisture in the underlying soil. A potential solution is to measure neutrons of different energies because they respond differently to combinations of snow and soil water. We used neutron transport modeling to examine the response of the intensity of thermal and epithermal neutrons to snow and soil moisture, with spatially uniform snow ranging from 0 cm to 100 cm of water equivalent, and spatially uniform soil moisture ranging from 0% to 45% by volume. The results show that snow can be measured up to 10 cm of snow water equivalent; above that value the changes in the neutron intensity are too small to be useful. A unique solution for both snow and soil moisture is possible for snow water equivalent less than 5 cm. These results are preliminary. They should be refined using additional modeling and then tested using controlled field experiments in which both soil moisture and snow are known independently.