Submitted Abstract

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Abstract

Snowfall is notoriously difficult to measure and existing preciptiation gauges are very poorly suited to constraining mountain precipitation in weather and climate models. They often suffer from large undercatch biases, are sparse and poorly distributed, and they represent only a tiny point in the landscape. We present an entirely new approach to observing snowfall from time series of lake water pressure. We demonstrate our method through a winter in wet and stormy coastal East Greenland using a 3 km wide, 17 km2 lake as our precipitation gauge. Our sub-daily, unbiased, large-area measurements of precipitating snow water content are uniquely well-suited to evaluating high-resolution weather models, and we use them to test the output of regional climate model RACMO2. Because the seasonally frozen lakes that our new method uses are widely distributed at high latitudes and are particularly common in mountain ranges, it is particularly well suited to the widespread, autonomous monitoring of snowfall in remote areas that are largely unmonitored today. This is potentially transformative in reducing uncertainty in regional precipitation and runoff in seasonally cold climates.