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The duration of snow cover at climate stations of the Alps with respect to the mean winter temperature over Europe has been investigated for the winters 1961-2000 (Hantel et al., 2000; Hantel and Hirtl-Wielke, 2007). The snow duration n, expressed as the relative number of days in a given winter, for which the snow depth exceeds a given treshold (typically 2-10cm), was determined from routine measurements. In order to pool data of stations with different elevation and horizontal position the "mountain-temperature" τ was introduced. τ combines the regional mean temperature with the 3D coordinates of the respective climate station in a regionally uniform manner (spatial Taylor expansion). The profile $n(\tau)$ is a logistic curve; when fitted to the data of many winters its slope (which is negative and adopts its minimum s_0 at $n = 0.5$) represents the snow duration–temperature sensitivity of the entire region. s_0 for the Alps is about $-0.3K^{-1}$.

This has been an alarming figure; it calls for an independent check in other mountain regions. Here we study, for the years 1961-2002, the SNOWTEL data for the Rocky Mountains; these are automated daily measurements of snow water equivalent (SWE). Since there is no unique conversion between SWE and snow depth we define independent tresholds for the SWE data (typically 10-320 mm) and then apply the $n(\tau)$ theory reviewed above to the Rocky Mountain region. Surprisingly, despite the difference in the data type and climate conditions the results are much the same ($s_0 = -0.3K^{-1}$, within error limits), implying that 1 degree warming should reduce the winter snow days by 30 percent; further, s_0 is independent upon the SWE treshold over more than an order of magnitude.

These results support the hypothesis that the concept of relative snow duration yields a robust sensitivity with respect to the large-scale regional temperature, no matter if the source data are snow depth (the Alps) or snow weight (the Rocky Mountains). It appears that a general behavior has emerged that governs different climate regions of the world in like manner.

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