

## **Contrasting responses of mean and extreme snowfall to climate change**

Paul O’Gorman

Snowfall is sensitive to climate change through changes in both air temperature and humidity. Because of the sensitivity to temperature and except in regions with very low surface temperatures, annual-mean snowfall is expected to decrease in a warming climate. However, it is shown here that comprehensive climate models simulate only small fractional changes in daily snowfall extremes for many regions and months of the year with large declines in mean snowfall. An asymptotic theory is introduced for the magnitude of snowfall extremes. The theory is based on the temperature dependencies of the rain-snow transition and precipitation intensity, and it accounts for the main features of the response of snowfall extremes to warming in the simulations.