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Use of a regional climate model to infer impacts of volcanic eruptions on Baffin Island climate

Mira Losic[†]; Alan Robock
[†] Rutgers University, USA
Leading author: mlosic@envsci.rutgers.edu

It is well-understood that the effects of volcanic aerosol loading into the stratosphere are transient, with global cooling lasting only a few years after a single large eruption. Geological evidence collected from Northern Baffin Island, Canada, suggests ice cap growth began soon after a succession of several large eruptions in the 13th century, and they did not start to melt until roughly a century ago. We investigate which feedbacks allowed these ice caps to be maintained long after the transient forcing of the volcanic aerosols, by conducting sensitivity studies with the Weather Research and Forecasting (WRF) Model and Polar WRF, a version of WRF developed specifically for the polar regions. Results from an ensemble of month-long regional simulations over Baffin Island suggest that better treatment of snow and ice in Polar WRF improves our regional climate simulations. Thus, three 6-month long simulations representing years with average, below- and above-average temperatures in the region using Polar WRF are presented. Preliminary findings suggest that high resolution Polar WRF can accurately simulate snow line altitude on Baffin Island in the average as well as the extreme temperature cases. The results from these and further sensitivity tests will provide insight into the influence of regional feedbacks on the persistence of these ice caps long after the 13th century eruptions.