Contemporary climate changes in high latitudes of the Northern Hemisphere: bias-corrected precipitation and variables of economic, social and ecological interest based upon daily temperatures and precipitation

Groisman, Pavel

U.S. , National Climatic Data Center Federal Building, 151 Patton Avenue Asheville, North Carolina 28801 , USA

Pasha.Groisman@noaa.gov

Co-Authors: Esfir G. Bogdanova, Boris M. Ilyin, Paul Whitfield, Eirik Forland, Vyacheslav N. Razuvaev, Bomin Sun, and Russell Vose

Significant climatic changes over the high latitudes in the 20th century have caused changes in many atmospheric, oceanic, and terrestrial variables.

1. Precipitation in high latitudes is measured with very high errors (biases) that may compromise any conclusions about its changes. Thus to estimate precipitation changes in the Arctic during the past 50 years, we corrected them using the entire suite of available synoptic and metadata information (cf., Bogdanova et al. 2002; J. Hydrometeorol.).
2. While changes in surface air temperature and precipitation are most commonly addressed in the literature, changes in their derivatives (variables of economic, social and ecological interest based upon daily temperatures and precipitation) have received less attention. This presentation will also shed light on some changes in a set of these derivatives over the past fifty years. Time series of the following variables have been constructed and the observed changes during the past fifty years will be described at the symposium: frequency of extremes in precipitation and temperature; frequency of thaws; heating degree days; growing season duration; sum of temperatures above/below a given threshold; days without frost; day-to-day temperature variability; number of days with different precipitation types; number of days with precipitation, lengthy periods with / without precipitation; frequency of rain-on-snow events; and Keetch-Byram (Soil Moisture) Drought Index.

Specific applications of these derivatives are numerous, ranging from crop-yield modeling and energy distribution to forest fire and flood forecasting. Our analysis has been done using a subset of about 1500 stations north of 50 °N.