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Bias in minimum temperature due to a redefinition of the climatological day

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When a homogeneity procedure was initially applied to the annual means of the daily maximum and minimum temperatures at 210 stations in Canada (Vincent and Gullett 1999), a decreasing step of about 0.6° to 0.8°C was found in 1961 in the minimum temperatures. This step accentuated the cooling trend observed in Eastern Canada over the past 50 years. In Western Canada, a significant step was not detectable. It was concluded that the step could have been caused by a redefinition of the climatological day in 1961 and needed further investigation.

Recently, this cold bias was closely examined (Vincent et al. 2009). Hourly temperatures taken at 121stations for 1953-2007 were used to determine its magnitude and spatial variation. It was found that its annual mean varies from -0.2 in the west to -0.8°C in the east. However, not all days were affected by the change in the observing time. The annual percentage of affected days ranges from 15% for stations in the west to 38% for stations in the east. An approach based on hourly temperatures is proposed to adjust daily minimum temperatures. Overall, with the adjustments, the trends are becoming either more positive or are reversing from negative to positive over 1950-2007, and they have changed by as much as 1°C in numerous locations in Eastern Canada.

Vincent, L.A., E.J. Milewska, R. Hopkinson and L. Malone, 2009: Bias in minimum temperature introduced by a redefinition of the climatological day at the Canadian synoptic stations. J. Appl. Meteor. Climatol., 48, 2160-2168. DOI: 10.1175/2009JAMC2191.1.
Vincent, L.A., and D.W. Gullett, 1999: Canadian historical and homogeneous temperature datasets for climate change analyses. Int. J. Climatol., 19, 1375-1388.