Geophysical Research Abstracts
Vol. 13, EGU2011-164, 2011
EGU General Assembly 2011

Future projections and uncertainties of short and long-term drought characteristics over Canadian Prairies as simulated by the Canadian RCM

Debasish PaiMazumder (1), Laxmi Sushama (1), René Laprise (1), Naveed Khaliq (2), and Dave Sauchyn (3)
(1) Centre ESCER (Étude et Simulation du Climat à l'Échelle Régionale), Université du Québec à Montréal, (2) Adaptation and Impacts Research Section, Atmospheric Science and Technology Directorate, Environment Canada, (3) Prairie Adaptation Research Collaborative, University of Regina

The Canadian Prairies have experienced severe and extended droughts, most notably in the 1910s, 1930s, 1960s, 1980s and 1999–2002, that have had significant impacts on agriculture, energy and other socio-economic sectors; it is therefore desirable to assess future changes to drought characteristics in this drought prone region, in the context of a changing climate. This study addresses validation, projected changes and uncertainty associated with projected change to short- and long-term drought characteristics, i.e. severity, frequency and duration, over the Canadian Prairies, using a ten member ensemble of Canadian RCM (CRCM) simulations, of which five correspond to the current climate (1971–2000) and the remaining five are the matching simulations of future climate (2041–2070), which are driven by five different members of a Canadian Global Climate Model (CGCM3.1) ensemble.

Validation of CRCM simulated precipitation suggests that the model reproduces well the observed precipitation distribution for all seasons, except summer, across a large portion of the Canadian Prairies. However, comparison of CRCM simulated drought characteristics with those observed suggests that the model has difficulties in reproducing observed severity, frequency and duration of drought events, particularly those associated with longer events, possibly due to the overestimation of summer precipitation by the model.

Analysis of projected changes to drought characteristics between the 1971–2000 and 2041–2070 periods suggests an increase for the other seasons, while the severity, frequency and maximum duration of both short- and long-term droughts are projected to increase a large portion of the southern Prairies and along the eastern slopes of the Rocky Mountains, with the largest projected changes associated with longer drought events. In general, this study indicates that the southern Canadian Prairies are projected to experience droughts of even greater severity and duration in the future than those of the 20th century.

Uncertainty in projected changes to droughts characteristics for the Canadian Prairies is investigated using two precipitation-based drought indices. Uncertainty associated with the CRCM driving data and the choice of drought indices are highly variable from region to region with larger uncertainty for the southern watersheds, compared to the northern watersheds. For some southern watersheds, in general, analysis suggests that uncertainty associated with the choice of the drought index is as important as that associated with the CRCM precipitation data. Nevertheless, a trivariate classification based on changes to various studied drought characteristics derived from ensemble mean of CRCM simulation, highlights the vulnerability of the southern Prairies watersheds in a changing climate.