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Added value of dynamical downscaling of winter seasonal forecasts over North America

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Skillful seasonal forecasts have enormous potential benefits for socio-economic sectors that are sensitive to weather and climate conditions, as the early warning routines could reduce the vulnerability of such sectors. In this study, individual ensemble members of the ECMWF global ensemble seasonal forecasts are dynamically downscaled to produce ensemble of regional seasonal forecasts over North America using the fifth generation Canadian Regional Climate Model (CRCM5). CRCM5 forecasts are initialized on November 1st of each year and are integrated for four months for the 1991-2001 period at 0.22 degree resolution to produce a one-month lead-time forecast. The initial conditions for atmospheric variables are obtained from ERA-Interim reanalysis, whereas the initial conditions for land surface are obtained from a separate ERA-interim driven CRCM5 simulation with spectral nudging applied to the interior domain. The global and regional ensemble forecasts were then verified to investigate the skill and economic benefits of dynamical downscaling. Results indicate that both the global and regional climate models produce skillful precipitation forecast over the southern Great Plains and eastern coasts of the U.S and skillful temperature forecasts over the northern U.S. and most of Canada. In comparison to ECMWF forecasts, CRCM5 forecasts improved the temperature forecast skill over most part of the domain, but the improvements for precipitation is limited to regions with complex topography, where it improves the frequency of intense daily precipitation. CRCM5 forecast also yields a better economic value compared to ECMWF precipitation forecasts, for users whose cost to loss ratio is smaller than 0.5.