Geophysical Research Abstracts
Vol. 20, EGU2018-5374, 2018
EGU General Assembly 2018

Observed and simulated rainfall at multiple scales: how do extremes from the Canadian CRCM5 Large-Ensemble scale in space and time in historical and future climate?

Silvia Innocenti (1), Alain Mailhot (1), Anne Frigon (2), Alex J. Cannon (3), and Martin Leduc (2)
(1) INRS - Institut National de la Recherche Scientifique, ETE - Centre Eau-Terre-Environnement, Québec, Canada (silvia.innocenti@ete.inrs.ca), (2) Consortium Ouranos, Montréal, Canada, (3) Environment and Climate Change Canada, Victoria, Canada

The accurate characterization of extreme rainfall across various spatial and temporal scales is critical to predict extreme precipitation response to climate change. This represents, however, a major challenge in hydro-climate sciences, since high uncertainties linked to deficiencies of available data (temporal and spatial coverage of available series, measurement errors, simulation biases and uncertainties, etc.) may affect the estimations.

Following improvements in spatial resolution and model complexity achieved in last decades, Regional Climate Models (RCMs) represent an interesting option to study extreme rainfall climatology since they provide long precipitation series with complete spatial coverage. Based on large ensembles of high-resolution RCM simulations, the evaluation of extreme rainfall variability across a broad range of spatio-temporal scales and climate periods is also possible. However, despite steady improvement in performance, several issues remain in RCM simulations, es-pecially for sub-daily rainfall extremes. It is thus crucial to evaluate the performance of state-of-the-art models in reproducing the observed statistics of extreme events before their use.

As a part of the Climate change and hydrological Extremes (ClimEx) project (http://www.climex-project.org/), a large ensemble of 50 members of the Canadian Regional Climate Model v5 (CRCM5) [Martynov et al. 2013; Separovic et al. 2013] has been produced at 0.11° resolution for north eastern North America and Europe for the period 1950-2100 under RCP 8.5 [Leduc et al., ready for submission]. In the present study the CRCM5 Large-Ensemble (CRCM5-LE) is used to assess the variability of rainfall extremes across a wide range of spatial and temporal scales of hydrological interest for the North American domain and the 150-year simulation period.

The RCM evaluation is carried out by comparing Annual Maxima (AM) series from CRCM5-LE against those from meteorological stations and three gridded datasets: a convection-permitting 13-year high-resolution WRF simulation [Liu et al. 2017]; the bias-corrected satellite CMORPH dataset [Xie et al. 2017]; and the Multi-Source Weighted-Ensemble Precipitation (MSWEP) v2 dataset [Beck et al. 2017]. The aim is to evaluate the ability of the model to simulate extremes associated with different weather regimes and describe the dependence of extreme statistics on data resolution and source.

The evolution of simulated rainfall extremes under climate change is then assessed by analyzing the change of AM probability distributions over time. To this end, various CRCM5-LE members are pooled to define long AM series for durations between 1 hour and 3 days and estimate high return period quantiles over short periods of a few years. The main goal is to assess how different precipitation regimes respond to climate warming over different time-horizons and to explore the impact of natural climate variability at local and regional scales.

- Beck et al. [2017], DOI: 10.5194/hess-2017-508.
- Liu et al. [2017], DOI: 10.1007/s00382-016-3327-9.
- Martynov et al. [2013], DOI: 10.1007/s00382-013-1778-9.
- Šeparovic´ et al. [2013], DOI: 10.1007s00382-013-1737-5.
- Xie et al. [2017], DOI: 10.1175/JHM-D-16-0168.1.