UNIVERSITY OF SASKATCHEWAN
Global Water Futures
GWF.USASK.CA

**Postdoc (PDF) Opportunities: Convection-Permitting WRF regional climate simulation**

This postdoctoral position is part of the pan-Canadian Global Water Futures (GWF) research program (https://gwf.usask.ca), led by the University of Saskatchewan, which aims to place Canada as a global leader in water science for the world's cold regions and to address the strategic needs of the Canadian economy in adapting to change and managing risks of uncertain water futures. This Postdoctoral Scientist will work as part of a multi-disciplinary team to study scaling relationships for extreme precipitation in mid-latitude climates such as Canada. The position will contribute to the recently funded GWF Pillar 1 project entitled "Short-duration precipitation extremes in future climate" (Yanping Li, PI), which seeks to improve the understanding of the physical processes affecting the precipitation extremes for short (sub-daily) accumulation periods and their possible changes – information that is critical for many GWF users. The work also feeds into the GWF Pillar 3 "Climate Related Precipitation Extremes" project (Ron Stewart and Francis Zwiers, Co-PIs), which is strongly user focused. Specifically, we are seeking a highly motivated and organized individual for this position to investigate how short-duration extreme precipitation will change under future climatic conditions. The 4-km continental scale WRF regional climate simulation will be the major tool to examine how mesoscale convective systems (MCSs) and convective environment will be differ under future climate. The PDF will examine the degree that short-duration extreme precipitation may alter this relation at local and regional scale. The PDF is expected to make extensive use of existing WRF Pseudo-Global Warming (PGW) simulation that was forced with a large global temperature increase (RCP8.5) thereby providing best opportunity to identify such footprint, as well as specially designed WRF simulations to reveal changes in particular aspects of processes. As the km-resolution WRF modeling tool explicitly resolves moist convection, the analysis will shed new light on possible changes in the physical mechanisms involved in short-duration extreme precipitation in a warming climate. Other work includes the comparison of different aspects and processes under the current and future climates including seasonal evolutions of extreme precipitation in relation to seasonal mean temperatures, precipitation efficiency of storms, life-time and spatial size of storms and mesoscale convective systems (MCSs), pre-storm atmospheric stability, updraft in extreme storms, and convective available potential energy (CAPE) etc. By focusing on physical mechanisms, we expect to answer questions related to not only how short-duration precipitation may change in the future, but also why it may change, thereby significantly enhancing our confidence in future projection.

The job responsibilities may include:

1. Work with the GWF core atmospheric modelling group, in collaboration with the US National Centre for Atmospheric Research (NCAR), to support the development of pan-Canadian high resolution (<=4km) atmospheric modelling of historical climate and future warming, using the WRF model. In Pseudo Global Warming mode bounded by a perturbed reanalysis model

dataset, the WRF runs will provide a dynamically downscaled future climate that includes convective storms. Multi-model RCM (CRCM, CanRCM) runs will provide additional context of model and scenario uncertainty. We plan to deliver high-resolution Weather Research and Forecasting (WRF) simulations. The PDF will link with and co-supervised by PCIC (The Pacific Climate Impacts Consortium), ECCC (Environment and Climate Change Canada) scientists to help with the explanation/analysis of the multi-model Canadian Regional Climate Model ensembles.

2. The PDF will examine the changes of convective mechanisms which are more directly related to the development of MCSs, how these processes are parameterized in the current WRF microphysics schemes. The PDF will also examine how do the properties of storms including maximum precipitation rate, precipitation efficiency, life-time and spatial size may change, what are the relationships between large-scale circulation and mesoscale dynamics in the context of future storms. The PDF will need to design and carry out idealized WRF simulations to model the full three-dimensional (3-D) dynamics of clouds to isolate aspects that may respond to warming more strongly.

**Eligibility:**

The required academic background of the student: major in Atmospheric Science, Environmental Science or Mechanical, Civil, or Environmental Engineering, or equivalent; a strong background in meteorology, climatology, and/or physics. Experience with numerical modeling of atmospheric processes is required. Experience with modeling atmospheric processes with WRF is a plus.

The required skills include: 1) Highly motivated and self-directed in advancing complex projects. 2) Ability to gather, understand, and critically analyze data from all relevant sources. 3) Experience with large spatial datasets (preferably using GrADS) on multiple computer platforms (Unix/Linux, Windows). 4) Excellent communications and scientific paper writing skills. 5) Programming skills, such as Fortran, NCL, Python, Matlab, R, and Shell script, etc.

**How to Apply:**

Interested applicants should contact Dr. Yanping Li (yanping.li@usasaks.ca) with a cover letter explaining their motivation, complete CV, and contact details for three academic references. Informal inquiries are welcome.

This position has 2-year term commitment. The candidate is required to work full time (37.5 hours per week). Pay rate will be commensurate with education and experience. Review of applicants will start immediately and continue until suitable candidates are found.