Atelier
« Modélisation des risques environnementaux et événements extrêmes »
28 au 31 août 2017

Workshop
"Environmental Risk Modeling and Extreme Events"
August 28-31, 2017

Probable maximum precipitation estimation and uncertainty quantification using bivariate extreme value analysis

F.W. Zwiers *

fwzwiers@uvic.ca

Probable Maximum Precipitation (PMP) is the key parameter used to estimate Probable Maximum Flood (PMF), both of which are important for dam safety and civil engineering purposes. Operational procedures for calculating PMP seek to obtain a plausible upper bound for precipitation that is unlikely to be exceeded. These calculations do not produce accompanying uncertainty estimates. We propose a probabilistic framework for the interpretation of PMP when it is calculated via the so-called moisture maximization approach, which is the approach that is used most frequently operationally. The proposed framework, which is based on a bivariate extreme value distribution, (i) enables assessment of the sensitivity of the PMP value to individual, possibly erroneous, observations; (ii) allows evaluation of the uncertainty of PMP values; and (iii) provides clarification of the impact of the assumption that a PMP event occurs under conditions of maximum moisture availability.

The frame work is used to estimate PMP across North America based on a 50-year CanRCM4 regional climate model simulation of the period 1951-2000. Results suggest that operational PMP estimates obtained via moisture maximization are highly uncertain and indicate that the assumption that PMP events have maximum moisture availability may not be valid. Specifically, in the climate simulated by CanRCM4, the operational approach applied to 50-year data records produces a value that is 15% larger on average over

*Pacific Climate Impacts Consortium, University of Victoria

North America than the maximum that is likely to be observed over such a period, which may have serious implications in engineering design.

This is joint work with M.A. Ben Alaya and X. Zhang.