Impact of climate change on runoff pollution in urban environments

Author: S. Coutu[1], S. Kramer[1] / B. Bates[2] / P. Roudier [3]/ D. A. Barry[1]

[1] ECOL / Laboratoire de Technologie Ecologique,
[2] LHE/EPFL, [3]JRC.

Contact: sylvain.coutu@epfl.ch

Introduction

The dynamics of urban runoff pollution are controlled by rainfall. Rainfall intensity and duration, as well as the length of dry periods are fundamental parameters as the dynamics of polluting substances are generally described by non-linear buildup/washoff (b/w) processes. In consequence, these processes will be affected by future changes in temporal rainfall distribution brought about by climate change.

In this study, we investigated the influence of climate change on future urban runoff pollution and the dominant sources of uncertaities in the prediction of contaminant concentration in runoff.

Methology

18 future rainfall series were used as inputs for 4 b/w models:

Scenarii — A1B | A2 | RCP3PD

Three climate scenarii were tested, corresponding to high (A2), intermediate (A1B) and low (RCP3PD) emissions of greenhouse gas.

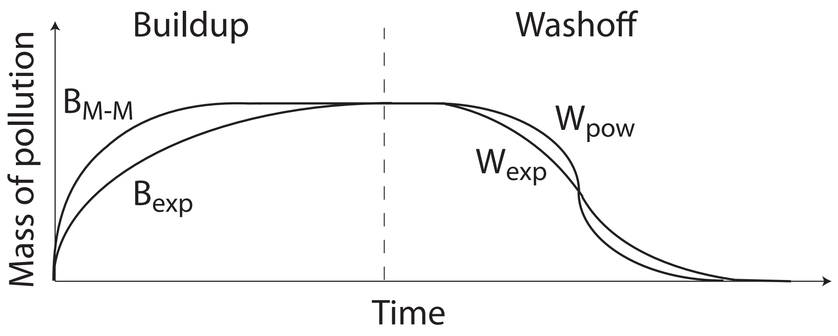
RCM/GCM — low | medium | high

Following Appenzeller (2011), three sample combinations of GCM/RCM models representing 'low', 'intermediate' and 'high' rain anomalies were used.

Frequency — 0% | +/- 20%

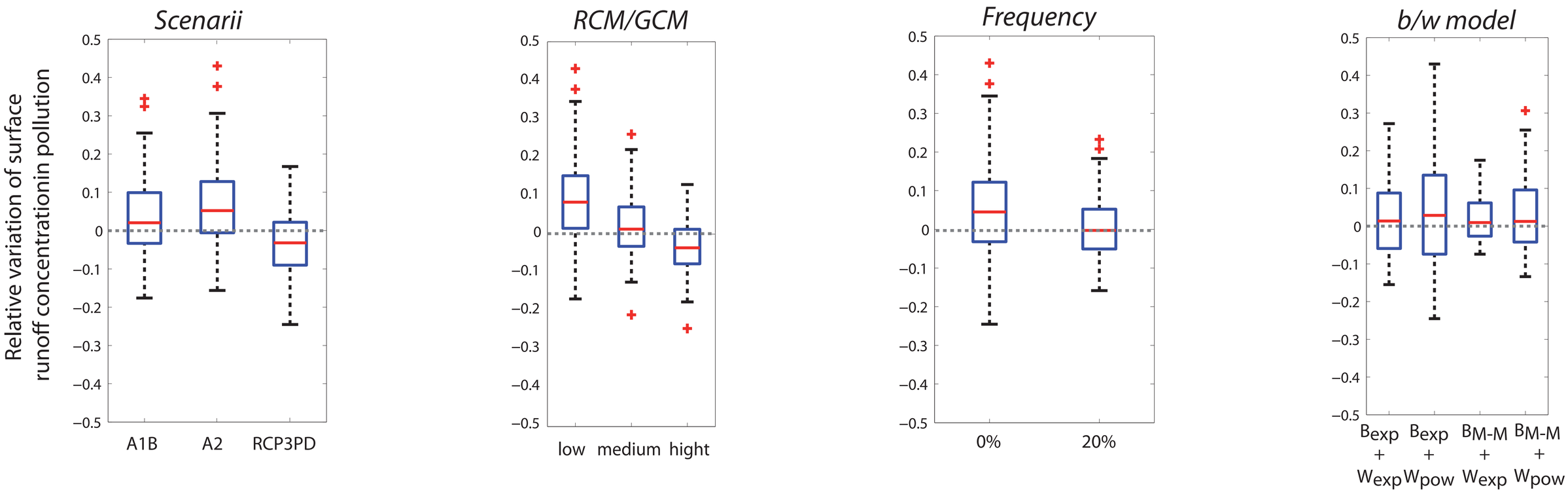
The frquency distribution of future rainfall obtained with the anomaly methodology was modified to produce +20% rainfall volumes in winter and -20% rainfall volume in summer.

b/w model



Four different shaped b/w models classically used were tested.

Results & Discussion



- In general, simulated concentrations are slightly higher than the present.
- Higher runoff concentrations represent higher risks for environmental conservation.
- The most sensitive input parameter is the choice of the RCM/GCM model.
- Sensitivity of results to b/w model parameter needs to be investigated.