Now back to the Ottawa flood: A study of a similar flood

Investigation of the mechanisms leading to the 2017 Montreal flood

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Abstract

Significant flood damage occurred near Montreal in May 2017, as flow from the upstream Ottawa River basin (ORB) reached its highest levels in over 50 years. Analysis of observations and experiments performed with the fifth generation Canadian Regional Climate Model (CRCM5) show that much above average April precipitation over the ORB, a large fraction of which fell as rain on an existing snowpack, increased streamflow to near record-high levels. Subsequently, two heavy rainfall events affected the ORB in the first week of May, ultimately resulting in flooding. This heavy precipitation during April and May was linked to large-scale atmospheric features. Results from sensitivity experiments with CRCM5 suggest that the mass and distribution of the snowpack have a major influence on spring streamflow in the ORB. Furthermore, the importance of using an appropriate frozen soil parameterization when modelling spring streamflows in cold regions was confirmed. Event attribution using CRCM5 showed that events such as the heavy April 2017 precipitation accumulation over the ORB are between two and three times as likely to occur in the present-day climate as in the pre-industrial climate. This increase in the risk of heavy precipitation is linked to increased atmospheric moisture due to warmer temperatures in the present-day climate, a direct consequence of anthropogenic emissions, rather than changes in rain-generating mechanisms or circulation patterns. Warmer temperatures in the present-day climate also reduce early-spring snowpack in the ORB, offsetting the increase in rainfall and resulting in no discernible change to the likelihood of extreme surface runoff.