Geophysical Research Abstracts
Vol. 15, EGU2013-14091, 2013
EGU General Assembly 2013

Decadal changes in the frequency of major floods in near-natural catchments across North America and Europe

Glenn A. Hodgkins (1), Jamie Hannaford (2), Paul H. Whitfield (3), Donald H. Burn (4), Anne Fleig (5), Kerstin Stahl (6), Benjamin Renard (7), Johanna Korhonen (8), Conor Murphy (9), Philippe Crochet (10), Donna Wilson (5), and Henrik Madsen (11)

(1) U.S. Geological Survey, Augusta, ME, USA, (2) Centre for Ecology and Hydrology, Wallingford, UK, (3) Environment Canada, Vancouver, BC, Canada, (4) University of Waterloo, Waterloo, ON, Canada, (5) Norwegian Water Resources and Energy Directorate, Oslo, Norway, (6) University of Freiburg, Freiburg, Germany, (7) Irstea, Hydrology-Hydraulics Research Unit, Lyon, France, (8) Finnish Environment Institute, Helsinki, Finland, (9) National University of Ireland, Maynooth, Ireland, (10) Icelandic Meteorological Office, Reykjavik, Iceland, (11) DHI, Hørsholm, Denmark

Recent major floods in North America and Europe have received much press, with some concluding that these floods are more frequent in recent years as a result of anthropogenic warming. There has therefore been considerable scientific effort invested in establishing whether observed flood records show evidence of trends or variability in flood frequency, and to determine whether these patterns can be linked to climatic changes. However, the river catchments used in many published studies are influenced by direct human alteration such as reservoir regulation and urbanisation, which can confound the interpretation of climate-driven variability. Furthermore, a majority of previous studies have analysed changes in low magnitude floods, such as the annual peak flow, at a national scale. Few studies are known that have analysed changes in large floods (greater than 25-year floods) on a continental scale.

To fill this research gap, the current study is analysing flood flows from reference hydrologic networks (RHNs) or RHN-like gauges across a large study domain embracing North America and much of Europe. RHNs comprise gauging stations with minimally disturbed catchment conditions, which have a near-natural flow regime and provide good quality data; RHN analyses thus allow hydro-climatic variability to be distinguished from direct artificial disturbances or data inhomogeneities. One of the key innovations in this study is the definition of an RHN-like network on a continental scale. The network incorporates existing, well-established RHNs in Canada, the US, the UK, Ireland and Norway, alongside RHN-like catchments from Europe (France, Switzerland, Iceland, Denmark, Sweden, Finland), which have been incorporated in the network following a major effort to ensure RHN-like status of candidate gauges through consultation with local experts.

As the aim of the study is to examine long-term variability in the number of major floods, annual exceedances of 25-, 50-, and 100-year floods during the last 40-100 years are estimated for all study gauges across North America and Europe. These are then pooled, and regional and continental flood frequency time series computed, including separate groups for different types of hydrological regime (pluvial, nival, mixed etc). Preliminary results will be presented, focusing on whether there is evidence for interdecadal variability in the occurrence of flooding at the large scale in Europe and North America. The unique intercontinental dataset is an example of successful international collaboration on hydro-climatic data exchange, which is potentially a step towards establishing RHN-like networks on a global scale. Such networks will make a valuable contribution to the understanding of hydrological change in future.