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# Worldwide floods are changing: Evidence from global high-quality annual maximum streamflow records

Hong Do, Seth Westra, and Michael Leonard

School of Civil, Environmental and Mining Engineering, University of Adelaide, Adelaide, Australia (hong.do@adelaide.edu.au)

In recent decades, floods have led to significant human and economic impacts (in 2014 alone the global cost of floods has been estimated to be US $37.4 billion), and reported flood losses have increased significantly from just US$7 billion per year in the 1980s. Recent empirical evidence of significant increasing trends in heavy rainfall has raised the concern of potential changes in flooding magnitude and frequency as a result of large-scale climatic changes. However, other driving forces, including changes in channel capacity and catchment characteristics, also play a large role in rainfall-runoff processes so trends in heavy precipitation cannot be taken as a proxy for trends in flooding.

In order to test whether global floods are changing or not, this study analyses a records global discharge time series from 1966 to 2005. Trends in worldwide flood magnitude were analysed using annual maxima daily streamflow obtained from Global Runoff Data Centre database, which holds records of 9,213 stations across the globe, with an average time series length of 42 years per station. High quality records during the reference period (1966 – 2005) with no more than 2 year of missing data were selected as the input of this study (1209 stations in all). To remove streamflow records impacted by large dams, the HydroSHEDS watershed boundaries and Global Reservoir and Dam (GRanD) databases are used to identify stations with existing dams in theirs upstream drainage basins. The Mann-Kendall test at the 5% significant level is applied on selected time series to identify stations showing significant positive and negative trends. The percentage of significantly increasing or decreasing stations are investigated in different climatic regions and catchment sizes, and compared against a bootstrap-based field significant test to represent the null hypothesis. The results indicate strong evidence against the null hypothesis of no change in flood magnitude at global and regional scales.