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Non-stationary flood frequency analysis in Australia

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ABSTRACT

Flood is one of the worst natural disasters, causing millions of dollars worth of damage and human deaths every year in Australia, and around the rest of the world.

Due to climate change, the frequency and magnitude of floods are changing, and in many cases the severity of floods are rising. This study aims to test the non-stationarity in the annual maximum flood (AMF) data across Australia. It applies trend tests to the AMF data, and then carries out flood frequency analysis (FFA) under both stationary and non-stationary paradigms. Several research questions are being investigated in this doctoral study:

a. What is the nature of trends in AMF data across Australia?

b. What are the impacts of climate change on design floods estimated by at-site FFA?

c. What type of relationship exists between trends in AMF and climate change indices data?

d. What is the best fit probability distribution(s) for AMF data in different regions of Australia?

e. How can we estimate a degree of uncertainty in non-stationary FFA?

The outcome of this research will provide sound scientific basis for recommending non-stationary FFA in Australia. The AMF data of all the Australian states are being compiled now. A minimum length of 50 years of record is considered in this study to select candidate stations. The trend analysis of AMF data from New South Wales show a downward trend for most of the selected stations. It is expected that four journal articles will be published from this doctoral research. This study will be completed in 2023. The outcomes of this research will assist in applying non-stationary FFA in Australia, which will result in reduced flood damage.