Climate change impact on extreme rainfall and the TN generation of a small New Zealand Lake catchment

Wei Ye, Wang Yao and David Hamilton

Abstract

The quality of most New Zealand lakes has been threatened by the dramatic land use change in their lake catchment, particularly the conversion of forest to of intensive pastoral farming land. The hydrological process is
the main driving factor in transporting the land based pollutant to become pollutant load in a lake. This process is greatly noticeable during extreme rainfall events. Future climate change will have add-on effects on this dynamic process due to its impact on local hydrological process. This research investigates the climate change impact on extreme rainfall and subsequently its effects on catchment TN generation. It presents a method that integrates a process based hydrological model with future climate change scenarios. The selection of a physical hydrologic model and the GCM model ensemble based scenario approach helps to overcome the hurdle of limited lake quality observation and the high uncertainty in climate change scenario generations. The method was applied to Lake Rotokakahi, a small lake of New Zealand, and reveals an increasing TN generation due to enhanced extreme rainfall frequency under climate change, even though the long term rainfall is likely to reduce, which leads to less flow to the lake in the future.