Bivariate Oscillation Model for Surrogating Climate Change Scenarios in the LCRR basin

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Abstract

From the unprecedented 2011 spring flood, the residens reside by Lake Champlain and Richelieu River encountered enormous damages. The International Joint Committee (IJC) released the Lake Champlain-Richelieu River (LCRR) Plan of Study (PoS). One of the major tasks for the PoS is to investigate the possible scenarios that might happen in the LCRR basin based on the stochastic simulation of the Net Basin Supplies that calculates the amount of flow into the lake and the river. Therefore, the current study proposed a novel apporach that simulate the annual NBS teleconnecting the climate index. The proposed model employed the bivariate empirical decomposition to contamporaneously model the long-term evolution of nonstationary oscillation embeded in the annual NBS and the climate signal (here, Artic Oscillation: AO). In order to represent the variational behavior of NBS correlation structure along with the temporal revolution of the climate index, a new nonstationary parameterization concept is proposed. The results indicate that the proposed model is superior performance in preserving long and short temporal correlation. It can even preserve the hurst coefficient better than any other tested models.

Keywords : Bivariate Empirical Mode Decomposition, Bivariate Nonstationary Oscillation Modeling, Lake Champlain, Richelieu River, International Joint Commission

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