H124-08 - Tree Ring Reconstruction Places Exceptionally High Modern Lake Erie Water Levels into a 350 Year Perspective

Friday, 11 December 2020

19:28 - 19:32

Abstract

In recent years, Lake Erie water levels have been higher than the historical mean of the observational record, which extends back to 1860. Exceptional water levels today prompts the question: when was the last time water levels were this high? In past studies, North Pacific tree-rings have been used to model the Laurentian Lake levels including Lake Erie. Tree-ring based reconstructions can extend observational records several hundred years into the past and here we use 27 tree ring chronologies from across Alaska in a principal component regression model that explains over 50% of the variance in recorded winter (January-March) Lake Erie levels. These far-afield and quite different climate indicators correlate with each other because they respond to the same continental-wide climate patterns. In this case, the explanatory power of the model based on North Pacific coastal and near-coastal tree-ring chronologies is due to the shared relationship with the Pacific North American (PNA) teleconnection pattern, the Pacific Decadal Oscillation (PDO), and the Atlantic Multidecadal Oscillation (AMO) climate modes. Two principal components (PCs) were retained in the final model, where the first PC most closely links to the influence of the AMO, and the second PC, the PDO. Currently, the AMO is most closely related to lake levels however, there are times when the PDO has a stronger influence. The lake level reconstruction extends back to CE 1650 and suggests that January-March average lake levels for 2019-2020 are unprecedented for at least the past 350 years. Ongoing modeling includes models of the other Great Lakes and the inclusion of a larger network of tree-ring series as predictors.

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