Connecting climate variability to the water levels of Lakes Michigan and Huron

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Abstract

Recent multidecadal changes in the water levels of Lakes Michigan and Huron have been documented since 1980, and numerous attempts have been made to connect this variation in lake levels to the global climate. In this study, we use a combination of lake level records and surface climate indices to analyze recent multidecadal climate patterns, particularly warming, in the Great Lakes region. We focus on the time period 1980 to 2006, during which the water levels of Lakes Michigan and Huron have increased at unprecedented rates, and we compare this period to previous climatic periods that exhibited large water level fluctuations. The water levels of Lakes Michigan and Huron are linked to the Great Lakes surface water temperatures, particularly the temperature of the upper 40 m of the lake, which is a good indicator of long-term climate warming. Additional surface temperature patterns are observed in the regional climate patterns of the Great Lakes region, which are important in understanding recent multidecadal climate changes in the lakes. The lake levels are also linked to trends in precipitation and to the extent of the summer sea ice edge. The results of this study are important in understanding the impact of climate warming on the Great Lakes region and in predicting future water levels.

Introduction

The water levels of Lakes Michigan and Huron have been of interest for many years. Since the 18th century, these lakes have exhibited significant increases in water level, particularly in the 20th century. The increases in water levels have been linked to climate changes, particularly warming, in the Great Lakes region. The water levels of Lakes Michigan and Huron are also linked to trends in precipitation and to the extent of the summer sea ice edge. The results of this study are important in understanding the impact of climate warming on the Great Lakes region and in predicting future water levels.

Historic lake-level and component data

The water levels of Lakes Michigan and Huron have been documented since 1980, and numerous attempts have been made to connect this variation in lake levels to the global climate. In this study, we use a combination of lake level records and surface climate indices to analyze recent multidecadal climate patterns, particularly warming, in the Great Lakes region. We focus on the time period 1980 to 2006, during which the water levels of Lakes Michigan and Huron have increased at unprecedented rates, and we compare this period to previous climatic periods that exhibited large water level fluctuations. The water levels of Lakes Michigan and Huron are linked to the Great Lakes surface water temperatures, particularly the temperature of the upper 40 m of the lake, which is a good indicator of long-term climate warming. Additional surface temperature patterns are observed in the regional climate patterns of the Great Lakes region, which are important in understanding recent multidecadal climate changes in the lakes. The lake levels are also linked to trends in precipitation and to the extent of the summer sea ice edge. The results of this study are important in understanding the impact of climate warming on the Great Lakes region and in predicting future water levels.

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Summary and discussion

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