

**Manuscript:** Chapter 6: Hydro-Climatic Conditions and Patterns

**Name of Reviewer:** Barrie Bonsal

1. Are the objectives of the work clearly stated? **2**
  - The objective or science question is clearly stated on the first page (How has climate affected the change in lake level relationship between Lake Michigan-Huron and Lake Erie).
2. Are the methods employed valid, appropriate and sufficient to address the questions, hypotheses or the problem? **3**
  - It appears that the methods used in the analyses are appropriate, but in some cases, there is a lack of clarity in their descriptions making it difficult to determine if the methods are valid. Details are provided in General/Specific Comments below.
3. Are the observations, conclusions and recommendations supported by the material presented in the manuscript (e.g., data, model and analyses)? **3**
  - Once again, it appears that the observations, conclusions and recommendations are supported by the material in the chapter, however, the lack of clarity in some of the writing makes it difficult to discern whether the conclusions logically follow from the observations. Details are provided in General/Specific Comments below.
4. Are the assumptions used valid and are the mathematics presented correct? **2**
  - The assumptions and mathematics appear to be valid.
5. Is the manuscript well organized, material precise and to the point, and clearly written using correct grammar and syntax? **4**
  - In many areas, the writing of the manuscript comes across as disjointed and is difficult to follow. Details are provided in General/Specific Comments below.
6. Are all of the figures and tables useful, clear, and necessary? **3**
  - Suggestions for improvements to the Figures are provided in Specific Comments below.
7. What is the quality of the overall work? **3**

**Recommendation**

**C**

**Rating**

**70**

Signature: Barrie Bonsal

Date: August 19, 2009

## **Comments for Transmission to Authors**

### **General Comments:**

The chapter addresses the question “How has climate affected the change in lake level relationship between Lake Michigan-Huron and Lake Erie” through an integrated approach involving comparative and statistical hydrologic data analysis. The conclusion is reached that climate has played a dominant role, while channel conveyance and glacial isostatic adjustment have had a smaller effect. From the information given in the report, this would appear to be a valid conclusion, however, in some areas, it is difficult to follow the methodologies and logic that lead to these findings. This is mainly due to the writing being disjointed and at times unclear. I believe that the overall presentation needs to be improved to more clearly convey the methodologies, results, and conclusions.

In addition, the finding that climate has played a dominant role in the lake-level relationship needs to be expanded. In other words, what particular climatic factors have contributed to this role? Is it due to lower precipitation, higher evaporation, several extreme events, ice cover, etc.? A more detailed analysis and interpretation of how climate has affected the relationship would vastly improve the chapter.

It also appears that many of the variables examined in the report have experienced substantial decadal-scale variability and thus, show periods of increasing/decreasing trends throughout the record. However, there is little mention of the overall trend during longer periods of record (i.e., those that would directly relate to climate changes). This requires comment. What is most important in terms of climate for the Great Lakes and resultant lake-level relationships? Is it decadal-scale variability or longer-term changes? How does one interpret these with respect to projected climate change? Are the low levels of the 1930s and 1960s analogous to those in the most recent decade?

### **Specific Comments:**

1. Page 149, paragraph 3, line 3: There should be some explanation as to why there is a greater focus on the period 1996 to 2005 and what impact this has on the conclusions of the chapter (if any).
2. Page 151, paragraph 4, last sentence: What impacts do the different data revisions have on the conclusions of this study?
3. Page 154, Figure 6-2: More explanation is required for this figure. Do the data used in this figure incorporate the Quinn revisions outlined on the previous page? Why is there an upward trend in differences for Lake Michigan-Huron, but a downward trend for Lake Erie? There are certain years that have more extreme differences (e.g., Lake Michigan-Huron around 1977). Can these be explained?
4. Page 155, paragraph 1, lines 2-3: I don't see the weak increasing trend for Lakes Michigan-Huron and Erie in Table 6-1. In fact, it is difficult to follow the logic of this

entire paragraph as it relates to the purpose of the chapter. Can you show results for precipitation, evaporation, and air temperature? Why is the fact that there is an upward trend in maximum air temperature over the Lake Superior Basin relevant? In addition, the abbreviations in Table 6-1 need to be spelled out. I suggest that this entire paragraph and Table be revised to either only provide results relevant to this study or expand on the information given as it relates to this study.

5. Page 155, last paragraph: Are these actually trends or just evidence of decadal variability? What is meant by a 'slight' rising trend for Lake Michigan-Huron (i.e., is it significant?). Much of the paragraph is devoted to Lake Superior and its differences. What is the relevance? In addition, why are regional climate and a reference to a closed basin lakes' study just 'thrown' into the mix? Again, this paragraph requires a substantial edit.
6. Page 156, paragraph 2, line 3: How were change-points due to climate removed? This needs to be clarified.
7. Page 156, last paragraph: I find this logic difficult to follow. The last sentence states that there have been declining lake levels yet the graphs in Figure 6-4 suggest that over the period of record, there has been substantial decadal variability but little change in lake levels over the entire period of record. What is the period of declining lake levels that the authors are referring to?
8. Page 157, last paragraph: What about the change in 1988?
9. Page 159, Figure 6-6: I would suggest making the y-axis the same for both graphs for easier comparison. It should also be noted in the text that the recent low values for Lake Michigan-Huron are not that unusual when examining the entire time series.
10. Page 160, 1<sup>st</sup> sentence: Over what period of record has there been a deficit in supplies and thus a resulting drop in lake level?
11. Page 161, paragraph 2, line 3: What does 'in part' mean?
12. Page 162, second bullet near middle of the page: Why is the second period 1996-2005 when on the previous page it was identified as 1988-2006?
13. Page 162, 3<sup>rd</sup> paragraph from the bottom (and elsewhere): What does 'reasonably' mean? This is not a very scientific term.