

## Response to Reviewer 1 Comments

**Manuscript: Ice jam formation at river confluences: comprehensive field investigation and comparison to laboratory-derived predictive equations**  
**Journal: Natural Hazards and Earth System Sciences of EGU**

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The authors thank Robert Ettema for its careful reading and positive assessment of the manuscript. His comments have improved the clarity and scientific rigour of the paper. Below, we address each comment in turn and describe the corresponding revisions made to the manuscript. All revisions are highlighted in the revised version.

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### **Comment 1 – Paragraph 10**

Comment: Replace "objective" with "objectives" and "is" to "are", as multiple objectives are stated.

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Response: Thank you for this correction. The text in Paragraph 10 has been revised accordingly. 'The objective of this study is therefore three-fold' has been replaced with 'The objectives of this study are therefore three-fold'.

### **Comment 2 – Paragraph 40**

Comment: Data are plural (datum is singular). So, replace "has" with "have".

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Response: Thank you for this grammatical correction. The sentence has been revised to read 'Field data have been used to develop'.

### **Comment 3 – Figure 1 (and all figures)**

Comment: Ensure the readability of this figure (actually, all figures). Some fonts are very small.

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Response: Thank you for this observation. All figures have been reviewed. The panels of Figures 1 and 2 were sized to fit within a single page to keep each composite figure compact and self-contained, so as not to make this paper any longer. However, this came at the cost of readability as mentioned and as the dense spatial content of each panel, including maps, aerial imagery, elevation profiles, instrumentation locations, and legend symbols, required small font sizes to avoid overlapping labels. We appreciate the reviewer's comment and agree that readability is a priority. In response, the size of each panel of these two figures has been increased to improve the legibility of all labels, station IDs, river names, and legend text. As a result, Figures 1 and 2 now extend across two pages in the manuscript. We note that while the figures span two pages in the Word document for readability purposes, each figure will be submitted as a single image file, ensuring that it remains a self-contained composite figure with a single caption.

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### **Comment 4 – Paragraph 225**

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Comment: Use "All data were...".

Response: Thank you. The sentence at Line 225 has been revised to read: 'All data were processed using MATLAB code created by the Université Laval research team and synchronized to a 1-hour timestep using linear interpolation between available measurements.'

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**Comment 5 – Paragraph 290**

Comment: Ensure the readability of this lengthy paragraph (here and there, elsewhere too). I suggest breaking the paragraph in two parts.

45 Response: Thank you for this suggestion. The paragraph at Line 290 has been divided into two parts. The first paragraph covers the model setup, simulation scenarios, boundary conditions, and default ice jam parameters. The second paragraph covers the model geometry, reach extent, cross-section counts, and the rationale for limiting hydraulic modeling to the STA-BDN confluence. We have also reviewed the remainder of the manuscript for similarly lengthy paragraphs and have broken where appropriate.  
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**Comment 6 – Table 6**

Comment: I use "variables" rather than "parameters" to describe dimensional quantities. "Parameters" (to my mind) are dimensionless ratios determined from dimensional analysis.

55 Response: Thank you for this terminological clarification. We acknowledge the reviewer's distinction and agree that it is technically precise. However, because the manuscript frequently presents both dimensional quantities and dimensionless ratios together, as it's the case in Table 6, which contains both variables (e.g.,  $bc$ ,  $b_1$ ,  $b_2$ ,  $\eta_1$ ,  $\eta_2$ ,  $q$ ,  $Sw$ ,  $B$ ) and dimensionless parameters (e.g.,  $\xi$ ), we have chosen to retain the term "parameter" throughout the manuscript as a unifying term covering both categories. This is consistent with common usage in the river  
60 ice engineering literature, where "parameter" is broadly understood to encompass both types of quantities. We believe this choice avoids unnecessary complexity in the text and tables without causing ambiguity, and we respectfully maintain this convention in the revised manuscript.

**Comment 7 – Paragraph 650**

65 Comment: Use "Conclusions" rather than "Conclusion", as you have several conclusions to state.

Response: Thank you for this remark. The section heading has been revised from '8. Conclusion' to '8. Conclusions' in the revised manuscript.

**Comment 8 – Table A1**

70 Comment: Be consistent with use of italics (e.g., in the Description you use text whereas under Symbol it [say  $F$ ] is italicized).

75 Response: Thank you for noting this inconsistency. Table A1 has been revised to ensure that all mathematical symbols are consistently italicised wherever they appear in the Symbol column and within the Description text. Force and variable names written as words (e.g., 'Bank shear resistance') remain in roman type, while all algebraic symbols (e.g.,  $F_{flow2}$ ,  $b_3$ ,  $v_{11x}$ ) are now italicised throughout the table. Additionally, the same italicisation convention has been applied consistently throughout the manuscript body, ensuring that all algebraic symbols are italicised when they appear in the text.

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**Comment 9 – Additional citation**

85 Comment: The authors should cite the 2008 book "River Confluences, Tributaries and the Fluvial Network", authored by Rice, Roy, and Rhoads, published by Wiley. Chapter 6 of this book concerns ice jams, giving several U.S. examples.

90 Response: Thank you for this recommendation. The book by Rice, Roy, and Rhoads (2008) has been added to the reference list and cited in the Introduction where the role of confluences in river ice dynamics is first discussed. Chapter 6 of this volume provides useful U.S. case studies that complement the Quebec context of the present study. Some references integrated in the book have also been added to the manuscript such as Michel (1972), Prowse (1986) and Tuthill & Mamone (1997).

95 The authors hope that these revisions adequately address all reviewer comments. We remain available to provide any further clarification if needed.