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Hydrology and Earth System Sciences Discussions

Interactive comment on "Development of a river ice jam by a combined heat loss and hydraulic model" *by* J. Eliasson and G. Orri Gröndal

J. Eliasson and G. Orri Gröndal

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Development of a river ice jam by a combined heat loss and hydraulic model J. Eliasson and G. Orri Gröndal. Received and published: 23 June 2008

Authors response to reviewers comments

Anonymous Referee #1

Review Report Hessd-2008-0020

COMMNETS This is an interesting exercise on applying static ice jam theory with ice volume estimated from heat loss calculations to model a freeze up ice jam. I do not think the word CFD used in the abstract is appropriate, since CFD is the term used for computational fluid mechanics while the authors’ work is actually a conventional steady state back water calculation. To use the term CFD is misleading. Also, the

authors should be more careful in writing the paper by providing complete information. Ice jam modeling has progressed significantly beyond what the authors’ used. The authors should make reference to these more recent advances.

Response: Basically the theory is a back water calculation where the surface is the pseudo-stationary surface of the ice jam. If the referee understood it as a presentation of a CFD simulation this is unintentional. Further explanation added on page 1023 line 1 – 5 in order to eliminate this misunderstanding. Our treatment is aimed at combining the two theories of ice production and jam buildup and to do that we use the equation system of Uzuner and Kennedy, they are very central in the more recent papers and adapt very well to the approximation used. More complex theories exist, these may very well be combined to the ice production theory also, but the paper would be considerably extended.

Detailed comments: p. 1026: The parameters used in the model such as k1, Ci, nc, φ, etc. should be given.

Response: That is difficult. The only case treated numerically is the very big Thjorsa jam reported by S. Rist. The k1, Ci, nc, etc coefficients are not estimated seperately, only the combinations that appear in the formulas eqs. 11 and 12.

p.1026: There are two variables α and Sw used for slope of water surface. Why?

Response: Sw means water surface slope.  means water surface slope angle. Clarification added.

p. 1208, line after Eq. (8): The sentence “ …internal strength on the ice jam to balance hydraulic forces on it.” Is not accurate. The internal strength is balanced by water drag, gravity, and bank resistance.

Response: (Page 1028) so corrected.

p. 1208, line before Sec. 2.3. : The last word “dam” should be “jam”. (Also, in the 1st paragraph of p.1031.)

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Response: (Page 1028) so corrected.

p. 1208: 1st sentence of Sec. 2.3 is not correct, since hm is not directly proportional to So according to Eq. 7.

Response: (Page 1028) directly corrected to inversely.

Figure 4: This comparison with filed data is not clear. The authors should show observed data in the figure. Also, the authors stated in the abstract “the results compare favorably to the HEC-RAS model”, but this comparison is not provided in the paper.

Response: (Page 1033) S. Rist’s observed data is provided in Table 2 andFig. 4 (blue line). New Fig. 4 is provided with better legend. Comarision with HEC-RAS is cited in section 1.1 (Eliasson and Gröndal (2006)) but not repeated in this paper.

Figure 4: what are Series 3 and 4?

Response: (Page 1033) New Fig. 4 is provided with better legend.

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