

Interactive comment on “Challenges in modeling ice floods on the Ningxia-Inner Mongolia reach of the Yellow River, China” by C. Fu et al.

Anonymous Referee #1

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The article, " Challenges in modeling ice floods on the Ningxia-Inner Mongolia reach of the Yellow River, China " by C. Fu, I. Popescu, C. Wang, A. E. Mynett, and F. Zhang undoubtedly focuses on an important and actual problem that follows from the title.

The article is constructed logically well. The purpose is stated clearly and methods are well-founded. The authors describe in details the object of research and the current state of the art in ice flood modeling demonstrating a good knowledge of advanced modeling techniques. Results obtained in accordance with the intended purpose and well interpreted by provided figures. To obtain these results, the authors use the sensitivity and Uncertainty analysis. Conclusions quite meet the declared objectives.

However importance and relevance of the work is limited only by its practical applica-

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tion, from a theoretical point of view it is of no interest. This follows from the approaches that are used by the author. Despite the understanding of current approaches (knowledge of which was demonstrated in a review of the article) the authors use a not very modern approach, namely the one-dimensional model. The main questions arise precisely because of the rationale for the choice of the model and set up. Initially, it is clear that the one-dimensional model can not solve the problems associated with flooding in full. Moreover the description of the model YRIDM is practically absent and there is no reference on it. The authors say only "The YRIDM is based on the RICE and RICEN models, and designed taking river ice processes into account... It consists of three main components, the river hydrodynamics, thermodynamics, and ice dynamic modules. (p 12303 paragraph 5)" Further hydrodynamic equations are given only. If YRIDM different from RICE and RICEN, it is necessary to dive all of the equations, or give a reference, but if it's just an adaptation of the existing models, why hydraulic equations are presented only?

Unfortunately I did not find any scientific novelty in current version of the manuscript Right now it looks like a publication of a new data only

It is not obvious and should have explained why initial roughness of ice cover is not included in the number of the sensitivity parameters.

Authors correctly identify deficiencies of the model "the model cannot simulate an ice jam breakup during the breakup period (p 12308 paragraph 5), the model ignores the effect on the water body mass balance due to changes in the ice phase, the model cannot work when the water level exceeds the height of the embankment (p 12308 paragraph 20)". In addition, for the forecast of ice floods it is not enough to know the discharge and water levels. Flooded area and the rate of it increase are the main characteristics. But for solutions of these problems will likely not be enough of these general propositions, as "the YRIDM should be improved so that it has the ability to deal with the problem (p 12309 paragraph 20)" and "the model can be further improved, for example, the one-dimensional models extended to two-dimensional models(p 12311

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paragraph 5)".

Since according to the authors "the ice dams and jams lead to dike-breaking and over-topping on the embankment (p 12294 paragraph 5)" and "This is the key problem to be solved on the Ning-Meng reach of the Yellow River (12302 paragraph 25)", for forecast of ice floods it is necessary to use other more advanced models such as DynaRICE

(DynaRICE Hung Tao Shen, Li Gao, Tomasz Kolerski, and Lianwu Liu (2008) Dynamics of Ice Jam Formation and Release. Journal of Coastal Research: Special Issue 52: pp. 25 – 32.)

or

Debolskaya, E.I, 'Numerical Modeling of Ice Regime in Rivers', Hydrologic Systems Modeling, Vol. 1, Encyclopedia of Life Support Systems, Eolss Publishers, Oxford (UK), 2009. P.137-165. <http://www.eolss.net>

Therefore, if "the purpose of this paper is to apply the YRIDM to the Ning-Meng reach of the Yellow River to examine the accuracy of the model (p 12296 paragraph 5)", it can be considered achieved.

However second goal/conclusion "A secondary objective is to examine the possibility of applying the YRIDM to forecasting ice flooding in support of decision making (p 12296 paragraph 5)", / "once the model has been calibrated, it can be used to forecast the ice regime to support decision making, such as on artificial ice-breaking and reservoir regulation (p 12310 paragraph 25) " requires significant additional explanation .

Technical corrections Tables 1 and 2 can be combined. Need to explain the lack of dimension of measurement units. There is no reference in the text to work. Shen, H. T., Su, J., and Liu, L.: SPH simulation of river ice dynamics, J. Comput. Phys., 165, 752–771, 2006. and vice versa (Shen et al., 2000) (p 12297 paragraph 20) is not in list of reference

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Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/10/C6145/2013/hessd-10-C6145-2013-supplement.pdf>

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