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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Efficient GIS-based model-driven method for flood risk management and its application in central China" *by* Y. Liu et al.

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The authors are indebted to the anonymous reviewer for raising numerous important issues which will improve our final manuscript. The following revisions will be made in response to those comments:

Comment 1: The manuscript essentially deals with the description of a risk management system based on loose-coupling (in opposition to tight-coupling) GIS with hydrological, hydrodynamic and disaster estimation models.

Response 1: The main contribution of this manuscript is to present a new methodological framework for decision support system (see Fig. 1). It has a double-ring iteration optimization structure (see Fig. 2), which contains behavioral-ring and technical-ring.

Then we illustrated a loose-coupling framework to support the optimization structure. Finally, we described how the optimization models and algorithms combined in this framework by a case study.

Comment 2: The Jingjiang flood diversion area realized in 1952 is very impressive for its geographical, social and economic characteristics, and by sure its risk management should be rather complex. However the paper lacks on some essential information. By a modeling point of view the paper widely lacks in the descriptions of procedures and algorithms.

Response 2: As the presentation of Response 1, the procedures and algorithms of a single part, such as the hydrological or hydrodynamic model, are not the focus. If you're interested in these models, you can check out our published papers, as follows:

[1] Liu, Y., Zhou, J.Z., Song, L.X., Zou, Q., Liao, L., Wang, Y.R., Numerical modelling of free-surface shallow flows over irregular topography with complex geometry [J]. Applied Mathematical Modelling, doi:10.1016/j.apm.2013.05.001, 2013.

[2] Song, L.X., Zhou, J.Z., Guo, J., Zou, Q., Liu, Y., A robust well-balanced finite volume model for shallow water flows with wetting and drying over irregular terrain [J]. Advances in Water Resources. 2011, 34(7): 915-932. [3] Zou, Q., Zhou, J.Z., Zhou, C., Song, L.X., Guo, J., Liu, Y., The practical research on flood risk analysis based on IIOSM and fuzzy α-cut technique [J]. Applied Mathematical Modelling, 36: 3271-3282, 2012.

[4] Guo, J., Zhou, J.Z., Zou, Q., Liu, Y., Song, L.X., A Novel Multi-objective Shuffled Complex Differential Evolution Algorithm with Application to Hydrological Model Parameter Optimization [J]. Water Resources Management, 27(8): 2923-2946, 2013.

[5] Song, L.X., Zhou, J.Z., Zou, Q., Guo, J., Liu, Y., Two-dimensional dam-break flood simulation on unstructured meshes. The 11th International Conference on Parallel and Distributed Computing [C]. Applications and Technologies, Wuhan China. 465-469,

2010.

Comment 3: The manuscript looks as written by an Information Technology expert, so a large (even too large) amount of acronyms is used (as it is in the IT style).

Response 3: This is an interdisciplinary research. Power and Sharda (2007) identified that, behavioral and technical research on model-driven method needs to address many unresolved issues. In order to ensure universality, we discussed a lot of application environments. Therefore, the manuscript involves a lot of terms and acronyms.

Comment 4: The term "model-driven" takes a central role in the manuscript but its meaning is never made explicit. Just an example: the authors state : ": : : focus on models rather than on computer programs.", this probably means that a "model" is intended as a formalized representation of reality, but, as the same term is widely, and commonly, used to define a class of computer programs a more detailed description appears advisable.

Response 4: Thank you, it is our mistake. It will be supplemented with relevant references. The term "model-driven" is one of the most important topics in the decision support system research since 1969 (Power and Sharda, 2007). Model-driven DSS uses algebraic, decision analytic, financial, simulation, and optimization models to provide decision support. This manuscript presented a new model-driven method with double-ring iteration optimization structure for flood risk management.

Comment 5: There is no direct relation between complexity and efficiency so the superior performances of the system have to be demonstrated in comparison with more traditional, and simpler, systems.

Response 5: For the complexity and uncertainty of the decision-making process, the key points are dynamic adaptability and heterogeneity. Therefore, we presented a loose-coupling framework, solving different decision problems by automated iterative optimization. Based on the feedback from managers, the DSS can efficiently customize

decision-making processes or change some more appropriate models. This application life cycle is different from the traditional decision support system. It has three benefits, which are described in the Section 6.

References Power, D. J. and Sharda, R.: Model-driven decision support systems: Concepts and research directions, Decis. Support Syst., 43, 1044–1061, doi:10.1016/j.dss.2005.05.030, 2007.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 1535, 2013.

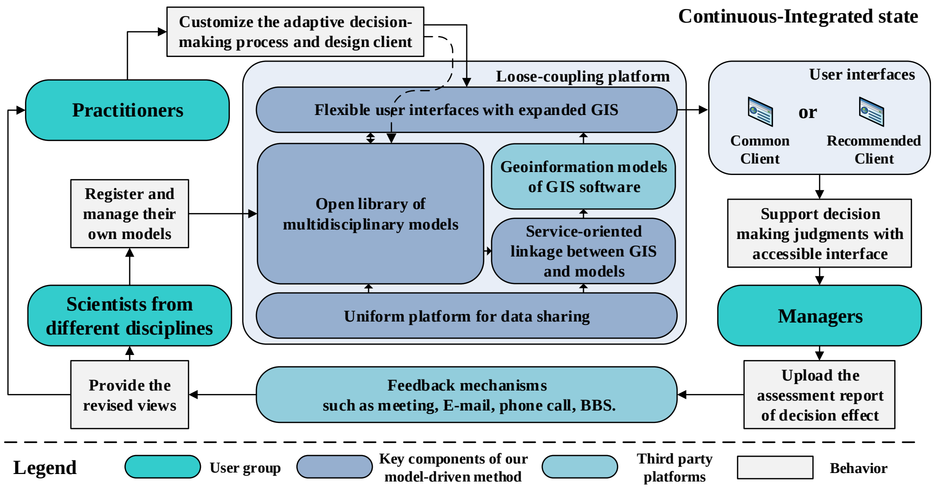

Fig. 1. Methodological framework of the model-driven method for flood risk management

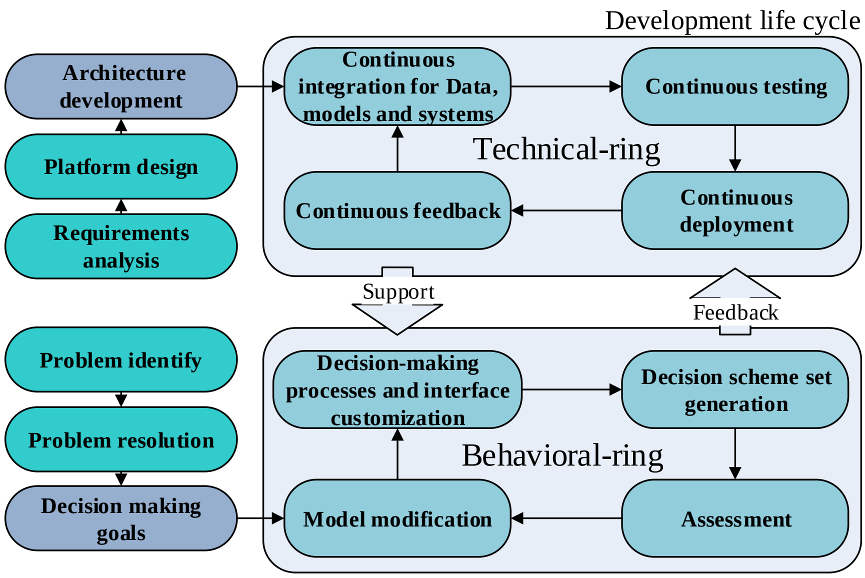

Fig. 2. Application life cycle for double-ring iteration optimization structure