

A new cost-performance grid to compare different flood modelling approaches

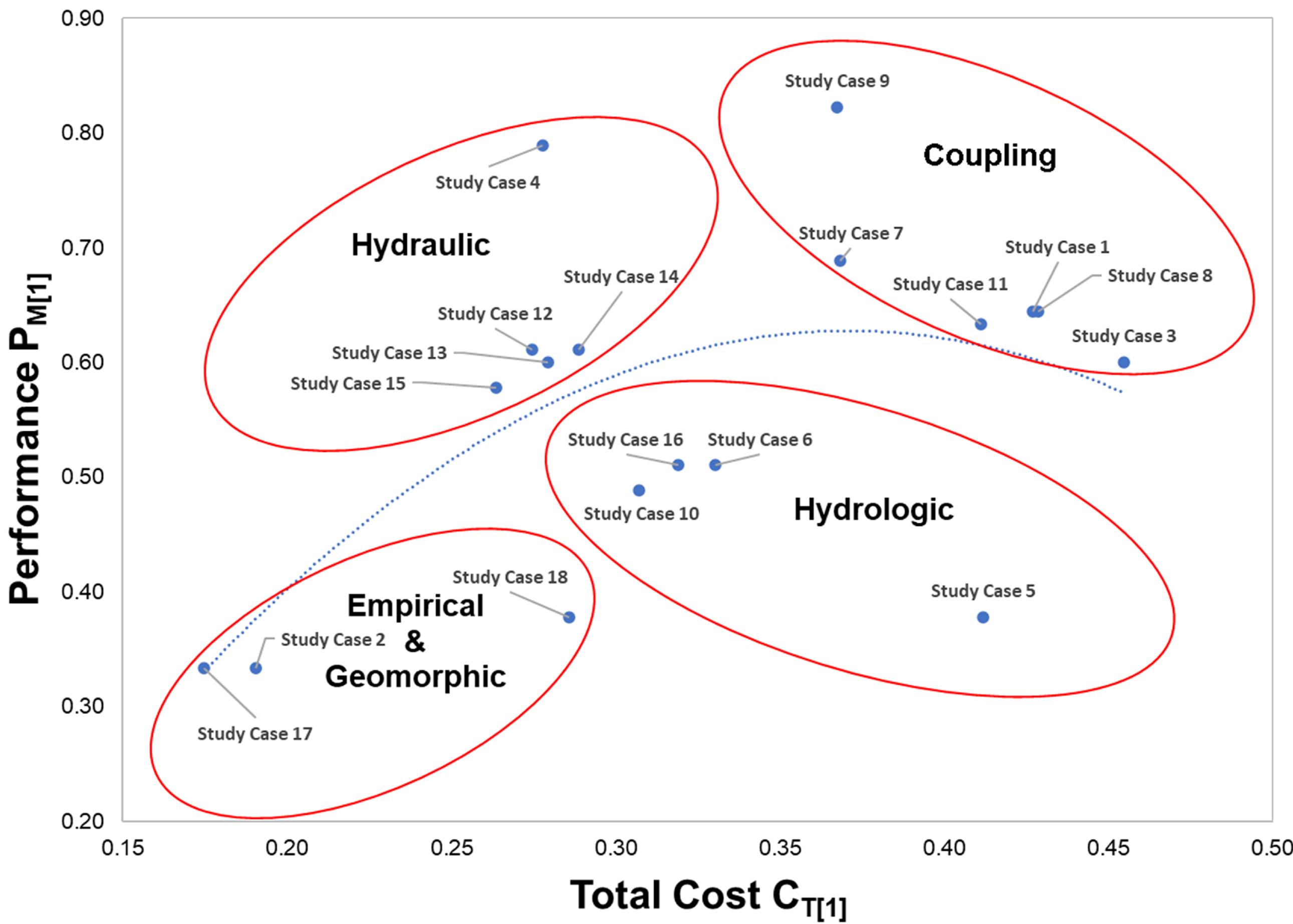
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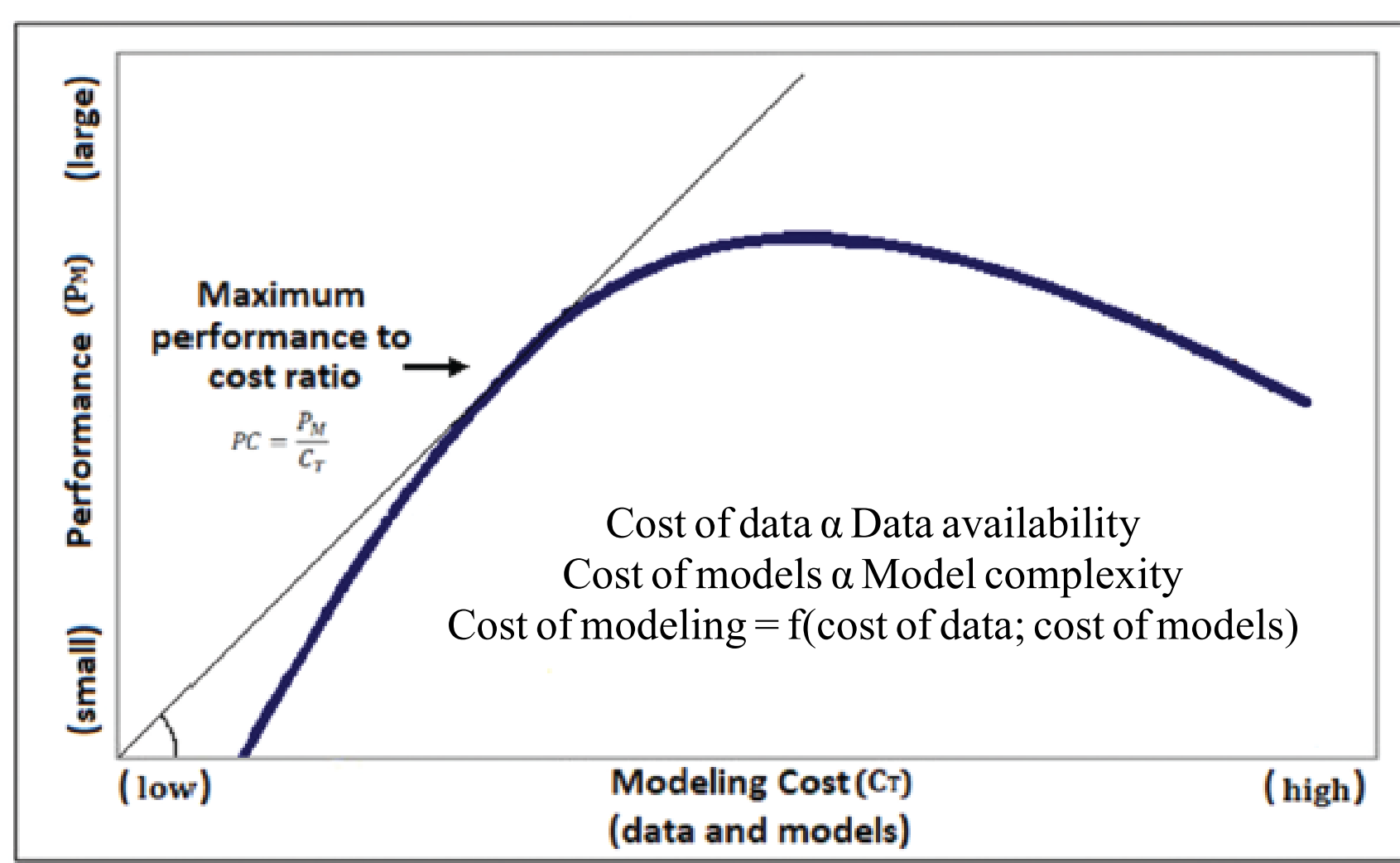
ABSTRACT

The wise selection of modeling approaches with an appropriate level of complexity for the study objectives is critical for robust inference. In this study, the structure of a cost-performance grid designed for flood modeling is presented. The grid is developed to compare different flood modeling approaches of variable complexity and to provide guidance on the proper selection of the data-model couple. The methodology involves defining metrics to quantify the three variables: data costs, model costs, and performance. Preliminarily, 18 flood modeling applications in the literature were arbitrarily selected and analyzed to guide the implementation of the grid. The cost-performance diagram allows us to trace a cost-performance curve and group applications in four zones corresponding to four modeling approaches (empirical and geomorphic, hydrological, hydraulic, and coupling). The grid is a tool to support the comparison, classification, and future selection of cost-effective modeling approaches. It is flexible and can be extrapolated to other modeling objectives.

Results



Methodology

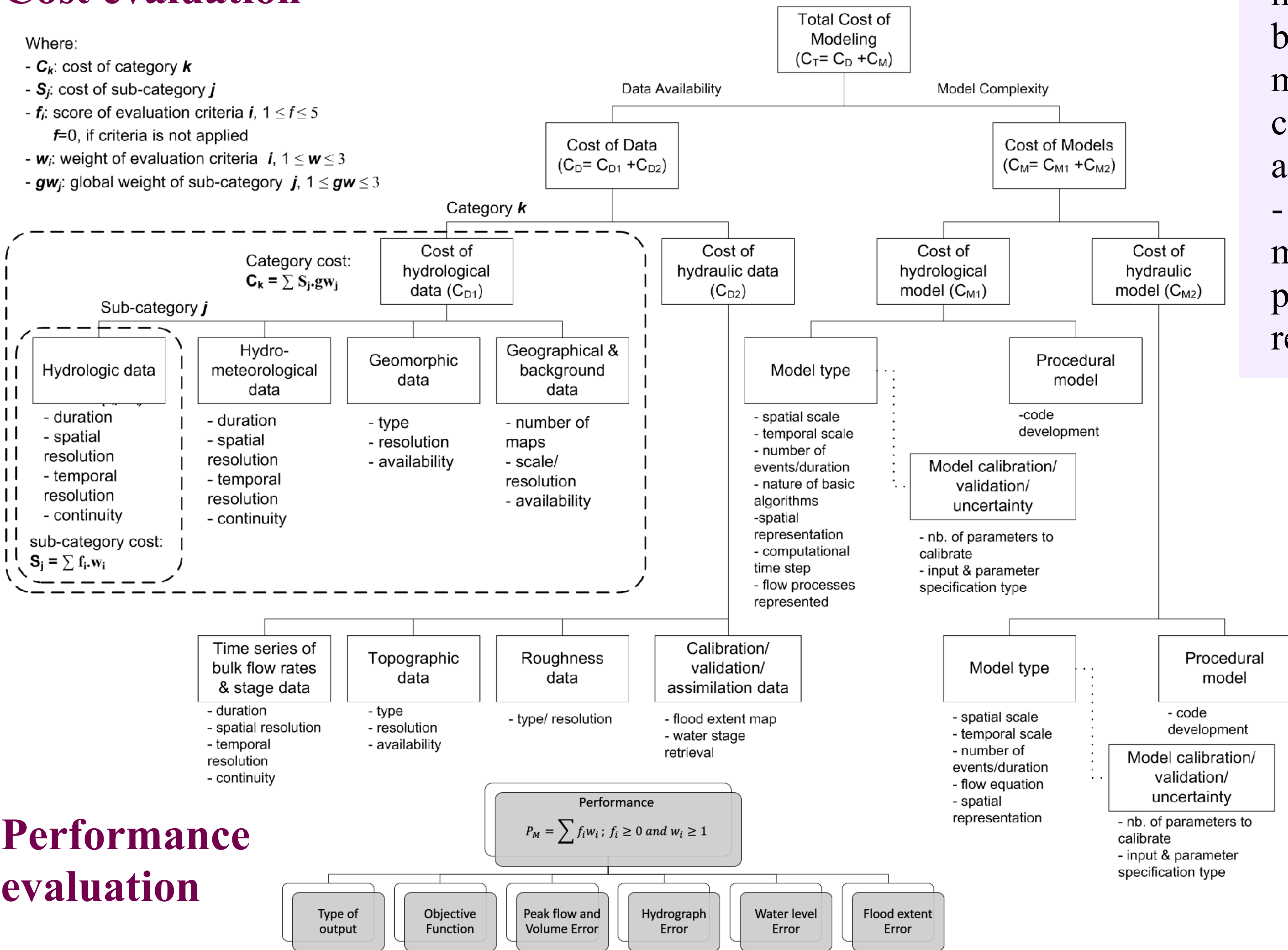


Application

The methodology was applied on 18 flood modeling study cases available in literature. The approach is structured in three applications:
1- General application based on our recommended scale of scores and weight values
2- Sensitivity analysis of the selected weights
3- Sensitivity analysis of the selected scoring scale

Cost evaluation

Where:
- C_k : cost of category k
- S_j : cost of sub-category j
- f_i : score of evaluation criteria i , $1 \leq i \leq 5$
- $F=0$, if criteria is not applied
- w_i : weight of evaluation criteria i , $1 \leq w_i \leq 3$
- gw_j : global weight of sub-category j , $1 \leq gw_j \leq 3$



Performance evaluation

Future Perspectives

- The cost-performance grid is tailormade; we are not aware of a similar one having been made previously. It allows, for the first time, plotting different flood modeling approaches on one graph and comparing them on a unified scale.
- Evaluating the relative position of different approaches on the cost-performance diagram allows us to classify them into categories based on their cost and performance levels.
- Comparing and classifying modeling approaches provide the modeler with guidance to judge the model performance. As such, the model choice can be justified based on the expert knowledge and the insights given by the cost-performance comparison.
- As a first application, the grid is fitted to flood modeling approaches, but the same methodology can be extrapolated to other modeling objectives, with modifications relevant to each case. Furthermore, it can be periodically updated to follow the recent advances in data measurements and model capabilities.
- A survey link is developed to collect information on more study cases. Interested researchers are advised to participate in the open survey which is available upon request by contacting the authors.

Supplementary Data

The grid and the survey link are available upon request by contacting the authors.

Acknowledgements

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References

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