Jul 13th, 11:10 AM - 11:30 AM

Multi-dimensional hydraulic coupling for flood forecasting

S. Barthélémy  
CECI, CNRS-CERFACS, barthelemy@cerfacs.fr

S. Ricci  
CECI, CNRS-CERFACS, ricci@cerfacs.fr

N. Goutal  
EDF, nicole.goutal@edf.fr

T. Morel  
CECI, CNRS-CERFACS, morel@cerfacs.fr

E. Le Pape  
SCHAPI, etienne.lepape@developpement-durable.gouv.fr

Follow this and additional works at: https://scholarsarchive.byu.edu/iemssconference

Part of the Civil Engineering Commons, Data Storage Systems Commons, Environmental Engineering Commons, Hydraulic Engineering Commons, and the Other Civil and Environmental Engineering Commons

https://scholarsarchive.byu.edu/iemssconference/2016/Stream-B/34

This Event is brought to you for free and open access by the Civil and Environmental Engineering at BYU ScholarsArchive. It has been accepted for inclusion in International Congress on Environmental Modelling and Software by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen amatangelo@byu.edu.
Multi-dimensional hydraulic coupling for flood forecasting

S. Barthélémy\(^{(a)}\), S. Ricci\(^{(a)}\), N. Goutal\(^{(b)}\), T. Morel\(^{(a)}\), E. Le Pape\(^{(c)}\)

\(^{(a)}\)CECI, CNRS-CERFACS, 42 Av. Gaspard Coriolis, 31057 Toulouse cedex 01, France
barthelemy@cerfacs.fr; ricci@cerfacs.fr; morel@cerfacs.fr

\(^{(b)}\)EDF, 6 quai Watier, 78401, Chatou, France
nicole.goutal@edf.fr

\(^{(c)}\)SCHAPI, 42 Av. Gaspard Coriolis, 31057 Toulouse cedex 01, France
Etienne.LEPAPE@developpement-durable.gouv.fr

Abstract: In the context of hydrodynamic modelling the use of 2D models is of fundamental importance in areas where the flow is not mono-dimensional. Nonetheless, the lack of bathymetric data to develop a global 2D model over an entire network or the computational cost of a global 2D model can be prohibitive for operational flood forecasting services. To overcome this limitation a solution is to use multi-dimensional coupling with the use of 1D models where the flow is mono-dimensional and the use of 2D models when needed. Multi-dimensional coupling allows for the use of a global hydrodynamic 1D/2D model over a network but for a much reduced computational cost compared to a global 2D model. It also guarantees the continuity of the hydraulic variables at the interfaces between the 1D and the 2D models with the use of a Schwarz algorithm adapted to the hydraulic case. In this study, multi-dimensional coupling in hydraulic was combined with 2D domain decomposition and 1D data assimilation of water level observations on the “Adour maritime” hydraulic network. This network is located in South West of France where a global 1D model on the network and a local 2D model on the Bayonne area have been developed and are used in operational context by French flood forecasting services. It was shown that the local 2D model improves the hydraulic modelling compared to a 1D model and that the combination of hydraulic coupling and 2D domain decomposition makes this methods compatible with operational constraints.

Keywords: hydraulic coupling; flood forecasting; domain decomposition; data assimilation.