8th. World Congress on Computational Mechanics (WCCM8)
5th European Congress on Computational Methods in Applied Sciences and Engineeering (ECCOMAS 2008)
June 30 –July 5, 2008
Venice, Italy

ABSTRACT TITLE

A quasi-3D estuarian river flow modeling

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Key Words: *Hydrodynamical modeling, adaptative coupling, error estimates, finite elements.*

ABSTRACT

We are interested in the hydrodynamical multidimensional modeling and simulation of an estuarian river flow. The ideal model to be employed is a three-dimensional model, but due to the huge computational cost, it is obvious that one cannot use it on the whole lenght of the river. Furthermore, a fine modeling taking into account the vertical and horizontal effects is necessary only near the estuary and in particular restricted zones. Therefore, it would be interesting to employ different lower-dimensional models on adequated regions of the river and to couple them by the means of an *a posteriori* error estimator's technique in order to get a global solution.
The 3D model to be employed in the estuarian zone is based on the instationary Navier-Stokes equations with physical boundary conditions. The simpler models are obtained by a projection method of the 3D problem, which has been put under a nonlinear mixed weak form. One gets two bidimensional models called 2D-horizontal and 2D-vertical, whether they are written on the free surface or on the median longitudinal surface of the river, and a one-dimensional model written on the median curve of the river. All these models provide a three-dimensional velocity and the pressure, which is an unknown of the problem and not supposed to be hydrostatic. Another advantage of this approach is that the 2D-vertical and the 1D-models take into account the geometry of the river since they are written in curvilinear coordinates.
These models are derived in a hierarchical way : the 1D problem is a conforming approximation of the 2D-horizontal, respectively vertical models, which are both conforming approximations of the 3D's one. This hierarchy allows a natural coupling, in the sense that the transmission conditions between the different models are implicitly contained in the formulations. The coupling is then based on residual *a posteriori* error indicators. Part of these works has been detailled in [1].
We propose here to couple the 2D-horizontal and 2D-vertical models to reconstruct a quasi 3D-model called 2,5D model. An automatic coupling is implemented for the modelisation of the whole domain. Realistic tests on the Adour river and a comparison whith IFREMER data will be performed.

REFERENCES

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