

CD无结构网格上的三维自由水面非静水压力流动模型II：验证

Three dimensional non hydrostatic pressure model for free surface flows on CD unstructured grid II Verification

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基金项目：

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中文摘要：

对作者建立的CD无结构、z坐标网格上的非静水压力流动模型中的若干技术细节问题进行了进一步的阐述。提出一种改进的ELM(Eulerian Lagrangian Method)方法求解对流项；紊流模型采用GLS(Generic Length Scale)模型，并针对急流的模拟提出一种给自由水面计算添加人工耗散以增强其稳定性的方法。通过微幅波、弯道环流、丁坝绕流3个典型算例对模型进行了基准测试，计算结果与解析解或试验资料吻合良好，表明本文模型具有能准确模拟非静水压力分布的流动和环流等的能力和良好的人工边界适应性。

英文摘要：

The technology details of the three dimensional non hydrostatic pressure model for free surface flows on CD unstructured grid proposed by the authors are further illustrated. An improved Eulerian Lagrangian method(ELM) is proposed to solve the convection term and the Generic Length Scale(GLS) model is adopted for turbulence closures. A simple, robust and conservative method is suggested to add an artificial dissipation in simulating supercritical flows for enhancing the stability of free surface calculation. The model is successfully applied to simulate three examples including the small amplitude wave motion, the circulation flow in a curve channel and the flow around a non submerged spur dike. The simulation results are in good agreement with the analytical solution and experimental data. It indicates that the proposed model has the abilities of simulating non hydrostatic flows and circulations and also has good adaptability to artificial boundary. Moreover, when the method for adding artificial dissipation is adopted in simulating the supercritical flow over a ramp, steady and accurate calculation is achieved. The maximum Courant number of the computation reaches 3.0.

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