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Shallow water flow estimation analysis using the ensemble Kalman filter FEM

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The SUPG method is frequently used to solve the governing equation. It is necessary to perform calculations based on several procedures that have been presented to obtain stabilization parameters[1]. However, even if a numerical simulation is carried out based on the stabilized FEM, the numerical solution is rarely in close agreement with real-world observed values. It has been confirmed that if the Kalman filter FEM is employed to compute the flow behavior while taking observed values into account, the computed value is in better agreement with the observed value than the computational results obtained using the conventional FEM[2]. However, the Kalman filter FEM can't be applyed to problem using the non-liniar system equation. Therefore, the ensemble Kaiman filter FEM is introduced in this study[3]. In the ensemble Kalman filter FEM, the stochastic distribution of the state variables is represented by the ensemble approximation, and the special distribution of the state variables is obtained by the FEM. As the governing equation, the shallow water equation is introduced, and the SUPG method, one of discretization method in the FEM, is applied to discretize the governing equation. Influence of sample number for estimation accuracy is investigated in open channel model.

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