

A moving mesh finite element methods for the solution of the shallow water equations

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A moving mesh finite element scheme based on the use of monitor functions is described. Mesh nodes are moved such that the integral of the monitor function over each mesh element remains constant. This conservation principle allows to derive the mesh velocity by using Reynolds Transport Theorem. By further assuming that the mesh velocity is irrotational, the conservation principle can be converted into an elliptic problem for the mesh velocity potential, which can then solved by means of a standard linear finite element method. The mesh velocity is finally found by projecting the gradient of the velocity potential on the mesh nodes.

The method is applied to the non-linear shallow water equations. The equations are discretized with the $P_1^{NC} - P_1$ finite element pair. Results are shown for a number of test problems using various monitor functions.

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