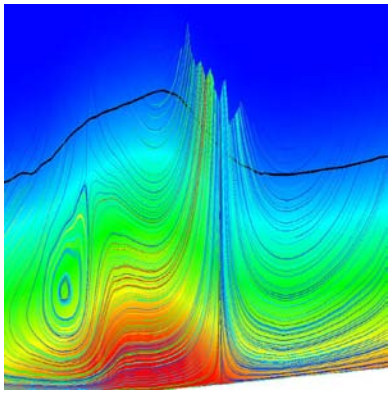
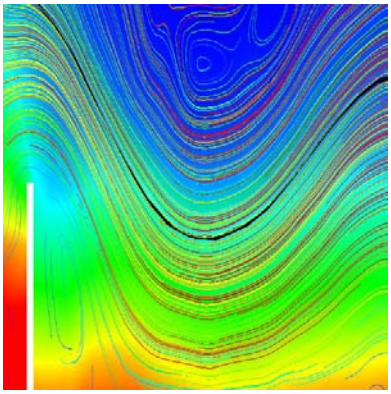
US Army Corps of Engineers®
Engineer Research and Development Center

Navigation Systems Research Program
High Fidelity Vessel Effects

Description

Accurate computer simulations of complex flow near vessels and structures are needed for channel design, coastal structure design, and environmental simulation. Moving boundary simulations are required to complement more efficient, but sometimes less accurate, approaches based on depth-integrated models and/or fixed boundaries. This research is focused on developing an accurate and robust simulation capability for two- and three-dimensional, incompressible, Reynolds-Averaged Navier-Stokes (RANS) in domains with moving boundaries and vessels. Fully unstructured, adaptive finite element methods based on level-set and volume-of-fluid approaches are being developed to model the dynamic geometry and topology inherent in these applications. Platform independent software is being developed to allow simulations to be run on a range of architectures, from laptops to multi-core workstations and massively parallel supercomputers.





Issue

Accurately simulating flow processes with moving boundaries is challenging because the geometry and flow are tightly coupled. Breaking waves, moving vessels, and waves near vessels and structures, are all examples of systems where a full three-dimensional, moving boundary simulation can be required in order to correctly represent the physics.

Users

Researchers and engineers will use this software for navigation and coastal studies.

Products

Software for simulating 3D incompressible air/water flow and air/water/solid interactions

Benefits

The software can enhance laboratory and field studies in navigation and coastal projects.

Corps Program

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