## SYMPOSIUM : COMPUTATIONAL MECHANICS WITH ADAPTIVE MESH REFINEMENT

This paper deals with transient adaptive simulations of 3D surface flows.

The free surface flow is computed with a stabilized finite element method that is coupled with higher order discontinuous Galerkin method for the level set equation [1]. The level set method is a powerful and popular numerical approach. This can be explained by the fact that this approach is easy to implement and can handle complex free surface dynamics without any special treatment.

However, we have shown in [1] that, in the context of the linear stabilized finite element methods, the boundary conditions at the interface cannot be satisfied exactly. Nevertheless, this error at the vicinity of the interface can be reduced significantly using anisotropic mesh adaptation near the interface.

Since the interface is represented by the iso zero value of a level set function, the proposed adaptive algorithm [2] adapts the mesh according to the distance to the interface and introduces anisotropic mesh refinement with a mesh metric that is based on the gradient of the level set.

Examples of complex transient flows with free surface are presented that demonstrate the accuracy and efficiency of the approach.

[1] E. Marchandise, J.-F. Remacle, "A stabilized finite element method using a discontinuous level set approach," Journal of Computational Physics, Submitted, 2005.

[2] X. Li, M. Shephard, M. Beall,"3D anisotropic mesh adaptation by mesh modification," Comput. Methods in Appl. Mech. and Engrg., v. 194, p. 4915-4950, 2005.