A PRIORI BASED MESH ADAPTATION FOR VISCOUS FLOW

ANCA BELME[*], ADRIEN LOSEILLE[†], HUBERT ALCIN[‡], FRÉDÉRIC ALAUZET[†], STEPHEN WORNOM[◇] AND ALAIN DERVIEUX[‡]

[*] Institut d'Alembert, UMPC, 4 place Jussieu, 75252 Paris Cedex 05, France,
e-mail: belme@dalembert.upmc.fr

[†] INRIA, BP 105, Domaine de Voluceau, BP 105, 78153 Le Chesnay Cedex, France
e-mail: Adrien.Loseille, Frederic.Alauzet@inria.fr

[‡] INRIA, BP 93, 2004 route des Lucioles, 06902 Sophia–Antipolis Cedex, France
e-mail: Hubert.Alcin@inria.fr, Alain.Dervieux@inria.fr

[◇] LEMMA, 2000 route des Lucioles, Sophia–Antipolis, France
e-mail: Stephen.Wornom@inria.fr

Key words: CFD, viscous flow, Large Eddy Simulation, mesh adaptation

Abstract. A priori estimates are applied to the anisotropic mesh adaptation for 2D viscous flows and 3D ones including Large Eddy Simulation.

1 METHODS

Two novelties were presented [1] in the recent ECCOMAS conference at Vienna. First an a priori analysis for diffusive flows allowing, through a goal-oriented criterion, the direct specification of mesh metric, *i.e.* mesh stretching and density, [3]. Second the extension of this method to the reduction of approximation error in LES formulations [2]. In contrast to the very preliminary numerical experiments presented at ECCOMAS, we plan to discuss a sequence of tests showing the interest of both methods.

2 AN EXAMPLE

The proposed mesh adaptation method is applied to the computation of the flow around an offshore platform with a very complex geometry. This flow was accurately computed and compared with experiments in a specialized conference [4]. For the present mesh adaptive calculation, we take into account a large enough time interval and compute the adjoint on this interval. The resulting mesh adaptation criterion can be concentrated on

the generation of a single mesh, since the vortices concentrate on a region of wake which is well identified by the algorithm. See illustration.

REFERENCES

[1] H. Alcin, A. Belme, A. Loseille, F. Alauzet, A. Dervieux, Goal-Oriented mesh adaptation for vortex shedding flows, ECCOMAS 2012, Vienna, Austria, 2012.

[2] H. Alcin, Resolution d'ecoulements instationnaires et adjoints, Thesis, university of Nice, 2012.

[3] A. Belme, Aerodynamique instationnaire et methode adjointe, Thesis, university of Nice, 2011.

[4] S. Sirnivas, S. Wornom, A. Dervieux, B. Koobus, O. Allain, A study of LES models for the simulation of a turbulent flow around a truss spar geometry, OMAE2006-92355, Proceedings of OMAE'06, 25rd International Conference on Offshore and Arctic Engineering, 4-9 June, 2006, Hamburg, Germany.

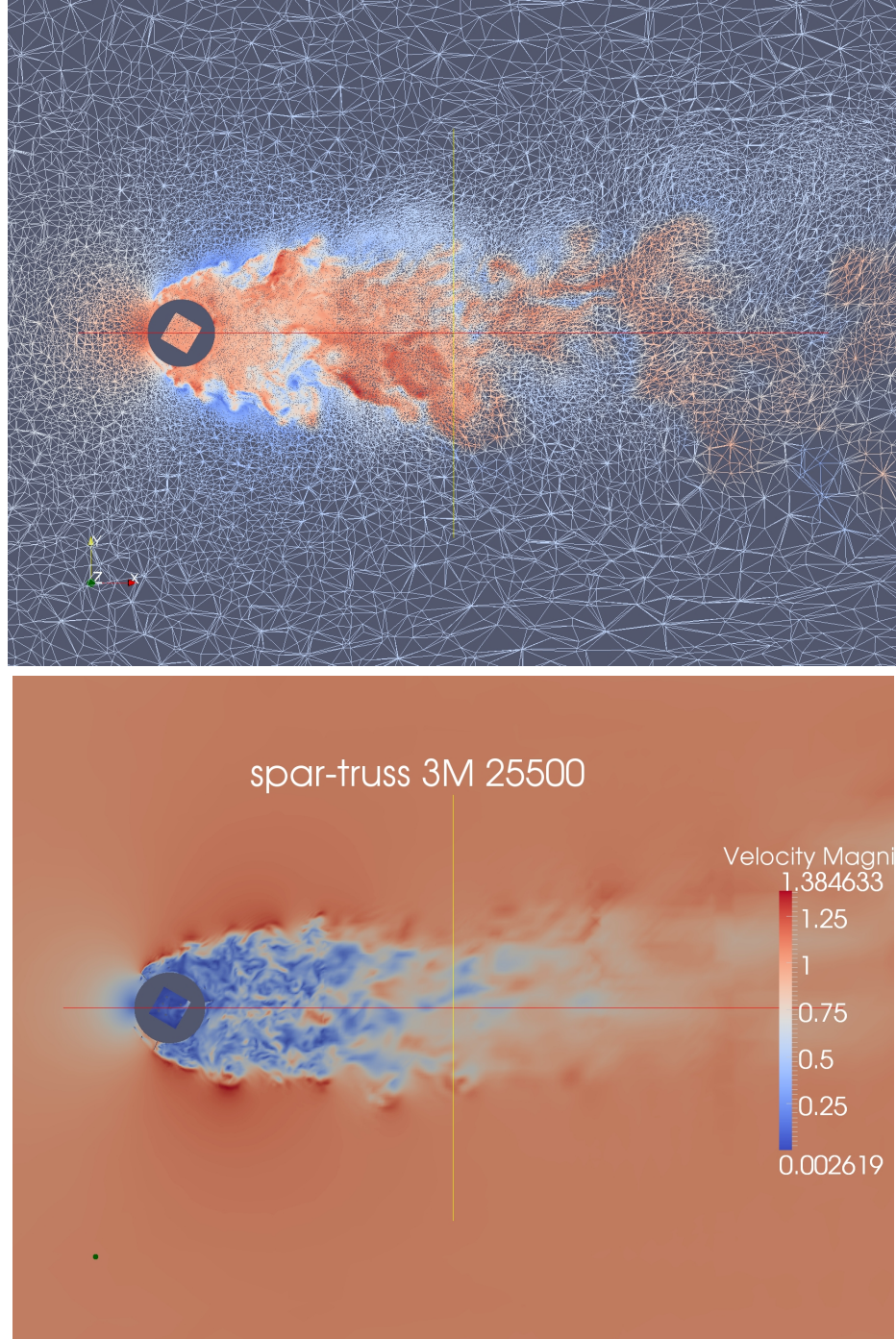http://www-sop.inria.fr/members/Alain.Dervieux/OMAE2007.pdf

Figure 1: Mesh adaptive flow around an offshore platform: velocity module at two different times, the first one with mesh wireframe representation.