FURTHER DEVELOPMENT OF LES WITHIN MIOMA

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In past years the new parallel Large Eddy Simulation code MiOma was developed for turbulence modelling by R. Giammanco during his PhD studies at the EA department at von Karman Institute. The solver work with fully cartesian discretization, therefore the Immersed Boundary Technique was implemented by J. Bodart to treat the cases of flow around non-cartesian bodies. This method allows to compute the flow around complex geometries without the necessity of having a body fitted grid.

In this approach three types of cells are first distinguished: fluid cells, boundary cells and solid cells and different treatment is used for each type. The presence of a complex boundary then is replaced by a spatially varying distribution of a forcing term, which mimics the effect of the body in the flow.

During this project various postprocessing tools have been developed in order to better understand the flow behavior and evaluate the capability of the solver. The module for calculation of body forces has been directly coded into the solver and the module for the extraction of surface distributions of different physical quantities has been implemented in the postprocessor. The fast and efficient Kenwright's algorithm for determination of separation/attachment lines has been introduced. Example of the output is shown on figure 1.

In order to perform the validation of the code, the flow past a sphere at laminar and turbulent Reynolds numbers (Re=300, Re=500 and Re=3700) has been simulated. In all test cases the behavior of the flow has been studied and the values of various dimensionless quantities compared with experimental and numerical results of different authors. The code was successfully validated at laminar cases while at Re=3700 the results are affected by the coarse grid used.

Based on the obtained results the necessary improvements on the boundary reconstruction have been done. The efficiency of MiOma has been significantly increased by an optimization of the code. Furthermore the robustness of the solver has been extended by a new boundary reconstruction.

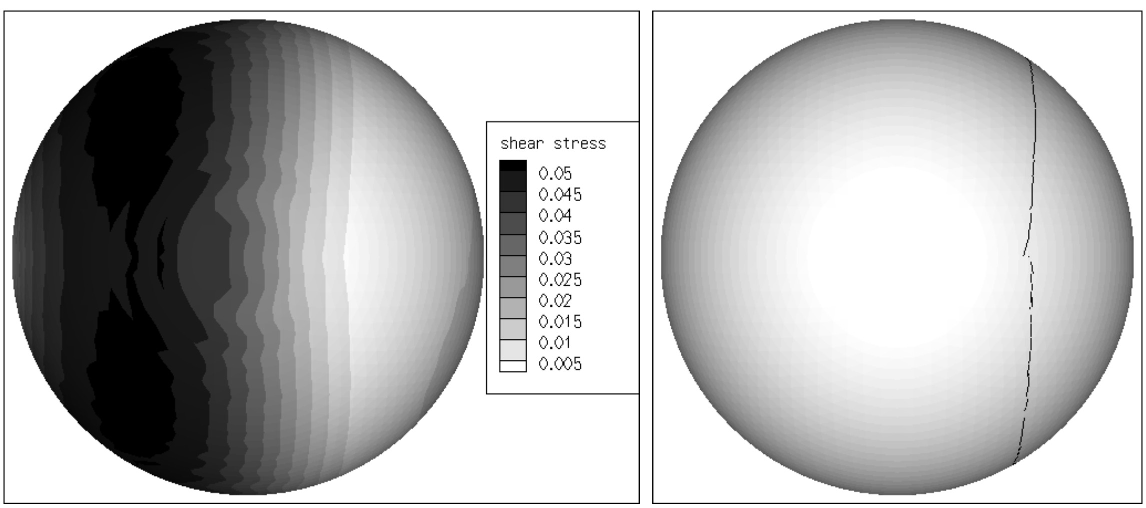

Figure 1: Wall shear stress distribution (left) and separation line (right) on the sphere at Re=300