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MULTI-SCALE METHODS: APPLICATIONS TO FLUID MECHANICS PROBLEMS

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Abstract. Multi-scale methods have emerged to facilitate its numerical solution when several simultaneous scales exist in the same problem, and where all of them exert a significant influence on the solution. The difference in scales may be in the physical properties of the materials, for example density, modulus of elasticity, viscosity or diffusion coefficients, etc. or there may also be a difference in scales in the solution to the problem itself, such as a great difference in the magnitude of the waves or the instabilities involved. Multi-scale methods emerged primarily for the study of composite solids, but have later been generalized to very different applications. In this talk we will apply them to fluid mechanics problems. We will develop two very different types of applications. On the one hand, turbulence problems, where the multi-scale exists due to the great difference in the magnitude of the instabilities existing within a turbulent fluid. In a second application, we will see the problem of fluids that contain particles within them, where their homogeneous study is essential due to the large number of particles that have to be studied.