DIPARTIMENTO DI INGEGNERIA
MECCANICA E AEROSPAZIALE

SAPIENZA
UNIVERSITÀ DI ROMA

AVVISO DI SEMINARIO

Il giorno 21 Giugno 2019 alle ore 15.00 presso l'Aula 40 della Facoltà di Ingegneria Civile e Industriale (via delle Sette Sale 12/B) si terrà il seguente seminario

Reduced Order Modeling of Wall Turbulence

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Abstract: Modeling turbulent flow near a wall is a pacing item in computational fluid dynamics for aerospace applications and geophysical flows. In high fidelity numerical simulations, wall modeling leads to dramatic reduction in the required computational resources. Gradual progress has been made in statistical modeling of near wall turbulence using the Reynolds averaged equations of motion. Recent advances in this area will be reviewed. The discovery of minimal flow unit that mimics intermittent dynamics and statistical features of turbulent flow in the vicinity of the wall provided early evidence that the near wall turbulence is amenable to reduced order modeling. The underlying rationale for potential success in using low dimensional dynamical systems theory is based on the fact that the Reynolds number is low in close proximity to the wall. Presumably for the same reason, low dimensional models are expected to be successful in modeling of the laminar/turbulence transition region. This has been shown recently using dynamic mode decomposition. Furthermore, it is shown that the near wall flow structure and statistics in the late and non-linear transition region are strikingly similar to those in higher Reynolds number fully developed turbulence. For example, it will be shown that turbulent spots which are associated with the laminar-turbulent transition, are also generated within fully developed turbulent flows. I will argue that the accumulated evidence suggests that wall modeling for large eddy simulation (LES) using low dimensional dynamical systems is a profitable avenue to pursue. The main challenge would be the numerical integration of such wall models in LES methodology.

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