FLOW OVER NATURAL OR ENGINEERED SURFACES

SPEAKER
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ABSTRACT
Natural and engineered surfaces are never smooth, but irregular, rough at different scales, compliant, possibly liquid-impregnated or superhydrophobic, etc., and their numerical modeling is not trivial. In the seminar, after a brief historical excursus onto wall boundary conditions, an adjoint technique will be presented describing how realistic surfaces can be homogenized to yield effective boundary conditions which can be applied at a fictitious, smooth, equivalent wall. The approach relies on the solution of adjoint equations over microscopic cells. Cell-based and macroscopic numerical results will be shown for a variety of surfaces, including in particular the case of liquid-impregnated surfaces (LIS). Some companion experimental measurements will also be presented, demonstrating the effectiveness of LIS in reducing skin friction drag and the interest of such an approach in applications.

ABOUT THE SPEAKER
Alessandro Bottaro was a Fulbright fellow at Rutgers University, NJ, from 1984 to 1988 where he obtained his PhD in Mechanical and Aerospace Engineering. He then joined the Swiss Federal Institute of Technology in Lausanne, where he conducted research on the simulation of flows in hydraulic turbines, on mixing processes in chemical reactors, and on the effects of centrifugal and Coriolis forces on flow instabilities in boundary layers and channels. In 1997, he was appointed Professor at the University Paul Sabatier in Toulouse, and moved his research activities at the Fluid Mechanics Institute of Toulouse; research topics in that period ranged from flow instabilities, to receptivity, coherent structures and optimal/robust control of transition. He joined the University of Genova in 2003, in the frame of an Italian National program aimed at counteracting brain drain. At present his research focusses on biomimetics and adjoint-based homogenization.

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