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LAMINAR TO TURBULENCE TRANSITION IN AERO/HYDRODYNAMICS

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ABSTRACT

Transition from laminar to turbulent regime is accompanied by a large change in flow related processes such as mixing, heat transfer and drag friction that increase dramatically. This Special Issue (SI) addresses the fundamental question of the transition stability criteria/instabilities in both internal and external flows focusing on the fundamental understanding of the flow physics for an ultimate active control strategy. This subject represents one of the most important and challenging problems in contemporary physics and fluid engineering.

The knowledge that will be acquired through special topics shall be of interest for many industries, such as those occurring in aerodynamics (nozzles, compressors and high-pressure turbine blades) and hydrodynamics (heat exchangers, transporting pipelines, flow assurance, ultraviolet disinfection of bacteria in flow treatment systems applications). As such we invite manuscripts ranging from new physical modeling and discoveries to the correct treatment of difficulties inherent to numerical modeling/experimental realization of such fluid flow system.

Regarding the methodologies, we look for novel developments of experimental techniques applied for measuring, controlling, diagnosing for prediction/visualizing transition processes. Also, the extension of current numerical models/algorithms that makes the simulations of such complex process more reliable and/or faster are of special interest, such as using high performance computing, neural network techniques, Largrangian tracking, etc..

Regarding the flow physics, we are interested in cutting-edge physical investigations multi-scale and/or multi-physics problems. For instances, how and through which mechanism a perturbation (such as roughness elements, free stream perturbations, wall induced excitation, etc.) grows and transits to turbulence? What are the rule of flow instabilities (such as Gortler/centrifugal instability, cross-flow instability, heat transfer excitation at the wall, etc.) on the transition process and mechanism? What are the minimum Reynolds number criteria for such transition and how to passively/actively control it? What is the contribution of transition in turbulent mixing and heat/mass transfer? Etc.