Stability and Sensitivity Methods for Flow Control and Industrial Design

E. Valero
Universidad Politécnica de Madrid (UPM)
laza Cardenal Cisneros 3, E-28040 Madrid, Spain
eusebio.valero@upm.es, https://www.upm.es

Key words: Stability, Sensitivity methods, Flow control, Industrial design

ABSTRACT

Within the framework of the European Project SSECOID: Stability and Sensitivity Methods for Flow Control and Industrial Design, this Special Technology Sessions (STS) aims to uncover ongoing advances in numerical and computational methods for fluid mechanics. This broad goal encloses not only the development of standard numerical schemes for the integration of the Navier Stokes equations, but also state-of-the-art Lattice Boltzmann or the difficulties and progress in the application of high-order schemes to more realistic industrial configurations, in particular the implementation of prevailing methods in present and future computational platforms, with an eye on exascale computing.

Moreover, the huge amount of data generated by numerical tools needs further postprocessing: data assimilation methods and machine learning as a way to obtain the flow sensitivity under perturbation, eventually linked to stability, optimization and control, can provide very valuable information about the flow. Several algorithms, such as DMD, POD, SPOD or Resolvent can obtain very important information that helps to identify relevant features, which are critical to understand the flow behaviour and, finally, will provide valuable information to control it. New developments and application of those methodologies to feature detection, optimization strategies and control are welcome.