HIFI-TURB: HIGH-FIDELITY LES/DNS DATA FOR INNOVATIVE TURBULENCE MODELS

Description

The most significant challenge in applied fluid dynamics (covering aerospace, energy and propulsion, automotive, maritime industries, chemical process industries) is posed by the insufficient understanding of turbulence-dependent features and laminarto-turbulent transition. As a consequence, the design and analysis of industrial equipment cannot be relied upon to accurately challenge flow conditions. Improving the capabilities of models on complex fluid flows offers the opportunity to reduce the energy consumption of aircraft, cars, and ships, with a consequent reduction in emissions and the noise of combustion based engines. The inevitable result is a major impact on economical and environmental factors and on industrial leadership in the highly competitive global market. Hence, the ability to understand, model and predict turbulence and transition phenomena is the key requirement in the design of efficient and environmentally acceptable fluids-based energy transfer systems. Against this background, the project sets out a highly ambitious and innovative program of work designed to address influential deficiencies in advanced statistical models of turbulence. The program rests on the following pillars of excellence: "The exploitation of high-fidelity LES/DNS data for a range of -reference flows thatcontain key flow features of major interest", and the application of novel artificial intelligence and machine-learning algorithms for identifying significant correlations between representative turbulent quantities. The research for improving the models is being guided by four world-renown industrial and academic experts in turbulence. The consortium is formed of major industrial aeronautical companies and a software editor, a SME acting as coordinator, the BSC, and academic groups, including ERCOFTAC, which is acting as a source of turbulence expertise and as a repository for the generated data, which will be made openly available.

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