Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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Institut für Fluiddynamik: Prof. P. Jenny, Prof. L. Kleiser, Prof. T. Rösgen
Computational Science & Engineering Laboratory: Prof. P. Koumoutsakos

19/09/13

EINLADUNG

zu einem Vortrag im Rahmen des

Kolloquiums Thermo- und Fluiddynamik

und des

ERCOFTAC Visitors Programme

Datum: **Mittwoch, 23. Oktober 2013**

Zeit: **16:15 Uhr**

Ort: Maschinenlaboratorium ETH Zürich
Hörsaal ML H 44

Referent: **Prof. Julian Andrzej Domaradzki**
Department of Aerospace and Mechanical Engineering
University of Southern California, USA

Thema: **Numerical Simulations of Separated Flows at Moderate Reynolds Numbers Appropriate for Turbine Blades and Unmanned Aero Vehicles**

Flows over airfoils and turbomachinery blades, for unmanned and micro-aerial vehicles (UAV), wind turbines, and propellers consist of a laminar boundary layer near the leading edge that is often followed by a laminar separation bubble and a transition to turbulence further downstream. The unsteady effects of flow separation greatly influence blade/wing lift and drag and thus performance of UAV's, and efficiency and robustness of turbomachinery components. Paradoxically, despite Reynolds numbers for such devices being low to moderate (10^4 - 10^6), numerical predictions for such flows can be more difficult than for high Reynolds numbers flows typical of civilian aeroplanes at cruising velocity (10^7 - 10^8). Reynolds Averaged Navier Stokes (RANS) turbulence models are inadequate for such flows because they often fail to predict the onset and the extent of separated flow regions. Direct numerical simulation (DNS) is the most reliable but also the most computationally expensive alternative, not practical in industrial applications. This leaves Large Eddy Simulation (LES) as a primary candidate for a fast and accurate prediction tool for such flows.

This talk assesses the capability of LES to significantly reduce the resolution requirements for such flows and still to provide results of DNS quality. Two different flows are considered. A flow over a flat plate with suitable velocity boundary conditions away from the plate to produce a separation bubble and a flow over a NACA-0012 airfoil. By employing several different numerical codes we conclude that accurate LES are possible using on the order of one percent of the DNS resolution but that the numerical dissipation plays a significant role in practical LES of such flows.

Host: Prof. L. Kleiser

Gäste sind willkommen!