8th. World Congress on Computational Mechanics (WCCM8)
5th. European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008)
June 30 – July 5, 2008
Venice, Italy

RANS/LES COUPLING FOR THE SIMULATION OF COMPLEX FLOWS

JOCHEN FRÖHLICH[*] AND IVAN MARY[†]

[*] Institute for Fluid Mechanics,
TU Dresden
01062 Dresden, Germany
jochen.froehlich@tu-dresden.de,
http://tu-dresden.de/die_tu_dresden/fakultaeten/fakultaet_maschinenwesen/ism/sm/index_html

[†] ONERA
29 avenue de la Division Leclerc
92322 Châtillon, France
ivan.mary@onera.fr
http://www.onera.fr/dsna/les/index.php

Key words: Fluid mechanics, Turbulence, Large Eddy Simulation, Turbulence Modelling

ABSTRACT

LES has clear superiority over RANS methods for the simulation of complex flows, especially when large scale structures dominate the turbulent transport, in transitional situations and when dynamic forces and noise generation must be calculated. However, due to the extremely high resolution and time-averaging requirements at high Reynolds numbers, LES still is too costly to be applied directly to flows of practical interest. On the other hand, RANS can determine the mean flow with engineering accuracy at much lower cost in many cases, especially attached flows, which often prevail in sub-areas of complex flows. Hence, a hybrid method using RANS in regions with simpler flow behaviour and LES only in the more critical areas appears to be the ideal approach for complex high Reynolds number flows. With this approach, the key issue is how the RANS and LES zones are coupled. Two different strategies have been retained to achieve the coupling of RANS and LES models. The first approach is based on a continuous transition from LES to RANS, an example of which is the Detached Eddy Simulation. The second approach is based on zonal coupling of LES and RANS. Here, the main difficulty lies in the definition of accurate boundary condition at the interfaces.

Due to its relevance for industrial applications, coupling of LES and RANS currently is a very active field of research. This minisymposium aims at providing an overview of recent advances both for DES-like and zonal methods and illustrating their respective requirements and benefits for complex flow configurations.

For any further request, please contact

jochen.froehlich@tu-dresden.de