ELSEVIER

European Journal of Mechanics B/Fluids 21 (2002) 281

Book review

Modern Simulation Strategies for Turbulent Flow
B.J. Geurts editor (Edwards, Philadelphia, USA, 2001)

This book presents a collection of snapshots (each one being around 20 pages long) dealing with Direct Numerical Simulation (DNS) and Large-Eddy Simulation (LES).

The reader will find 16 chapters, each one being devoted to a single topic and written by different authors.

The content of the book illustrates the discussions held under the sponsorship of ERCOFTAC, and especially the meeting cycle devoted to turbulence which took place in Cambridge in 1999.

Chapters 1 to 9 are devoted to fundamentals works dealing with the theory of LES and new approaches to subgrid modelling, while chapters 10 to 16 are oriented towards illustration of the use of LES/DNS and practical numerical problems.

But, it is worth noting that the content of the book put the emphasis on academic research, and already existing complex applications of LES (relying on the use of highly stretched curvilinear, multiblock meshes, and/or Chimera-like technique) have not been considered by the authors.

I think that some of the presented sections constitute a very interesting and important contribution to the literature: many of the most productive researchers have got some space to freely expose their ideas and, maybe more interesting, their point of view on actual problems. The reader will find here some remarks that he will not find anywhere else.

A special mention should be given to the paper of M. Germano on the dynamic model(s!), where the developments are summarized but also the remaining problems clearly identified and discussed.

I believe that all the researchers involved in LES will also enjoy the syntheses on deconvolution methods (Adams and Stolz), on subgrid-scale estimation model (Yee and Domaradzki), spatial velocity increment (Brun and Friedrich), tensor diffusivity models (Winckelmans et al.) and rotational transformation (Horiuti).

The review of progress on DNS and LES (Sandham) is clearly based on the conclusions of the 1999 turbulence program that took place in Cambridge. The presented conclusions and guidelines are ‘classical’ and correspond to the usual strictly academic point of view, which aim at obtaining a controlled and fully understood fidelity of the results. Here, my main regret is that the engineering applications of LES already succesfully performed are ignored, and the resulting state-of-the-art, as far as the use of LES for practical applications is discussed, is incomplete. As a consequence, some conclusions dealing with the interactions of numerics and LES should be written in a different way.

The very interesting section on numerical errors and LES (Geurts and Froehlich) also suffer the same restrictions.

My main regret dealing with this theoretical part of the book is that no global synthesis is carried out, and I have the feeling that many fruitful interactions between the different authors might have arisen from such a synthesis. But this is a structural flaw of this kind of augmented proceeding-like books, and monographs devoted to LES and DNS are still very rare.

The remaining sections deal with the use of LES/DNS for different applications. Most of them can be seen as augmented conference papers rather than reviews on a single topic.

But the reader will find a very interesting introduction to DNS and LES of turbulence-combustion interaction (Luo), which summarizes the main problems associated to this highly strategic research area.

This book contains many useful informations for people interested in DNS/LES. Rather than a complete state-of-the-art, it will provide expert readers with some detailed informations about very specific features of modern research areas. I think that all advanced researchers in DNS/LES field will find some interest in it. More than results and ready-for-use solutions, they will find stimulating and refreshing ideas and questions.

Pierre Sagaut
ONERA
Chatillon, France

0997-7546/2002 Published by Éditions scientifiques et médicales Elsevier SAS.
PII: S0997-7546(02)01180-9