

Detached-Eddy Simulation Series Methods for Compressor Internal Flow

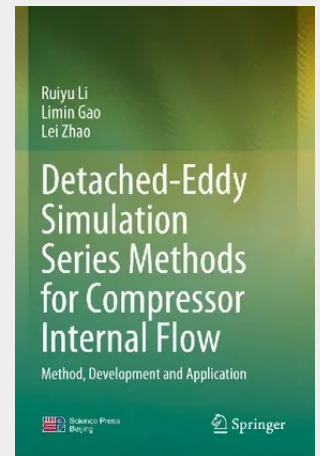
Method, Development and Application

This book concentrates on high-fidelity numerical methods for predicting internal flows within aeroengines' compressors. A distinctive features of this work is the establishment of a comprehensive research framework. Specifically, it starts with engineering application requirements and integrates high-performance parallel algorithms to develop detached eddy simulation (DES)-series methods tailored to the needs of compressor design. Additionally, it encompasses the development of data analysis methods suitable for handling the "vast" amounts of high-fidelity unsteady flow data in compressors and the high spatial resolution experimental results. This book takes us from making the intricate details of compressor flow field structures "visible" to "explainable". Another noteworthy aspect of this book is its practical orientation, seamlessly integrating theoretical concepts with practical applications. Herein, it addresses three major engineering problems in detail and elucidates the technical approaches involving advanced numerical methods and data analysis techniques for solving these physical problems.

The book highlights the challenging issues associated with complex internal flows in compressors, the governing equations for DES-series methods, and the implementation strategies for numerical simulations of internal compressor flows. They also delve into data-driven analysis methods for unsteady flow field data, high-fidelity numerical simulations of flow in the blade root region of compressors, dynamic flow capture methods in the tip region of compressor blades, and simulation and analysis of flow fields in inlet distortion generators.

This book serves as a valuable reference for researchers and engineering professionals in the aerospace, computational fluid dynamics, and high-performance turbomachinery fields. Additionally, it can be used as a specialized textbook for doctoral and master's students in disciplines such as aerospace science and technology, power engineering, and engineering thermophysics.

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192,59 €

179,99 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9789819602575

Medium: Buch

ISBN: 978-981-960257-5

Verlag: Springer

Erscheinungstermin: 02.01.2026

Sprache(n): Englisch

Auflage: Erscheinungsjahr 2026

Produktform: Kartoniert

Gewicht: 427 g

Seiten: 233

Format (B x H): 155 x 235 mm

