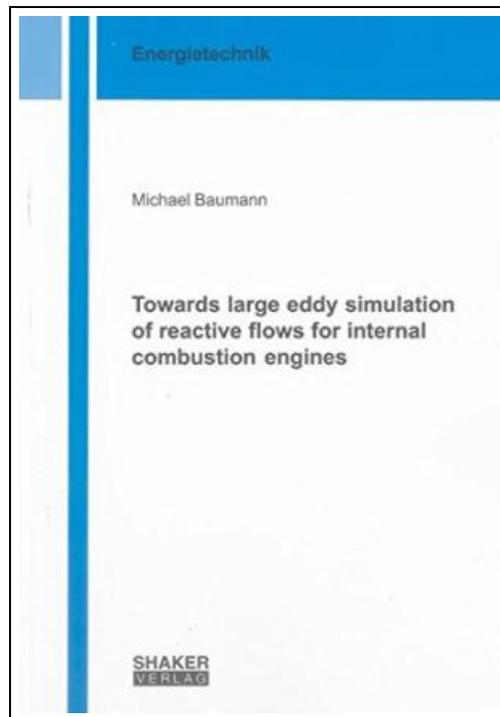


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TOWARDS LARGE EDDY SIMULATION OF REACTIVE FLOWS FOR INTERNAL COMBUSTION ENGINES



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Shaker Verlag Jul 2013, 2013. Buch. Book Condition: Neu. 208x146x15 mm. Neuware - The present work is focused on the detailed investigation of internal combustion engines in terms of flow and combustion analysis using an advanced numerical simulation method in the framework of computational fluid dynamics. The numerical approach used in this work is based on the Large Eddy Simulation technique implemented in STAR-CD, which has the intrinsic capability to accurately observe highly unsteady phenomena of engine flow characteristics. An extended version of the Coherent Flame Model, called 3-Zones Extended Coherent Flame Model (ECFM-3Z), which provides a universal combustion modelling approach available for all modes of technical reacting flows, is applied within the LES context. The ECFM-3Z is a model specially developed, to describe the combustion process taking place in modern internal combustion engines, in which depending on the mixture different modes of combustion exists. This study provides a comprehensive validation of the LES combined with the ECFM-3Z combustion model and reveals a detailed insight into incylinder physical phenomena. After an introduction to the fluid dynamics background in the form of a mathematical and physical description of turbulent reactive flows and their numerical implementation, the ECFM-3Z LES approach is first used for turbulent reactive and non-reactive flows of technical combustion systems of varying complexity to deal with different combustion modes. The results obtained for these flows provide a model performance assessment or predicting experimental measurements for the flow and scalar distribution. The main part of this work is focused on a detailed analysis of a single cylinder spark-ignition direct-injection DISI engine. To guarantee a proper definition of boundary conditions, the intake and exhaust ports are included in the numerical domain until the positions of pressure measurements. A multi-cycle LES was carried out on two meshes with different spatial resolution and...



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