

A Study on Turbulent Stratified/Multiphase Combustion by High Resolution Combined Laser Diagnostics and Large-Scale GIRD DNS

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【Outline of survey】

To overcome the recent environmental problems, development of high efficiency and low emission combustors is required. Flow fields of various combustors are in turbulent state, whereas details of the turbulent combustion have not yet been clarified. In the new combustion technology such as direct injection or HCCI engine, turbulence plays very important role in each combustion process. However, since detail of the each process is not investigated, the combustors in many applications have been developed through a trial and error process. In this study, turbulent stratified/multiphase combustion, which includes evaporation, mixing and combustion process of fuel droplets, and ignition and flame propagation of inhomogeneous fuel mixture in turbulence, is investigated by high resolution combined laser diagnostics and large-scale direct numerical simulation (DNS) on the GIRD supercomputer. Furthermore, based on the structure of turbulent stratified/multiphase combustion, highly accurate turbulent combustion model will be developed for the realization of high efficiency and low emission combustors.

【Expected results】

In this study, turbulent stratified/multiphase combustion, which is very important in many combustors in engineering applications, will be clarified by highly accurate DNS and high resolution combined laser diagnostics. The results of this study will be used to develop highly accurate turbulent combustion model which is useful in design and development of combustors by computer simulation. The use of this model will reduce time and cost for the development of high efficiency and low emission combustors, and will contribute to conquest the environmental problems.

【References by the principal researcher】

- M. Tanahashi, S. Murakami, G.-M. Choi, Y. Fukuchi and T. Miyauchi, Simultaneous CH-OH PLIF and Stereoscopic PIV Measurements of Turbulent Premixed Flames, Proc. Combust. Inst., Vol. 30 (2005), p.1665-1672.
- G.-M. Choi, M. Tanahashi and T. Miyauchi, Control of Oscillating Combustion and Noise Based on Local Flame Structure, Proc. Combust. Inst., Vol. 30 (2005), pp. 1807-1814.
- T. Miyauchi, Numerical Simulation of Combustion, Maruzen (2001).

【Term of project】 FY2006 - 2010

【Budget allocation】 24,500,000 yen

【Homepage address】

<http://www.navier.mes.titech.ac.jp>