5. Direct Numerical Simulation of Hydrogen-Air Turbulent Premixed Flames

***Tanahashi, M.*[1]*, Fujimura, M.*[1] *and Miyauchi, T.*[1]**

1) *Department of Mechano-Aerospace Engineering, Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro-ku, Tokyo 152-8552, Japan*

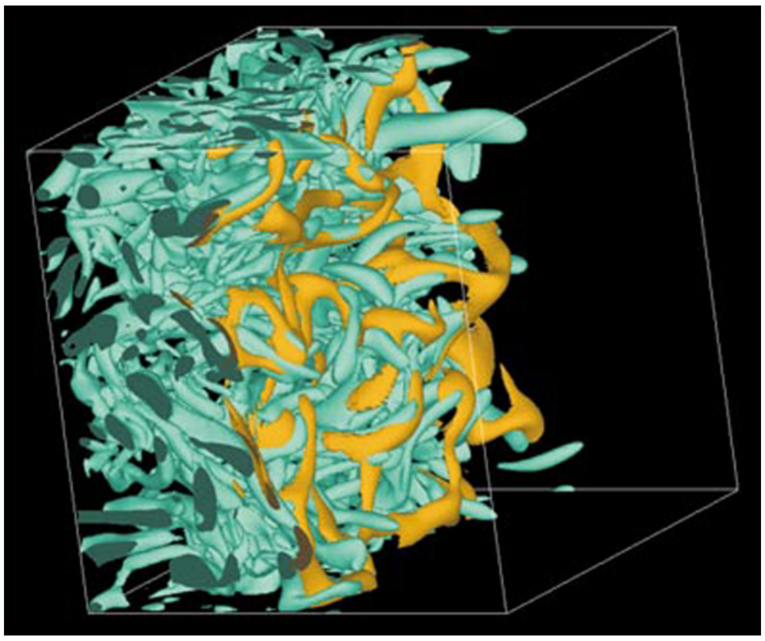
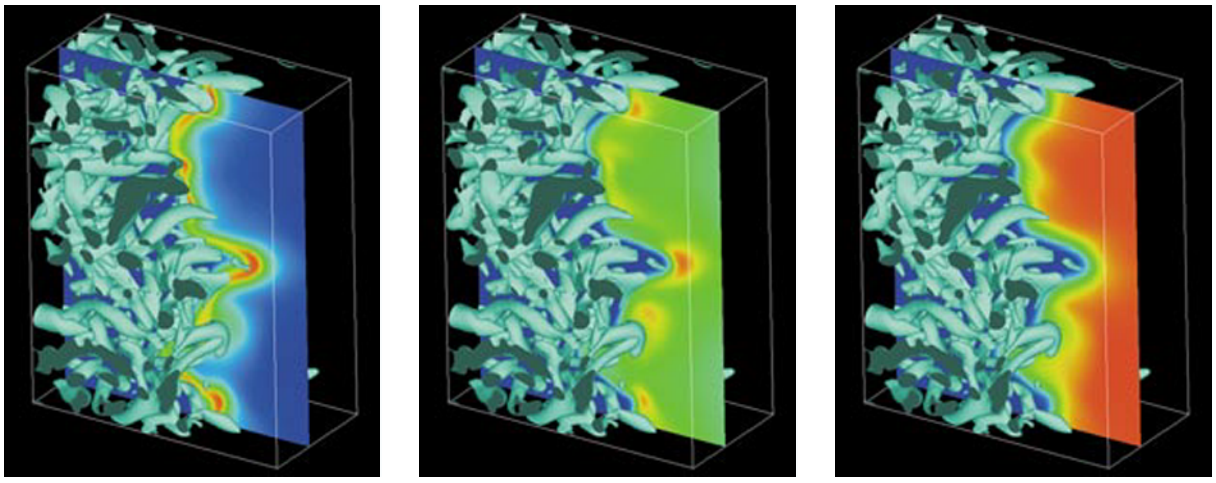


Figure 1 Coherent fine scale eddies in unburnt turbulence (green) and high heat release rate region (yellow) in a hydrogen-air turbulent premixed flame.



(a) Heat release rate (b) O atom (c) OH radical

Figure 2 Modification of local flame structure due to coherent fine scale eddies in turbulence.

Direct numerical simulation of hydrogen-air turbulent premixed flames propagating in homogeneous isotropic turbulence is conducted to clarify turbulence-flame interaction in turbulent premixed flames. A detailed kinetic mechanism which includes 12 species and 27 elementary reactions is used to represent the H_2-O_2-N_2 reaction in turbulence. Figure 1 shows tube-like coherent fine scale eddies and heat release rate. It is shown that the fine scale structure of turbulent premixed flames is significantly affected by the coherent fine scale eddies in turbulence. Figure 2 shows distributions of heat release rate, O atom and OH radical on a typical cross section with the coherent fine scale eddies. The relatively strong coherent fine scale eddies can survive behind the flame front and they are perpendicular to the flame front where heat release rate increases. Most of the coherent fine scale eddies near the flame front tends to be parallel to the flame front and enhance the chemical reaction.