Prof. Dr.-Ing. Heinz Pitsch

Templergraben 64
52056 Aachen
phone +49 241 80 94607
fax +49 241 80 92923
email office@itv.rwth-aachen.de

Institut für Technische Verbrennung

RWTH AACHEN UNIVERSITY

Stand: 24.03.2023

Bachelor / Master Thesis

Model Development for Premixed Nonequilibrium Turbulent Flame

With the advance of computational resources, Large Eddy Simulation (LES) becomes a promising method for the simulations of practical applications. In LES, large scales are resolved but small scales are modelled. Turbulence-flame interactions, which are important in turbulent premixed combustion, occur typically on small scales. Therefore, turbulent premixed flames are particularly difficult to describe in the context of LES. One widely used method is the G-equation method, where the flame fronts are explicitly tracked.

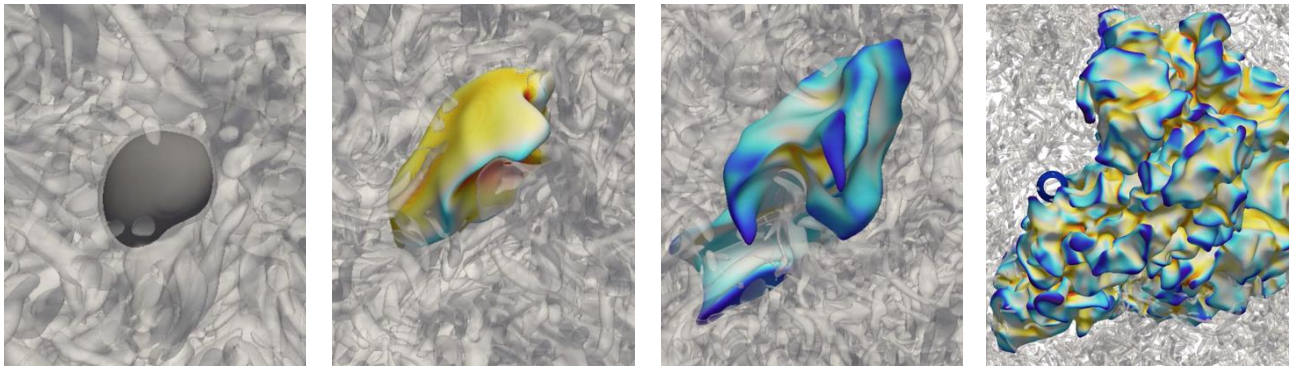

Figure 1 DNS of early flame kernel development: temperature iso-surface colored by heat release rate (T. Falkenstein, H. Chu, H. Pitsch, et al., LES4ICE 2018)

In this study we will investigate the G-Equation model in the context of LES. The LES models should be assessed in a priori and a posteriori way, comparing with the already available DNS data. We will focus on the transition process from laminar to turbulent flame. Simplified configurations are chosen: planar flames and flame kernels in isotropic turbulence. Laminar flames are initialized in an isotropic turbulent flow field, where the laminar flames develop later into turbulent flames.

Tasks

- A priori assessment of the premixed combustion models using DNS data
- LES simulation of the transition process from laminar flames to fully developed turbulent flames in CIAO
- Analysis of the influence of model parameters

Requirements

- Interest in programming
- Experience with Linux desirable
- Self-motivation & commitment

Contact person:
Mr. Hongchao Chu, M.Sc.
Tel.: +49 241 80 97592
h.chu@itv.rwth-aachen.de
R.220