Institut für Technische Verbrennung

RWTH AACHEN UNIVERSITY

Master or Bachelor thesis

Direct numerical simulation of autoignition in hydrogen-air mixtures

Topic is suitable for

- ✓ Master thesis
- ✓ Bachelor thesis

Field of activity

Turbulent reacting flows

Contact Person

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Autoignition plays a significant role in the safe and stable operation of hydrogen-fueled devices, such as industrial furnaces, automotive engines, etc. Understanding and predicting of autoignition of hydrogen-air mixtures is of practical importance. Such process is significantly influenced by the local thermochemical state (temperature, pressure, species concentrations) and mixing. The interaction between chemistry and mixing is expected to have a strong effect, which has not been fully understood.

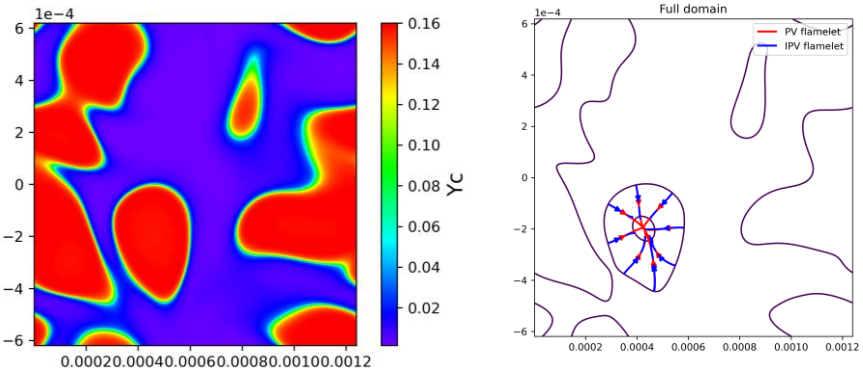

Figure 1. 2D DNS of auto-ignition in turbulent mixing field: distribution of progress variable (left) and tracing flamelets in ignition kernel (right).

In this project, the interaction between auto-ignition and the mixing process in the turbulent field is investigated by direct numerical simulations (DNS). In particular, the influence of fine-scale mixing and enthalpy stratification on ignition will be considered. This study is part of a DFG project, a collaboration between seven institutes at three German Universities, which includes numerical and experimental investigations.

Tasks:

- Specification of the DNS parameters and simulation of autoignition in hydrogen-air mixtures using in-house code CIAO (on the RWTH cluster)
- Analysis of the simulation results

Our Offer:

- Close supervision with integration into the research group
- A relevant, state-of-the-art research topic that can be adjusted to your interests

Requirements:

- Enthusiasm about programming and numerical modeling
- Interest in fluid dynamics and thermodynamics