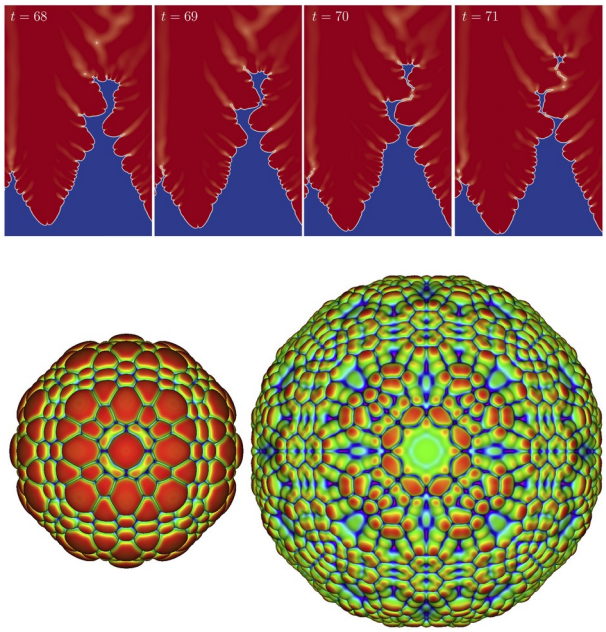
ETH zürich

CAPS

STUDENT THESIS PROPOSAL

MACHINE-LEARNING AND MODEL REDUCTION FRAMEWORK DEVELOPMENT FOR DNS DATA



Direct numerical simulation of a planar (top) and a spherical (bottom) lean premixed hydrogen-air flame.

Python-based open source frameworks offer powerful platforms to assist the construction of reduced order models as well as for machine learning applications.

The aim of this project is to develop a general framework that will simplify and accelerate the application of such tools on high-fidelity data generated by spectral element solvers for the direct numerical simulation (DNS) of low Mach number reactive flows. The framework will be used on existing DNS data from different setups. Depending on progress, new simulations will also be performed for lean hydrogen-air premixed flames to enrich the existing datasets.

TASKS / GOALS

- Familiarization with the spectral element solver for low Mach number reactive flows and the data format
- Development of a python-based tool for processing DNS data using reduced order modelling and machine learning approaches
- Application to existing and, depending on the progress of the development effort, newly-generated data for lean H_2-air flames

THESIS TYPE AND DURATION

- BT / One semester

REQUIREMENTS

- Courses on combustion, numerical methods and machine learning
- Independent and creative work attitude

CONTACT

Dr. Christos E. Frouzakis

Combustion, Acoustics & Flow Physics
(CAPS) Laboratory, ML J 12.1

044 632 7947

cfrouzakis@ethz.ch