Aerodynamisches Institut und Lehrstuhl für Strömungslehre | RWTH AACHEN UNIVERSITY

Bachelor/Master Thesis

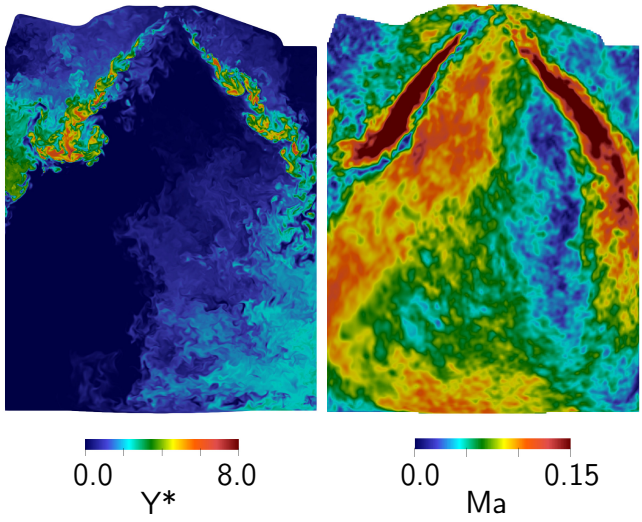
Injection and Turbulent Mixture Formation of Bio-Hybrid Fuels in Internal Combustion Engines

For an efficient, stable and low emission combustion of bio-hybrid fuels in internal combustion engines (ICE), the fuel distribution at the start of ignition plays a crucial rule. Within the cluster of excellence, 'The Fuel Science Center' an optimization of the ICE to specific fuel properties in combination with new engine concepts such as multiple fuel injection and pre-chamber combustion systems is performed. While the injection system and fuel properties define the initial fuel vapor distribution, the subsequent fuel-air mixing depends on the engine flow field, i.e. the formation and break-up of large scale flow structures such as the tumble vortex.

Large-eddy simulations (LES) with high mesh resolution are necessary to accurately predict the involved scales for the mixing process. For the large number of spray droplets, a Lagrangian Particle Tracking (LPT) algorithm is used to accurately predict the liquid fuel propagation and evaporation. An efficient four-way coupling of the liquid droplets with the gas phase is performed based on the underlying hierachical unstructured Cartesian mesh. These numerical methods have been implemented in the multi-physics solver m-AIA of the Institute of Aerodynamics.

Future research aspects in this field include:

- high fidelity simulations of pre-chamber fuel injection
- implementation and validation of novel spray-models
- analysis of the tumble motion in regards to cycle variations.



Non-dimensional fuel vapor and mean Ma-number at the end of injection in the engine tumble-plane

You ...

- ... are interested in (computational) fluid dynamics and complex multi-phase flow
- ... have some fundamental programming experiences and a quick grasp for new concepts/languages
- ... are eager to learn new skills and are able to work in an independent manner

If you are interested, please contact me with your CV

Contact: Tim Wegmann, M.Sc.
Lehrstuhl für Strömungslehre und Aerodynamisches Institut
Wüllnerstr. 5a, 52062 Aachen
Room: 106
Tel.: +49 - (0)241 - 80 - 9419
Mail: t.wegmann@aia.rwth-aachen.de