



Research Assistant (Ph.D. position)

Modelling phase transfer in reacting flows

Description

Research at the Institute for Combustion Technology at the University of Stuttgart focuses on theory and computation of turbulent multiphase flows. The key expertise of our work is the modelling of multiscale processes and the corresponding interactions between turbulence, chemistry and particle dynamics. Examples include specific combustion related issues like turbulent combustion, solid fuel combustion and pollutant formation but also nanoparticle flame synthesis, flash boiling and mixing in particle laden flows.

We have a current opening at ITV for a research assistant (Ph.D.) position in the area of “modelling phase transfer in reacting flows”. The project is motivated by the continued need for accurate predictions in energy conversion processes using liquid fuels. The challenges include novel burner design due to different combustion strategies and different properties of alternative fuels such as biofuels, e-fuels or ammonia. The latter will be needed for future carbon neutral or carbon free energy provision. Knowledge of the details of evaporation, liquid-gas phase interactions and subsequent combustion is, however, limited, especially in regions of high liquid fuel density. The current project shall use stochastic methods to predict the droplet combustion process in such multiphase environments with emphasis on the predictions of the mass and energy transfers between the phases and their effects on fuel conversion and pollutant formation.

Your tasks:

- Your tasks will focus on the simulation of spray combustion within different environments, ranging from rather dilute to dense sprays in canonical configurations and of laboratory flames. The phase transfer terms between the (real) liquid droplets and the stochastic particles representing the gas phase need to be assessed and strategies need to be devised that hold across all flow and flame regimes.
- You need to develop and implement the corresponding algorithms that can also be used on high performance computing platforms.
- You will analyze the simulation data with the aid of analytical models and machine learning methods. Especially the latter shall help you to identify the key quantities that serve as suitable coupling parameters.
- You will develop new models and closures for the statistical description of the relevant processes such that the models are transferable to applications of industrial interest.
- You will collaborate with partner groups predominantly in Germany and Australia, and all results shall be presented at national and international conferences.

- Dissemination of your results in international journals is expected.

Your profile

We expect an excellent Master degree in engineering or related disciplines. You have a solid background in fluid mechanics, thermodynamics, combustion and/or particle technology. You enjoy theory and model development and their numerical implementation. You will have experience in programming (C, C++ and possibly Python). Knowledge of OpenFOAM is required.

You will be an enthusiastic and self-motivated person with a willingness to work closely with other team members. The Institute's scientific language is English, but willingness to study German is expected.

We offer:

- The pay scale is according to TVL-E13. The grade and therefore the final salary will depend on your relevant experience. The original appointment will be for one year. Upon successful completion of the first year, the employment can be extended for a minimum of two further years.
- We offer excellent potential for scientific development in the Institute for Combustion Technology (ITV) at the University of Stuttgart with state-of-the-art computer facilities and access to the University's supercomputing centre.

The University of Stuttgart is one of the leading technically oriented universities in Germany with about 26.000 students and more than 5.000 staff. The Institute for Combustion Technology is part of the Faculty of Energy-, Process- and Bioengineering.

The University of Stuttgart seeks to increase the number of women in areas, where they are underrepresented. Women are therefore expressly encouraged to apply. Severely handicapped people are given priority if they have the same aptitude. Recruitment is carried out by the central administration. The University of Stuttgart strives for gender and diversity equality. We welcome applications from all backgrounds.

Please note that by submitting your application, you consent to the storage and earmarked use of your personal data. Information in accordance with Article 13 DS-GVO on the handling of applicant data can be found at <https://www.uni-stuttgart.de/en/privacy-notice/job-application/>

If interested, please send your CV and all other relevant application documents as PDF per email to bewerbungen@itv.uni-stuttgart.de

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