Research Assistant (PhD candidate) in the field of turbulent reacting multi-phase flows

Description

The Institute of Combustion Technology for Aerospace Engineering (IVLR) at the University of Stuttgart offers a job opening with the opportunity to conduct a PhD in the field of turbulent reacting multi-phase flows with focus on the atomisation and evaporation of carbon-neutral synthetic liquid fuels in highly turbulent gaseous flows.

Focus Area

Experimental quantification of turbulent reacting multi-phase flows

Background

The institute of combustion technology for aerospace engineering (IVLR) at the University of Stuttgart is an integrative unit of the DLR institute of combustion technology. The institutes host approximately 80 scientists plus a number of students from various fields of specialization to address research question of modern gas turbines. Thermal conversion of sustainable energy carriers, e.g. green hydrogen, is a key element for the energy transition policy, while synthetic aviation fuels are without alternative for flights beyond mid-range distances. We support this development with the competence fields computer simulation, chemical kinetics and analytics, combustion diagnostics, mass spectrometry, multi-phase flow and high-pressure combustion. Current research topics are instationary combustion, pollutant formation, spray combustion, alternative fuels and innovative combustor systems. In this context, we target fundamental research and transfer the results to technical applications.

Your position is assigned to a DFG funded (Emmy Noether) junior research group at the IVLR, University of Stuttgart, work in close cooperation with the DLR Institute combustion technology and advance the fundamental understanding of turbulent reacting multi-phase flows to enable technology innovations. For this purpose, we utilise canonical spray and combustion configurations as well as realistic high-pressure test rigs. Laser-based diagnostics and novel data analysis methodologies are our most important tools to resolve the effects of turbulent flow on physical and chemical processes governing in spray atomisation and combustion. The acquired highly accurate data are used to advance our fundamental understanding of the involved processes, allow us to develop novel and optimised fuel injector and combustors concepts as well as validate and advance numerical models.

Problem Definition

The overarching objective is the advancement of fundamental understanding of the interactions between turbulent flow, reaction chemistry and multiple phases that govern pollutant formation as well as fuel and load flexibility of combustion concepts. The acquired understanding is of paramount importance for the development of cleaner, more sustainable and environmentally friendly technologies. Nearly emission-free operation becomes feasible when used in combination with carbon-neutral synthetic liquid fuels. However, the sought flexibility and low emissions can currently not be achieved simultaneously due to the lack of suitable injection and combustion concepts. Multi-stage liquid fuel atomisation in highly turbulent gas flow in combination with auto-ignition based combustion offers a promising concept to achieve these objectives. However, the complexity of the inherent nonlinearities and multilateral interactions on multiple scales is accompanied by a lack of quantitative data. This gap shall be closed using laser-based diagnostics in combination with a novel AI-supported data analysis concept. Your specific tasks will involve:

- Familiarise yourself with the topics turbulent multi-phase flows, atomization, evaporation and combustion
- In the team we will develop novel laser-based diagnostics to delineate the involved processes and interactions.
- Plan and conduct detailed measurements of turbulent reacting multi-phase flows, i.e. turbulent spray flames of synthetic aviation fuels.
- Advance innovative fuel injection concepts.
- In the team we develop innovate data analysis tools to enable a quantitative description of the studied phenomena and interactions.
- You analyse the data and present your work within the team, on national and international conferences as well as journal publications.
- Your results will provide the fundamental understanding to develop novel injector concepts, to enhance fuel and load flexibility as well as scalability limits and reduce pollutants.
- You engage and discuss your findings with various internal and external colleagues as well as national and international collaboration partners.

Your Qualifications

- Completed academic university degree (MSc. / university diploma), e.g. in aerospace engineering, engineering, physical chemistry or comparable subject
- Determination, commitment and enthusiasm
- Innovation capability, open mindedness and good comprehension
- Independence and team work within and outside our group
- Strong background in fluid mechanics and thermodynamics
- Basic knowledge of multi-phase flows (sprays) and combustion
- Experience with programming languages (e.g. Python) is advantageous
- Experience with laser-based diagnostic is desirable
- Fluent in written and spoken English
- Knowledge of the German language or interest to learn the language is beneficial

We offer

- Excellent opportunity to conduct a PhD (fully funded)
- You will be part of a young and highly motivated team that is an integrative subdivision of a very experienced and interdisciplinary research department
- Focus on fundamental research with a simultaneous high exposure to technical application within the department
- Collaboration with leading national and international research labs
- Interdisciplinary, independent and diversified research tasks
- A stepping stone for a leadership career in industry and research
- Possibility to participate in national and international conferences and workshops
- Access to an extensive profession development programme

Application

If you are interested, please send your application documents (or questions) via email to Fabian.hampp@ivlr.uni-stuttgart.de by latest the 20.02.2022. A complete application should consist of: Cover letter (1 page), academic CV, certificates, research interests and hypothesis for the PhD (max. 1 page), ideally 1-2 references and other potentially relevant documents.

Basic information

Type of employment: full-time

Starting Date: earliest possible 01.04.2022

Remuneration: TV-L EG13

Application Deadline 20.02.22 – 23:59

The University of Stuttgart would like to increase the number of women in the scientific field and is therefore particularly interested in applications from women. Severely disabled persons are given priority in the case of equal suitability. The employment process of scientific employees is carried out by the university's central administration.

Contact Details

University

University of Stuttgart

Institute

Institute of Combustion Technology for Aerospace Engineering (IVLR)

Location

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