



The Institute of Space Systems (IRS), University of Stuttgart is offering a

PhD Research Position

in the field of rarefied gas dynamics. The Numerical Modelling and Simulation research group focuses on the development and application of particle-based methods for the simulation of plasma flows such as during atmospheric entry manoeuvres or in electric propulsion systems. For this purpose, a three-dimensional solver called PICLas is developed cooperatively with the Institute of Aerodynamics and Gas Dynamics.

The proposed research topic is in the field of radiation of plasma flows. Radiative transport plays a significant role in the understanding and description of complex plasma phenomena, occurring in a multitude of space applications. To understand these phenomena, experimental measurements can be performed, which are cumbersome and limited to a few plasma parameters. An alternative is the numerical simulation, where typically computational fluid dynamics (CFD) are utilized to compute a flow solution and then coupled with a radiation solver such as PARADE, a code available at the IRS. However, the assumptions behind conventional Navier-Stokes solvers break down in the rarefied gas regime and strong thermal and chemical non-equilibrium. Therefore, the goal of the PhD research is to realize a unidirectional coupling of the radiation solver PARADE with Direct Simulation Monte Carlo (DSMC), a microscopic method with applicability in regimes relevant for plasmas.

Proposed research plan:

- Familiarization with the topic and the available codes PICLas and PARADE
- Development of an interface between PICLas and PARADE
- Implementation of a radiation transport solver in PICLas
- Application of the method to experimentally investigated cases (Hayabusa and Stardust re-entry) and the simulation of an Ariane 5 upper stage re-entry

The PhD thesis is part of a Graduate Research Training Group supported by Airbus Defence and Space. The work shall be performed at the IRS (pay scale TV-L E13-50%), with the possibility for a research stay at Airbus Defence and Space in Bremen. The research group consists of four PhD students, a group leader and a professor. Access to high-performance computing resources is available. The candidate shall be able to work in an academic team environment, be motivated and self-driven. The successful candidate shall have:

- Masters/Diploma degree in aerospace engineering, physics, applied mathematics, software engineering (or similar) with an excellent academic track record
- Experience in software development and programming in a Unix/Linux environment (ideally with knowledge of Fortran 90+)
- Knowledge in numerical simulation, rarefied gas dynamics (preferable)

The planned duration is 3 years with a possible start in **October 2017**. Applications are accepted until the position is filled (**latest 15th September 2017**). Applications consisting of a cover letter, curriculum vitae and supporting documents shall be sent to fasoulas@irs.uni-stuttgart.de and mpfeiffer@irs.uni-stuttgart.de.



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The University of Stuttgart is an equal opportunity employer. Applications from women and historically underrepresented groups are strongly encouraged. Severely challenged persons will be given preference in case of equal qualifications. Employment through the Central Administration (ZV).