

## 2019 Helmholtz – OCPC – Program for the involvement of postdocs in bilateral collaboration projects

### PART A

**Title of the project:**

Measurement and analyses of temperature in the middle- and upper atmosphere using recent and upcoming satellite missions applying new spatial heterodyne interferometer technology

**Helmholtz Centre and institute:**

Forschungszentrum Jülich, Institute for Energy and Climate Research, Stratosphere (IEK-7)

**Project leader:** Dr. Martin Kaufmann

**Web-address:** <http://www.fz-juelich.de/iek/iek-7/EN/>

**Description of the project:**

This project is located in atmospheric research using existing and upcoming satellite observations made in collaboration between Germany, China, and other partners.

In the first phase, the global temperature distribution in the middle atmosphere shall be derived to study planetary- and small scale gravity waves in the atmosphere. Lacking knowledge about these waves is one of the main sources of uncertainty for climate modelling on decadal time scales. Data resource is the AtmoSHINE instrument, which is a German- Canadian instrument launched in December 2018 on a Chinese satellite. Involved institutes are Research Centre Jülich, Max Planck Institute for the Science of Light in Germany, the National Metrology Institute of Germany, York University in Canada, Aerospace Flight Dynamics Laboratory in Beijing, and Chinese Academy of Sciences. The instrument uses a new spectrometer technology (Spatial Heterodyne Interferometer, SHI). A joint research team was set up to develop data processing methods and to exploit the data scientifically. The PostDoc will be part of that team. The work plan for the first phase includes the processing of the data from raw data to calibrated spectra and the subsequent inverse modelling to obtain atmospheric temperature. Well proven methods to obtain gravity wave momentum flux, which were developed at Research Centre Jülich, shall be applied to the data. This data will be used to validate climate models in the framework of other projects.

In the second phase, the processing and data exploitation of the follow-on project “AtmoLITE” shall be developed further. The instrument will be deployed on two micro-satellite missions led by Singapore. Scheduled launch dates are mid- and end of 2020. A new working package is the advancement of the radiative transfer model to simulate daytime measurements, including scattering affects. One aspect is to simulate and correct for potential straylight affecting the measurements. In parallel and as a gap filler in the case of potential launch delays, measurement strategies shall be developed for future satellite

constellation missions, which are in an early planning phase in Germany and China. These missions will provide a handful of satellites to observe atmospheric regions from multiple viewing directions or with different asynoptic sampling. Appropriate tomographic reconstruction techniques shall be developed to retrieve atmospheric structures at unprecedented spatial resolution from these data.

**Description of existing or sought Chinese collaboration partner institute:**

The post-doc project will be in cooperation with Research Centre Jülich in Germany, and the State Key Laboratory of Space Weather (SKLSW) in the National Space Science Centre (NSSC, China), which is part of the Chinese Academy of Sciences (CAS). The NSSC is one of China's leading institutes in middle and upper atmosphere research. Many ground-based passive remote-sensing instruments have been deployed all over the China by NSSC to study the photochemistry and dynamics in the middle and upper atmosphere, and extensive experiences in atmospheric modeling, instrument development and data processing were gained. IEK-7 and NSSC, CAS have similar scientific interests in many aspects and share the same scientific objectives in investigating atmospheric radiation, deriving constituent profiles and understanding dynamical process and long-term variations. We have been closely working together since the last ten years, and have joint activities in aspects of OH airglow modeling, data analysis and new instrument developments for ground-based observations. This PostDoc project will intensify the collaboration in the field of remote sensing from satellites, which is expected to become more important in the future. We also welcome collaboration with any Chinese institution that deals with the same subjects and share our scientific interests.

**Required qualification of the post-doc:**

- PhD in Physics, Mathematics, or Remote Sensing
- Excellent knowledge of programming languages, preferably Python, Linux, and state-of-the-art software development and management
- Experience with satellite data processing
- Strong project management, communication and team working skills
- Fluent written and spoken English

**PART B**

**Documents to be provided by the post-doc, necessary for an application to OCPC via a postdoc-station in China, which is affiliated to a research institution like a university:**

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

**PART C**

**Additional requirements to be fulfilled by the post-doc:**

- Max. age of 35 years
- PhD degree not older than 5 years
- Very good command of the English language
- Strong ability to work independently and in a team