Ministry of Human Resources and Social Security

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

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

**PART A**

**Title of the project:**
Lagrangian transport analyses of aerosols, clouds, and trace gases in the upper troposphere and lower stratosphere

**Helmholtz Centre and institute:**
Forschungszentrum Jülich, Supercomputing Centre (JSC)

**Project leaders:** Dr. Lars Hoffmann, Dr. Sabine Grießbach

**Web-address:** http://www.fz-juelich.de/ias/jsc/slcs

**Description of the project:**

The Asian summer monsoon (ASM) is the largest circulation pattern in the upper troposphere and lower stratosphere (UTLS) during boreal summer. This large-scale anticyclonic system exists from about June to September and extends from East Asia to the middle East and from the subtropical jet in the North to the tropics in the South. The tropopause within the ASM is elevated to tropical levels at extra-tropical latitudes and the anticyclonic circulation extends into the lowermost stratosphere. Observational and modelling studies show persistent maxima of tropospheric source gases such as water vapor, carbon monoxide, and methane as well as aerosols in the UTLS confined to the ASM region.

For tropospheric trace gases and aerosols the strong anticyclonic circulation of the ASM acts as a transport barrier. However, in spite of this transport barrier, the ASM plays an important role in transporting tropospheric air masses into the lower stratosphere. The ASM is also one of the most important transport pathways between the extratropical lower stratosphere and the tropical tropopause layer (TTL). The quasi-horizontal exchange takes place via mixing processes over the subtropical jets, mostly at the flanks of the ASM circulation, where air masses from the tropics can be transported to the mid- and high latitude lower stratosphere or air masses from high-latitudes can be transported to the TTL.

Our project will address the following open key questions: How permeable is the ASM transport barrier? Where and how efficient are the main export regions of the ASM circulation? What is the impact of moderate volcanic eruptions on the formation of the ATAL? How does the ASM circulation control troposphere-stratosphere exchange?

To study these questions, the candidate will work together with atmospheric scientists and HPC experts at the Jülich Supercomputing Centre. Scientists at JSC developed a new

Lagrangian transport model, MPTRAC, that facilitates large-scale transport simulations on current supercomputers. The scientists in Jülich are also developing new and improved algorithms for aerosol, cloud, and trace gas retrievals from satellite observations. The project work will be interdisciplinary, bringing together atmospheric modelling and innovative observations. The work on this Helmholtz-OCPC project will be embedded in a new Chinese-German collaboration project starting this summer.

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

The Chinese collaboration partner institute for this project should have a focus on atmospheric science, meteorology, Earth sciences, or related fields. The project partners at the Jülich Supercomputing Centre have contacts to the Institute of Atmospheric Physics, Chinese Academy of Science, Beijing, the School of Earth and Space Sciences, University of Science and Technology of China, Hefei, and the National Supercomputer Center in Guangzhou. The Postdoc should help foster the existing collaborations or build up a collaboration with a new partner institute.

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

- PhD in atmospheric sciences, meteorology, chemistry, physics, applied mathematics, computational science, or related fields.
- Experience with Lagrangian models, numerical weather forecasting models, chemistry-climate models, or the analysis of remote-sensing observations of aerosols, clouds, and trace gases.
- Additional skills in programming, data analysis, and visualization (e.g. Matlab, Python, C, Fortran, IDL).

**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