

## **Numerical modelling for transport research**

Emissions from transport (land-based transport, shipping, and aviation) contribute significantly to anthropogenic climate change. In addition, transport shows particularly high growth rates compared to many other sectors. The environmental impacts of transport are therefore a central research topic of the German Aerospace Center (DLR).

The focus of this project is on carrying out and evaluating numerical simulations to investigate the effect of transport emissions on the global atmosphere and the climate. The work is carried out within the framework of the DLR transport research program and related third-party funded projects. Parts of the work, in particular the analyses of the impact of aviation emissions, are also the subject of the DLR aviation program.

The methodological focus is on the further development and application of global three-dimensional chemistry-climate models for the detailed assessment of transport effects, as well as on the development of climate response models to efficiently assess global and regional transport scenarios and mitigation measures with regard to climate effects. The goal is also a methodologically consistent description of the effects of emissions from all three transport sectors.

Regarding the scientific focus, we are in particular investigating the effects of the non-CO<sub>2</sub> components, as there are still comparatively high uncertainties in this field. The aim is to supplement the quantification of CO<sub>2</sub> effects with consistent assessments of the effects of all other relevant emission components. A particular focus is on transport-induced changes in atmospheric aerosol and associated modifications of clouds and the radiation budget. Another focus is the analysis of the effects of transport emissions on atmospheric gas phase chemistry, especially with regard to changes in global air quality (e.g. through nitrogen oxide and ozone pollution) and the concentrations of climate-relevant gases, such as ozone and methane. In this context, we assess the climate impacts of direct and indirect (i.e. fuel or electricity supply) emissions from transport in different scenarios and for specific mitigation measures, e.g. developed by our project partners in the DLR transport program. Additionally, we aim to assess the climate impact of hydrogen (H<sub>2</sub>) emissions related to the switch from a fossil fuel-based to a hydrogen economy.