

## 2 PhD projects 'Greenhouse gas measurements from commercial airliners: exploiting a new data stream'

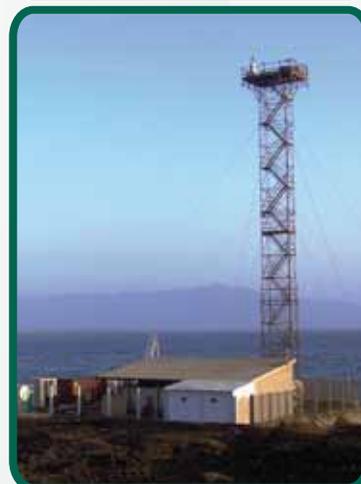
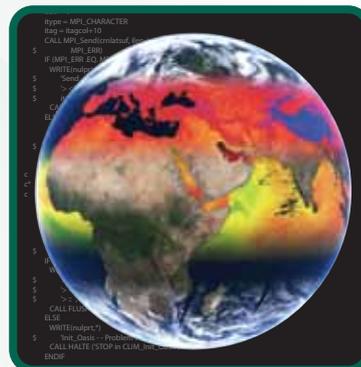
### Project description

There are two PhD positions funded by IGAS, an EU project coordinated by the MPI for Biogeochemistry which will be starting January 1, 2013. The IGAS project is closely tied to the existing project, IAGOS (In-service Aircraft for a Global Observing System), which uses commercial passenger aircraft to perform regular atmospheric observations. In 2013 the first of the greenhouse gas instrumentation packages (already designed by our institute) will be installed in an airliner and will begin making high accuracy mixing ratio measurements of carbon dioxide, methane, carbon monoxide, and water vapour in situ with a high temporal resolution (every four seconds). Further expansion to a total of 5-7 aircraft is planned over the next five years. Each aircraft collects over 1400 profiles per year at airports around the world, and this new data stream provides exciting opportunities for learning more about vertical mixing of tracers in the atmosphere, validating satellite measurements, and ultimately better understanding the carbon cycle.



The **first position** will be focussed more on the measurements themselves, and will involve some quality assessment/quality control, and comparison of the data with other coincident in-situ measurements to assess both internal and external consistency. Furthermore, the profiles collected during ascent and descent in the vicinity of airports will be artificially extended to the top of the atmosphere in order to provide dry air mole fraction columns for comparison with total column measurements provided by satellites and ground-based remote sensing. Finally, some modelling work is envisioned with the application of the profile data to the existing global atmospheric inversion system for the estimation of surface sources and sinks, taking into account uncertainties in the modelled vertical mixing in the atmosphere. The impact of the potential future expansion of the IAGOS fleet on the current knowledge of the carbon cycle will also be assessed with the global model.

The **other project** will concentrate on atmospheric modelling, going from the global to the regional scale. Atmospheric transport modelling tools will be used and refined to assess the spatial representativeness of both the profile and the flight-level data in both the horizontal and vertical domain, in order to better understand their applicability with respect to space-based data, inverse modelling, and the GMES Atmosphere Service. This work includes the analysis of the impact of local pollution, which is especially important as all the profiles take place near major airports, which may be influenced by near-field emissions. A potential outcome is a bias correction that compensates for the impact of local



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sources that cannot be represented at coarse resolution. The coincident measurements of CO<sub>2</sub>, CH<sub>4</sub> and CO can help to tease apart different sources and sinks, as each is involved in different processes, and a regional budget study exploiting the lower tropospheric profiles is envisioned.

### About the school

The International Max Planck Research School for Global Biogeochemical Cycles located in Jena, Germany, offers fellowships to outstanding students interested in research on biogeochemical cycles in the Earth system. The school provides excellent research possibilities for students to obtain a PhD degree in a 3-years graduate program.

The elements key to life such as carbon, oxygen, hydrogen, and nitrogen are continuously exchanged among the land, ocean and atmosphere in what are known as global biogeochemical cycles. Research in the IMPRS-gBGC discovers how these cycles function, how they are interconnected, and how they can change with climate or human activity.

In their thesis projects, students deal with various crucial aspects of global biogeochemical cycles and participate in ongoing research comprising field observations, method development, experiments, and modeling. Students will also benefit from a three-month external research visit, specialised courses in e.g. statistics, Earth observation, modelling and analytical techniques, as well as in soft skills and will have ample opportunity to develop their personal career networks.

The school is thus an excellent starting platform for a successful career in a field related to global biogeochemical cycles and Earth System Science.

### Requirements

Applications for the program are open to well-motivated and highly-qualified students from all countries. A prerequisite for joining the school is a diploma or master of science degree in geophysical sciences, environmental sciences, biological sciences, physics, chemistry, computer sciences or related fields, including a corresponding thesis. Proficiency in English is required since English is the official language of the program.

Both of the positions require a candidate with a degree in the physical sciences, such as Physics/Meteorology/Computer Science. Experience with atmospheric measurements and/or modelling would be ideal, some familiarity with computer programming is essential. The ability to work in a team is key, as it is hoped that the two students would be able to work well with each other (to become experts on the IAGOS greenhouse gas data), the rest of the department (to learn more about the modelling tools), and colleagues from other international institutions (primarily through IGAS/IAGOS).

### How to apply

We accept applications for PhD scholarships until February 06, 2013. Top candidates will be invited to take part in our selection symposium on April 15-16, 2013.

**>> Find out more and apply online: <http://www.imprs-gbgc.de>**

### After you have been selected...

The IMPRS office will happily assist you with your transition to Jena.

Successful applicants for this fully funded position are expected to join us in spring-summer 2013. There are no tuition fees. Handicapped persons with comparable qualifications receive preferential status.

