

## Theo Ridder

**Name:** Theo Ridder (ESSReS PhD student)

**Institute:** IUP Uni Bremen

**Department:** Remote Sensing

**Phone:** +49-(0)421-218 62177

**Email:** [tridder\(at\)uni-bremen.de](mailto:tridder(at)uni-bremen.de)

**Web link:** <http://www.iup.uni-bremen.de/>

**PhD-project title:** Latitudinal variations of long-lived trace gases from ground-based remote sensing in the infrared spectral region.

Trace gases in the atmosphere contribute only a small part to the atmosphere's composition (<1%). Despite their low concentration atmospheric trace gases essentially determine the physical and chemical properties of the atmosphere. The measurement of their distribution within the atmosphere yields information on their sources and sinks, their chemical behaviour and on their impact on the climate system.

As a measurement tool high resolution solar absorption Fourier transform spectrometer is used. For FTIR spectroscopy solar radiation is collected by a solar tracker and directed into a Michelson-Interferometer. The output signal is the Fourier transform of the absorption spectrum. Information about trace gases are retrieved from these absorption spectra by an algorithm based on a nonlinear least squares fitting procedure. Beside column densities vertical profiles can be determined up to a maximum height of 40km.

The possibility to retrieve total columns and vertical profiles with FTIR spectrometers is a great advantage of remote sensing against in situ measurements. Total columns and vertical profiles provide information from different atmospheric layers and allow to draw conclusions about dynamic and chemic processes. In situ measurements from the ground are influenced mainly by local events and contain no information about processes in higher atmospheric layers. Thus they are not well suited for understanding global processes. Aircraft in situ measurements indeed provide vertical profiles, but are quite expensive and therefore sparse.

Ship-based measurements will be used to investigate the latitudinal variation of trace gases. These measurements are extremely important to constrain models specifying the physics and chemistry of the atmosphere. A focus of the work will be the analysis of the impact of anthropogenic pollution on the atmosphere in the Northern Hemisphere and biomass burning in the Southern Hemisphere.

For the prediction of future climate warming a better understanding of sources and sinks of greenhouse gases is needed. Satellite measurements will provide global coverage but need careful validation from the ground to determine a potential spatial bias and temporal drift. Precise measurements from remote sensing observations are therefore needed. Ground-based FTIR-Spectrometry is the only suitable ground-based remote sensing technique for the validation of satellite measurements.

**Start of doctoral thesis:** 01.06.2008

### Thesis Committee:

Supervisor: Prof. Dr. J. Notholt (IUP University Bremen)

Co-supervisor: Dr. T. Warneke (IUP University Bremen)

Dr. R. Weller (AWI)

### Presentations:

Theo Ridder, C. Gerbig, A. Jordan, M. Rothe, T. Warneke, O. Schrems, and J. Notholt: "Latitudinal Distribution of Trace Gases from Biomass Burning Emissions", Tagung der Deutschen Physikalischen Gesellschaft (DPG), Hamburg, Deutschland, 2-6 March, 2009.

T. Ridder, T. Warneke, O. Schrems, and J. Notholt: Ship borne FTIR and in situ measurements in the western Pacific.



Conference of the Helmholtz "Earth System Science Research School" in Bremerhaven (poster), August 2009

**References:**

T. Ridder, M. C. Rogge, and R. J. Haug: Spin- and edge channel dependent transport through quantum dots, Journal of Physics: Condensed Matter, 2008, 20, 454206 (4pp)

**Expeditions:**

08/2009-12/2009: Solar Absorption FTIR measurements on board of Research Vessel Sonne – field campaign from Tomakomai, Japan to Auckland, New Zealand

**Research stay abroad:**

DAAD stipend for research stay at the Institute of Engineering and Applied Science, Harvard University, Cambridge, MA, USA.