1ST CONSORTIUM NEWSLETTER

Introduction

After the 1st StratoClim Annual meeting in Budapest, it was decided that the Coordination team will start a series of consortium newsletters based on the Executive Committee telecon meetings. The main objective of these newsletters is to inform the consortium on the latest developments within the project and ensure a regular communication within the consortium.

This first Newsletter will shortly introduce the progress within each WP and list news items from the coordination. The second Newsletter will be sent out in October 2016 after the Main aircraft campaign in the Asian Monsoon area.

Group picture of the StratoClim Consortium at the 1st Annual Meeting in Budapest, Hungary 26-30 October 2015

WP1 - Tropical Field Campaign

WP1 held a **flight planning meeting in February 2016 in Rome** in order to define the general Science Objective flights. The meeting concluded in 5 main and 2 contingency flight plans:

- Deep Convection, Convective Outflow and Vertical Transport, processing in the outflow at different stages (match), New Particle Formation (SO-POC Legras),
- Cold Point Tropopause and SubVisible Cirrus (SO-POC Borrmann).
- Survey flights to sample Horizontal and Vertical Structure (chemical composition) of the AMA core and Surrounding Domains (TTL) (these may need different templates for in-situ and remote sensing payloads) (SO-POC Fierli)
- Structure of the AMA Barrier (different horizontal and vertical sampling flights strategies) and associated Transport and Mixing, together with its intra-seasonal variability (SO-POC Vogel)
- ATAL and precursors (SO-POC Schlager)

On the occurrence of the event, flights can/ will be designed to sample:

- Typhoon outflows (forward trajectory to spot influenced regions) (add-on to flights if there is an opportunity)
- Volcanic emissions (contingency flight)

The WP1 planned on **two aircraft campaigns during 2016,** a shorter test campaign in Kiruna and the main scientific campaign in Indian subcontinent. The first one of them, a two week **test campaign in Kiruna, Sweden in April 15-28**, ended before it got properly started because of cancellation of flight permits by the Swedish authorities. The campaign group managed to run ground tests on the mechanical compatibility of the new instruments and basic electric tests, before the aircraft was ordered to leave Sweden. The test flights are now planned to take place in the beginning of the main campaign in Italy, from which the aircraft will fly instrumented via Sharjah to the main campaign base in Indian sub-continent.

The Myasishchev M-55 Geophysica is a dual-fan one-seated high altitude research aircraft by the Russian Myasishchev Design Bureau. Photo: MDB / Project Wiki

The main scientific campaign in Indian subcontinent will take place July 14 - August 29. Primary base location for the main scientific campaign is the city of Nagpur in India. All political prerequisites in India have been in place since December 2015 and work towards obtaining clearances from Indian authorities is now underway. In case the clearances on the Indian peninsula will not realise, permissions and clearances are also been applied for in Kathmandu, Nepal and Dhaka, Bangladesh.

WP2 - Ground Stations

In the beginning of the year, WP2 officially opened the **Palau Atmospheric Observatory** in cooperation with Palau Community College (PCC) and the Coral Reef Research Foundation (CRRF).

Palau is located in the centre of the restricted ascent area. The new observatory allows the project to study on-site the processes, which determine the UTS's composition on a global scale. Three to four intense observational periods are planned per year concentrating on ozone, aerosol and water vapour soundings. A new method on measuring in-flight background current has been developed at AWI and will be tested during these measurement periods.

The measurements will be complemented by an educational program at PCC consisting of a series of lectures on climate issues by scientists from the StratoClim consortium.

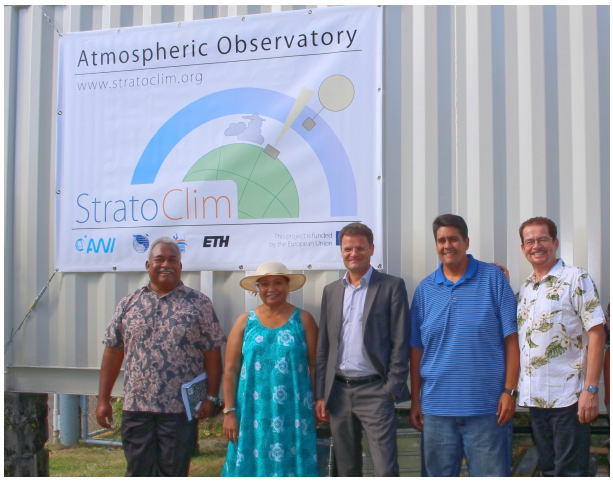
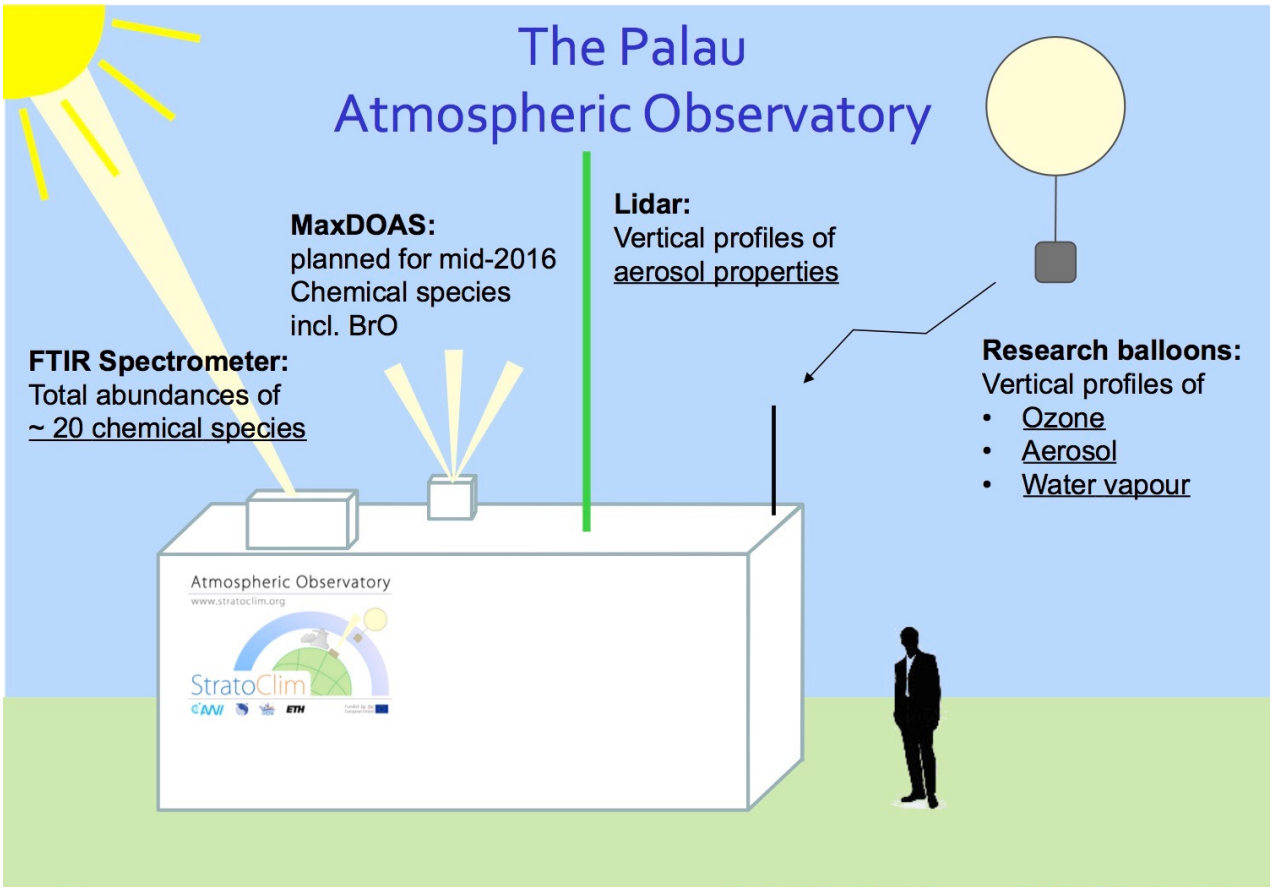


Photo: J. Graeser

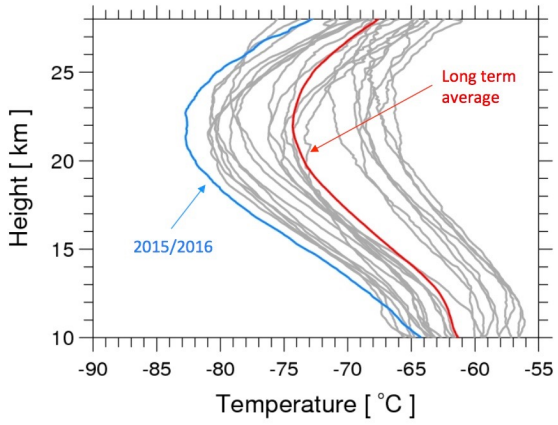


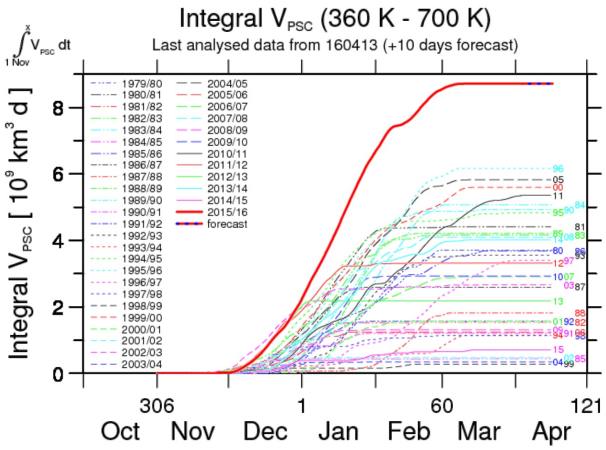
WP2 - Ground Stations

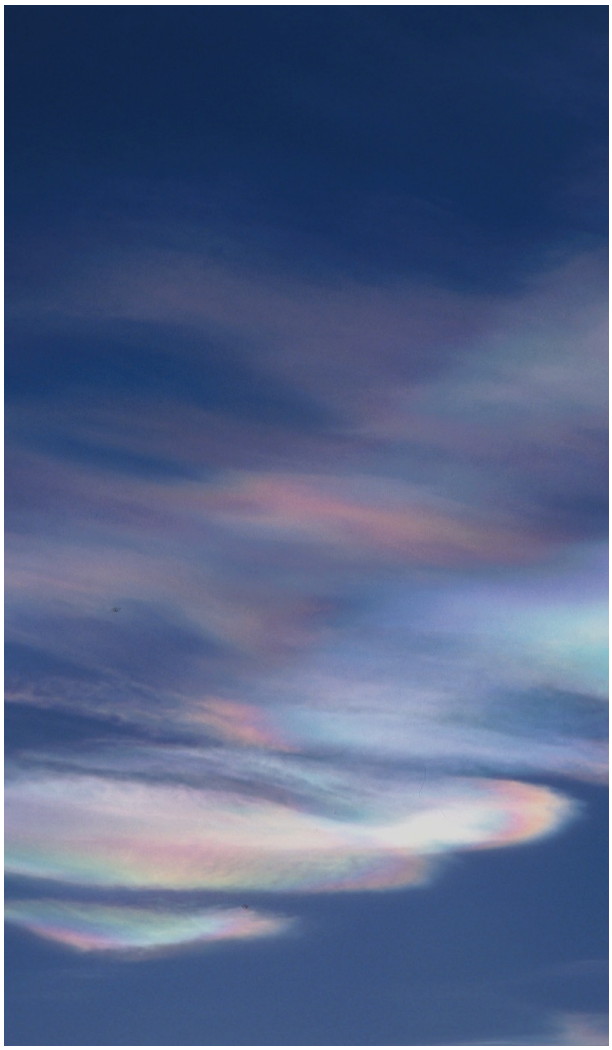
Very **exceptional conditions** were observed **in the Arctic** over the winter months this year. Data shows that the winter 2016 (Dec-Feb) was the coldest stratospheric winter in the Arctic since measurements started. These unprecedented temperatures led to the strongest ozone loss event in the Arctic so far, which in turn led to the activation of the Match campaign within the WP2 in January. An extensive campaign was conducted including 23 stations launching altogether 480 sondes.

The cold spell in the Arctic stratosphere ended in mid-March with an impressive stratospheric warming. Fresh ozone has since been transported to the Arctic with the poleward falling air masses, which means that the ozone layer there has already partially regenerated. The potential that, as a result of the general weather situation, an ozone minimum would have reached Central Europe and cause extremely high UV radiation there did thus not realise.

The upper figure here below shows the Stratospheric mean temperature profiles in Ny Alesund between Dec-Feb. The lower figure shows the respective Ozone loss during the same months, compared to previous years.







Polar Stratospheric Clouds. Photo: M.Rex

WP3 – Satellites

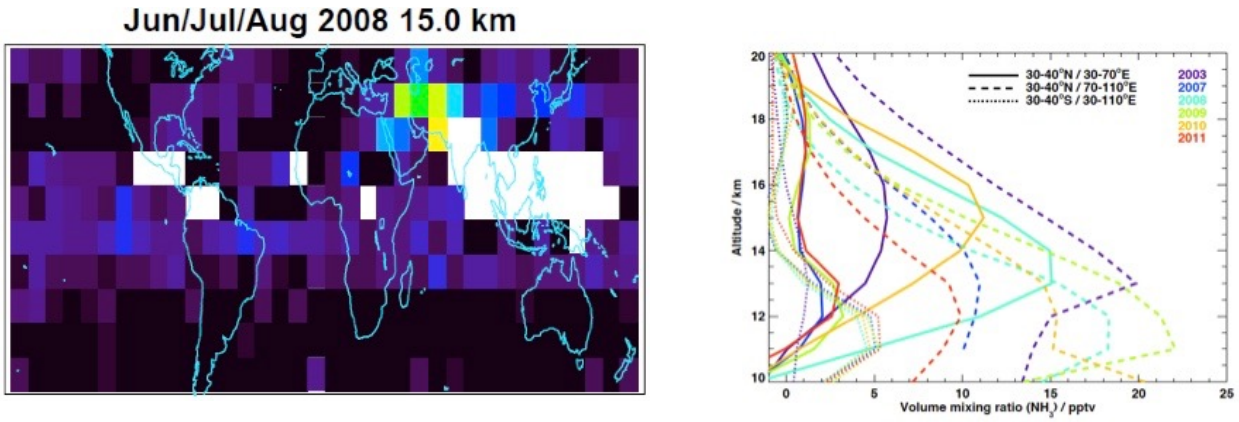


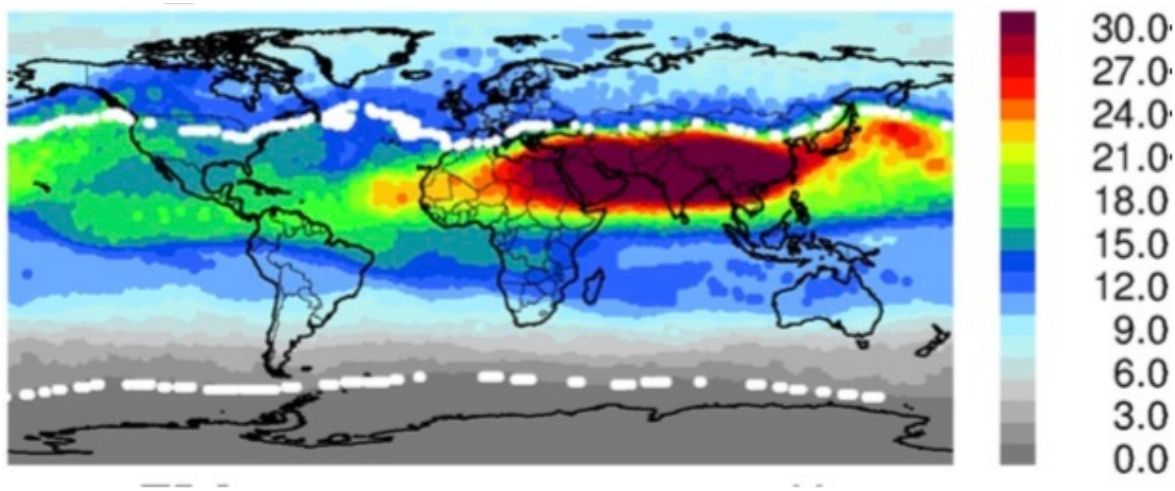
Fig.: Left panel: Global distribution of upper tropospheric NH3 at 15 km altitude for June/July/August 2008; right panel: mean JJA vertical profiles of NH3 for various years (color coding) for the Eastern (dashed) and western part (solid) of the Asian monsoon anticyclone, and for a SH bin for comparison (dotted lines) (from Höpfner et al., ACPD, accepted for publication, 2016).

Enhanced levels of NH3 in the Asian monsoon anticyclone (AMA) region (12 to 18 km altitude) have been detected from **MIPAS/ Envisat observations**. This is the first global detection of ammonia in the upper troposphere. The enhancement is observed during the monsoon season in the AMA only; for all other global locations and times values around the detection limit are found. These observations show that loss processes during transport from the boundary layer to the upper troposphere in the Asian monsoon do not deplete the air entirely of NH3. Thus, ammonia might contribute to the so-called Asian tropopause aerosol layer (ATAL) by forming ammonium aerosol particles (ammonium sulphate or ammonium nitrate aerosols). Detection of enhanced amounts of NH3 in the Western part of the AMA in several years (see Figure above, right panel) suggests that the lifetime of ammonia is long enough to survive transport far from its source region.

The detection limit of NH3 from averaged MIPAS spectra as used in the work described here is in the order of 3 to 5 pptv, and the observation uncertainties are dominated by measurement noise. The respective low measurement noise level necessary to significantly detect NH3 can be reached for single spectra of the GLORIA instrument. This means that unequivocal detection of NH3 by remote sensing measurements with GLORIA will be possible. The spectral range containing NH3 signatures is well covered by GLORIA. Detecting ammonia by GLORIA during the STRATOCLIM Asian monsoon campaign flights would be extremely helpful in order to advance our understanding of the formation and the fate of the ATAL.

Reference: M. Höpfner, R. Volkamer, U. Grabowski, M. Grutter, J. Orphal, G. Stiller, T. von Clarmann, and G. Wetzel, First detection of ammonia (NH3) in the Asian monsoon upper troposphere, Atmos. Chem. Phys. Discuss., 16, accepted for publication, May 2016.

WP4 - Process Studies and Mesoscale Modelling



From Vogel et al., ACP to be submitted, 2016

In WP 4 progress has been made with Lagrangian studies driven by observed (Reanalysis) meteorological information. These studies are based on synthetic artificial tracers to mark the origin of air masses. Within WP4, ongoing work aims at harmonising the origin of air tracers to obtain a better comparability of the results of such studies.

Recent work with the **CLaMS model** (Vogel et al., 2016, to be submitted) finds that the air masses within the monsoon circulation in September are strongly influenced from air masses originating in India and China. In the monthly mean for 2012, there is also a clear indication of export of air masses from the monsoon circulation at the North east edge. Further, a trajectory study with Traczilla finds that air from the Bay of Bengal, the China sea and the Chinese and Indian land masses contribute most strongly to the mass flux into the TTL in the monsoon season (July-September). These results and a discussion of the entire, much more comprehensive study have recently been reported by Tissier and Legras (2016).

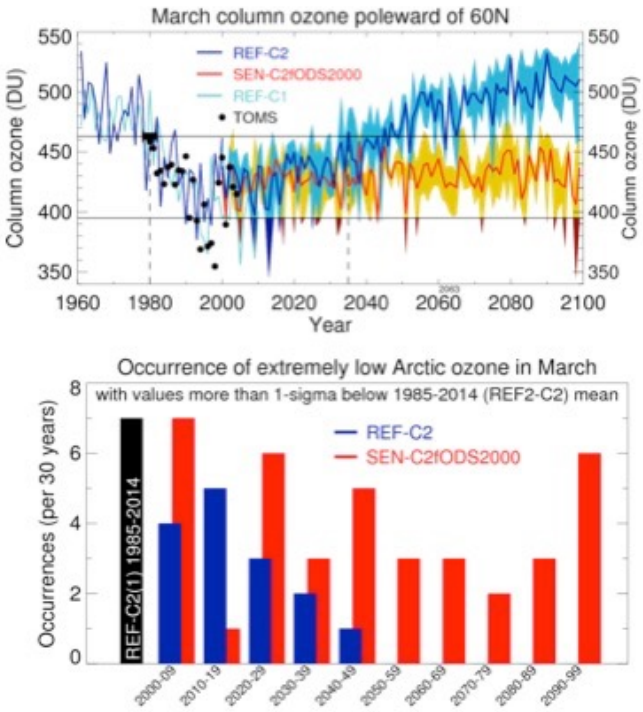
The figure here above shows CLAMS tracer for India and China, September mean.

Tissier, A.-S. and Legras, B.: Convective sources of trajectories traversing the tropical tropopause layer, Atmos. Chem. Phys., 16, 3383-3398, doi:10.5194/acp-16-3383-2016, 2016.

WP5 - Global Climate Modelling

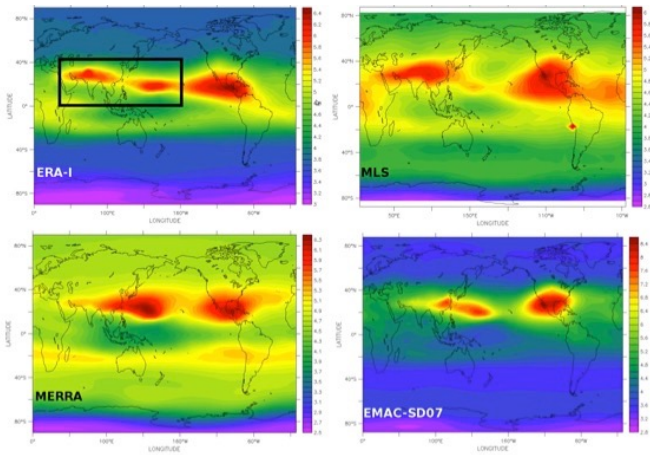
Already during the first year into the project, the WP5 concluded an extensive report with recommendations for tropical field campaign. This report is stored in the project Wiki under “CoordIssues”.

The current status of the WP5 includes updates on **Arctic Ozone projections**. Related studies with Chemistry-Climate Models (CCMs) are focusing on the role of ozone depleting substances in a changing climate. Moreover, analyzing CCM simulations together with satellite data and reanalysis products indicate significant uncertainties regarding the description of **Asian Summer Monsoon signatures**. Therefore the procedures of determining these signatures are compared and detailed process-oriented studies are carried out to identify the correct description of the ASM.



Model; model data and observations show good agreement. The red curve shows results from a sensitivity study with ODS amounts fixed at 2000 values. The lower part indicates that with declining ODS amounts,
extremely low ozone in March is unlikely after 2050.

The upper part of the figure on upper right corner (N. Butchart (UKMO)) shows total ozone columns in March as observed (black dots) and respective two simulation results (blue colours) from a Chemistry-Climate



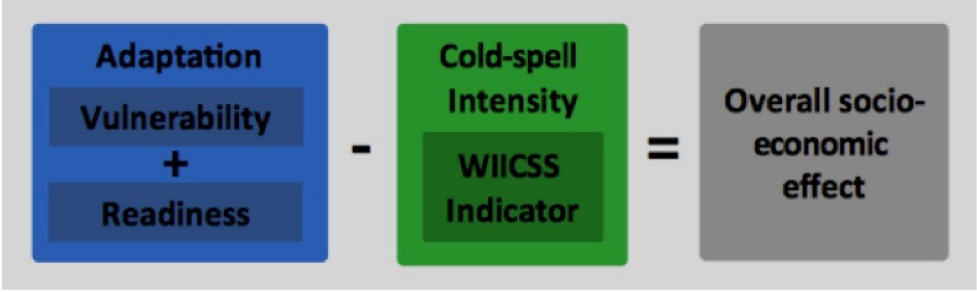
In the figure here left (M. Nützel et al.) different signatures can be detected in the region of the monsoon and the West Pacific (warm pool) in reanalyses (top left, bottom left), observations (top right) and model results (bottom right). This problem is addressed in current investigations.

WP6 and 7 - Socioeconomic implications, Public dissemination and stakeholder services

The WP6 concluded the first of four deliverables on the UTS related socio-economic impacts. The **preliminary report "Socio-economic impact of changes to the European climate caused by the UTS"** discusses European countries' adaptation to extreme cold events by examining their vulnerabilities (current status) due to climate disruptions and readiness (future capacity) to implement adaptation solutions. The report introduces an adjusted methodology of calculating a score for countries' adaptation to climate change, modifying the The Notre Dame Global Adaptation Index (ND-Gain) to represent extreme cold events rather than overall climate warming. Further, the report introduces an WIICSS indicator (Wuppertal Institute Indicator for Cold-Spell Severity), which provides a single-digit number representing the relative severity of cold-spells in one winter compared to another winter (or aggregated winters) for a given location.
The full report with preliminary results can be found in the project Wiki.

Further, WP6 held a joint workshop with WPs 5 and 4 on 15th of February at Wuppertal Institute's office in Berlin to discuss the further development in WP6, both in the section concerning European winters, and also the section concerning the Asian Monsoon.

Photo: L.Grübner



Coordination

Project reporting towards the EC

The first StratoClim periodic report was submitted last summer and accepted without comments by the EC Project Officer Claus Brüning. The **2nd periodic reporting** will take place in **December 2016 - January 2017** and it is envisaged that some of the breakout sessions at the 2nd annual meeting will be be allocated to the report preparation. The reporting periods are as follows:

- P1: months 1 to 18 (1st Dec 2013 to 31st May 2015)
- P2: months 19 to 36 (1st June 2015 to 30th Nov 2016)
- P3: months 37 to 54 (1st Dec 2016 to 31st May 2018)
- P4: months 55 to 60 (1st June 2018 to 30th Nov 2018)

At the end of each reporting period the project has 60 days to complete the online financial reporting as well as the scientific progress report. The interim payments of the EC grant will only be paid after successful acceptance of both parts of the periodic reporting.

EC Project Officer

StratoClim project has a new Project Officer at the EC. Her name is **Ms Justine Mudahogora**. She replaces Anna-Natasa Asik, who, for three months, was the StratoClim project officer after the retirement of Mr. Claus Brüning.

Project T-shirt

The project will provide all partners a project T-shirt for free. In order to have better overview of the sizes, please go and order your T-shirt on the project website at www.stratoclim.org under **"Order you T-shirt"-link** in the news ticker on the left side of the page.

Annual Meetings

Presentations from the 1st Annual meeting, held in Budapest Hungary 26-30 October 2015 are now online in the project wiki.

The **2nd Annual StratoClim meeting** will take place **16-18 November 2016** in Madrid Spain and will be hosted by Natalia Calvo Fernandez at UCM.

Photo: Wiki Commons

Project Wiki

Jülich is hosting a **StratoClim project wiki**, in which the WP1 originally stored and exchanged information on the **aircraft campaign**. We have now added pages in to the wiki for the **project coordination and global modelling**, to make all project documentation available for you all in one place.
Under the link "Project Coordination" in the wiki you have access to the Description of Work (DoW), submitted project deliverables and annual meeting presentations.
You can access the wiki via the login page at https://stratoclim.icg.kfa-juelich.de/MainPage?action=login (also accessible via http://stratoclim.org/) and create an account for yourself, which allows you to search through the wiki. If you have problems accessing the wiki, please contact Reimar Bauer (r.bauer@fz-juelich.de) at FZ Jülich.