BACCHUS

Impact of Biogenic versus Anthropogenic emissions on Clouds and Climate: towards a Holistic UnderStanding

Collaborative Project

SEVENTH FRAMEWORK PROGRAMME
ENV.2013.6.1-2

Atmospheric processes, eco-systems and climate change

Grant agreement no: 603445

Deliverable number:	**D5.7**
Deliverable name:	**Special BACCHUS session at EAC 2017**
WP number:	5
Delivery date:	Project month 47 (31/10/2017)
Actual date of submission:	29/09/2017
Dissemination level:	PU
Lead beneficiary:	ETHZ
Responsible scientist/administrator:	Ulrike Lohmann, Monika Burkert (ETHZ)
Estimated effort (PM):	0.06
Contributor(s):	Ulrike Lohmann (ETHZ), Philip Stier (UOXF)
Estimated effort contributor(s) (PM):	0.06
Internal reviewer:	

Summary of results

The European Geophysical Union (EGU) 2017 conference took place from 23-28 April 2017 in Vienna, Austria. Due to the success of the BACCHUS session at EGU 2016 as presented in Deliverable D5.5 (http://www.bacchus-env.eu/public/Deliverables/D5.5_month30_final.pdf), EGU 2017 conference has been chosen to present the results of BACCHUS. This allowed disseminating the BACCHUS results to a broader community of researchers than would have reached at the EAC 2017.

The BACCHUS Project Management Office (PMO) together with the Steering Committee (SC) decided to organize a BACCHUS session embedded in the General Session "AS1.35: Clouds, Aerosol, Radiation and Precipitation" in collaboration with the session conveners. This allowed addressing researchers from a larger variety of backgrounds rather than an individual BACCHUS session leading to a greater dissemination of the work and results from BACCHUS. Contributions from BACCHUS were explicitly invited to this session (http://meetingorganizer.copernicus.org/EGU2017/session/22698) and the convener of the session was BACCHUS WP3 leader Philip Stier. The session was held on Monday, 24 April and consisted of an oral session between 10:30 and 17:00 with 16 presentations including three invited presentations, and the poster session exhibited another 38 presentations in the evening from 17:30 to 19:00 on the same day.

In addition, BACCHUS contributed with multiple presentations to session "AS3.3: Atmospheric Ice Particles", which was co-chaired by Ulrike Lohmann in the sub-session on ice nucleating particles. This session consisted of 18 oral presentations and 34 poster contributions.

The BACCHUS highlighted presentations are summarized in the following:

In the general session AS1.35, two BACCHUS partners gave an oral presentation.

Max Heikenfeld from the University of Oxford and co-workers presented work with the title "A microphysical pathway analysis to investigate aerosol effects on convective clouds". M. Heikenfeld and his co-workers tested two commonly-used cloud microphysics schemes in the WRF model for which certain diagnostic outputs (process rates for number and mass mixing rations) were tested. This allowed to investigate how changes in aerosol conditions have an effect on individual processes and to track the propagation of perturbations in convective clouds. Idealized supercell simulations were used to test the analysis methods in a well-studied case and were then extended to large case study simulations to study tropical convection in the Amazon rainforest.

BACCHUS work package co-leader Albert Ansmann from the Leibniz Institute for Tropospheric Research, Leipzig (TROPOS), gave a presentation on "Lidar observations of ice nucleating particle (INPC) and ice crystal number (ICNC) concentrations: height-resolved INPC-ICNC closure studies in mixed-phase altocumulus layers". The presented results were based on measurements during the BACCHUS field campaign in spring 2017 in Cyprus during which the evolution of extended liquid-water altocumulus fields with subsequent heterogeneous ice formation has been observed. This closure study deployed the recently developed polarization-lidar method for estimating the INPC at cloud level. Doppler lidar observations of thermal velocities allowed to estimate the ice crystal number concentration of the falling ice crystals. A reasonable agreement between the INP concentration in immersion freezing and the ICNC for cloud top temperatures between -20 and -30 °C has been observed.

In addition, BACCHUS partners contributed with poster presentations of the following titles:

- "Improving microphysics in a convective parameterization: possibilities and limitations" by Laurent Labbouz (from project partner University of Oxford), Max Heikenfeld, Philip Stier, Hugh Morrison, Jason Milbrandt, Alain Protat and Zak Kipling.
  The convective cloud field model (CCFM) is implemented in the climate model ECHHAM6.1-HAM2.2 and it provides a convective parameterization of different convective cloud cases. In this work, the authors presented a new double-moment microphysics (P3) scheme implemented in the CCFM, which was compared to radar retrievals at Darwin.
- "Ice nucleating particles from a large-scale sampling network: insight into geographic and temporal variability" by Jann Schrod (BACCHUS partner Goethe-University of Frankfurt), Daniel Weber, Erik S. Thomson, Christopher Pöhlker, Jorge Saturno, Paulo Artaxo, Joachim Curtius and Heinz Bingemer.
  Measurements from a time series of ice nucleating particle concentration (INPC) between 2015 and 2016 obtained as part of the BACCHUS campaign were presented. The data provide a large-scale sampling network for which measurements from unique and remote locations (e.g. Amazonian Tall Tower Observatory/Brazil, Martinique, Svalbard, Taunus Observatory/Germany or the Mt. Kenya GAW station were used. The INPC results were obtained by an electrostatic sampling technique and subsequent analysis of the samples with the FRIDGE instrument in a temperature range between -20°C and -30°C (relative humidity 115-135%) to test geographic and temporal variability of atmospheric INPC.

In the session on "Atmospheric Ice Particles" (AS3.3) another oral presentation was given by BACCHUS members. Jesús Vergara-Temprado, University of Leeds, and co-workers talked about the "Contribution of feldspar and marine organic aerosols to global ice nucleating particle concentrations". For their study, J. Vergara-Temprado and co-workers used a global aerosol model to simulate the concentrations of K-feldspar and marine organics to consequently estimate the contribution of the species to INPC. For this purpose, laboratory-developed parameterizations have been used to describe the ice nucleating ability of K-feldspar and marine organics. The study resulted in a better prediction of the global observation in INPC when the two species were combined in comparison to recent parameterizations and possible biases were discussed.

Also in this session, poster presentations were given by BACCHUS partners:

- "Ice nucleating particles around the world – a global review" by James D. Atkinson, Zamin A. Kanji, Berko Sierau and Ulrike Lohmann (ETH Zurich).
  The BACCHUS ice nucleation database consisting of historical and contemporary observations of INP concentrations was reviewed. The authors presented an overview of all data in the database at different locations and times. The data has been compared by deriving correlations of accompanying variables. An initial parameterization to estimate global INP concentration as a function of temperature and relative humidity based on this data set was presented. In the future, this can be used for modelling of global atmospheric INP concentration.

- "Ice Nuclei measurements across Europe within BACCHUS" by Matteo Rinaldi, Alessia Nicosia, Gianni Santachiara, Marco Paglione, Silvia Sandrini, Stefania Gilardoni, Paolo Cristofanelli, Angela Marinoni, Paolo Bonasoni, Maria Cristina Facchini and Franco Belosi (CNR-ISAC).
  The authors presented measurements from field campaigns of the BACCHUS and the Air-Sea-Lab (CNR) projects consisting of INPC measurements at various sites in Europe. Data was obtained by using a membrane filter technique with a dynamic filter processing chamber (DFPC). Sampling performed with parallel PM_1-PM_{10} collectors revealed the highest INPC at San Pietro Campofiume in Italy and the lowest concentration was measured at the Mace Head station on a North Atlantic coastal site. During episodes of Sahara dust events an increased super-micron particle concentration and increased INPC was found for the PM_{10} samples. However, the activated fractions decreased during the Sahara dust events for which the authors speculated on ageing processes during long-range transport of mineral dust.
- "Spatio-temporal variations in marine ice nuclei concentration" by André Welti, Mareike Löffler and Frank Stratmann (TROPOS).
  Ship and ground based measurements of INPC were presented for a temperature range between -5 and -40°C (immersion freezing) and the spatial and temporal variability was discussed. The authors observed that the spatial variability in the marine environment is small and influences from heavily populated areas or dusts were limited to the temperature regime below -25°C. For example, they observed in their measurements that the temporal variability is larger than changes with location.

In honor of the BACCHUS Steering Committee member and former WP4 leader Jon Egill Kristjansson after his tragic accidental death in August 2016 a memorial session was held at EGU 2017, which was organized by the University of Oslo. Ulrike Lohmann, ETH Zurich, contributed with a solicited talk on "The influence of clouds and aerosols on climate" to the session honoring the work from Jon Egill Kristjansson for research and in particular for his tremendous contribution to BACCHUS.

Summary

The EGU 2017 was a successful conference at which the BACCHUS project was well represented in different sessions with multiple BACCHUS contributions, which resulted in discussions and awareness of the BACCHUS results. For instance it disseminated the ice nucleation data base to a broader community. Incorporation of the BACCHUS session to a general session allowed dissemination of the results also into other research fields due to the larger audience with more distinct backgrounds.

Changes with respect to the DoW

A special BACCHUS session was organized at EGU 2017 instead of a session at the European Aerosol Conference (EAC) 2017 after the success of the EGU 2016 BACCHUS session and due to the larger community participating in the EGU conference thus larger dissemination of the BACCHUS results.