

Name of research institute or organization:

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**Max Planck Institute for Chemistry, Mainz**

Title of project:

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Characterization of ice residuals using X-ray microspectroscopy

Part of this programme:

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CLACE 2014

Project leader and team:

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Prof. Dr. Ulrich Pöschl, project leader

Mira L. Krüger

Dr. Christopher Pöhlker

Prof. Dr. Meinrat O. Andreae

Project description:

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As part of the CLACE 2014 field campaign, we performed aerosol sampling for X-ray microspectroscopy at the High Altitude Research Station Jungfraujoch from 17 February to 23 February 2014.

The focus of the campaign was the analysis of the properties of ice residuals. The analysis of ice residuals' properties is crucial for a sound understanding of the formation of ice crystals and precipitation.

For this purpose, we have taken samples at two different inlets in parallel, the ISI inlet to sample ice residuals and the total aerosol inlet.

The aerosol samples were collected with two stage impactors. The samples have been analyzed using two different micro-spectroscopic techniques: (i) scanning transmission X-ray microscopy with near-edge X-ray absorption fine structure (STXM-NEXAFS) analysis at synchrotron facilities and (ii) scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDX). These techniques allow spatially resolved investigations of the chemical composition and mixing state of individual aerosol particles (Moffet et al., 2010; Pöhlker et al., 2012).

Initial results indicate that the collected ice residuals are relatively small ( $\ll$  500 nm) and comprise a variety of elements in strongly internally mixed aerosol particles. Moreover, an unusual chemical signature of the organic constituents has been observed, which differs from organic aerosols from other sampling locations worldwide. Based on the current state of analysis, no clear distinctions in aerosol composition and morphology have been found between ice residuals and total aerosol samples. The ongoing analysis will probably allow more detailed insights.

References:

Moffet, R. C., Tivanski, A. V. and Gilles, M. K.: Scanning transmission X-ray microscopy - Applications in atmospheric aerosol research, in: *Fundamentals and applications in aerosol spectroscopy*, edited by: Signorell, R. and Reid, J., CRC Press Taylor & Francis Group, Boca Raton, 2010.

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Pöhlker, C., Wiedemann, K. T., Sinha, B., et al.: Biogenic Potassium Salt Particles as Seeds for Secondary Organic Aerosol in the Amazon, *Science*, 337, 1075-1078, doi: 10.1126/science.1223264, 2012.

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Key words:

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Aerosol composition, ice residuals, x-ray microspectroscopy

Collaborating partners/networks:

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ETH Zürich, Switzerland

Helmholtz Zentrum Berlin (HZB), Germany

Max Planck-Institute for Intelligent Systems, Stuttgart, Germany

Paul Scherrer Institute (PSI), Switzerland

Technical University Darmstadt, Germany

Address:

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Max Planck Institute for Chemistry

Multiphase Chemistry Department

Hahn-Meitner-Weg 1

D-55128 Mainz, Germany

Contacts:

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Mira L. Krüger

Tel.: +49 6131 305 6204

Fax: +49 6131 305 6019

e-mail: [m.kruger@mpic.de](mailto:m.kruger@mpic.de)