

# Application: 2022-0000000098

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ATMO-ACCESS Second call for Trans-National Access

## Scientific activity report

Completed - Nov 4 2022

## ATMO-ACCESS Scientific Activity report

Please confirm the type of service accessed (mandatory):

Research/innovation services

### TNA project title

Vertical aerosol profiles during the Pallas Ice Cloud Experiment 2022 - VAP-PaCE

### TNA project acronym

VAP-PACE

### Name of Project Leader

Julia Schmale

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## User group details

Please provide the following details for each user in the group

Name:

Surname:

Gender: (*male, female, non-binary*)

Nationality:

Employing organization name:

Employing organization legal status: (*Public research, University and higher education, Small Medium Enterprise (SME), Other industrial and/or profit private organization, Other*)

Employing organization country:

Field of activity: (*ENV-ATMO - Earth and environmental sciences/Atmospheric domain, ENV-HYDRO - Earth and environmental sciences/Hydrosphere domain, ENV-LITHO - Earth and environmental sciences/Lithosphere, ENV-ECOBIO - Earth and environmental sciences/Eco-biosphere, PHY - Physics astronomy, astrophysics, CHEM - Chemistry, BIO-MED - Biological, medical sciences and biotechnology, ENG-TECH - Engineering and technology, EGY - Energy, ART - Humanities and arts, ISC - Information science and communication, SOC - Social sciences, MS - Material sciences, MATH - Mathematics*)

Name: Julia / Roman / Lionel

Surname: Schmale / Pohorsky / Favre

Gender: female / male / male

Nationality: Germany / Switzerland / Swizerlan

Employing organization name: EPFL

Employing organization legal status: University and higher education

Employing organization country: Switzerland

Field of activity: ENV-ATMO

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**Please make sure to address any comments made by the reviewers (if applicable).**

## Executive summary

### Vertical aerosol profiles during the Pallas Ice Cloud Experiment 2022 - VAP-PaCE

We deployed a tethered balloon facility, a helikite, at the ACTRIS station Pallas between 24 September and 16 October 2022 to measure the vertical profiles of aerosol properties and their interactions with clouds. A total of 18 flights were performed with a payload of aerosol microphysics and chemistry instruments. More than half of the flights were performed in and above clouds, while six flights were cloud-free. Notably, also new particle formation events were captured.

## Scientific objectives

The overall objective of VAP-PACE is to explore aerosol-cloud interactions in situ. Specifically, we aimed to:

- characterize atmospheric boundary layer thermodynamics (temp, humidity) and aerosol properties (size distribution, concentrations of INP and CCN, optical properties).
- understand particle chemistry and microphysics below, in and above clouds and related processes

## Reason for choosing station/ infrastructure

The Pallas ACTRIS station performs in depth aerosol chemistry and microphysics measurements on the ground and with remote sensing. We measure many of the ACTRIS standard aerosol variables with our vertical system (e.g., particle number concentration, size distributions, absorption coefficients) and can hence directly relate ACTRIS surface observations with the vertical in situ data, as well as relating remote observations with the in situ data. Moreover, other tethered balloon systems and UAVs were operated at the same time.

## Activities during the TNA (research, training, events, ...)

### Research activities:

- We installed the tethered balloon at the Matorova hut and performed 18 flights with aerosol instrumentation on board.
- Ground based aerosol instruments were operated in the hut.
- The payload instruments were compared to the Pallas main ACTRIS instruments at the beginning and end of the field work.

## Method and experimental set-up

### Ground based instrumentation:

- SMPS
- OPC
- trace gases
- filter sampler

### Tethered balloon instrumentation:

- filter samplers (for chemistry and INP)
- mini SMPS
- CPC
- OPC
- cloud droplet probe
- absorption photometer
- trace gases
- weather station

## Preliminary results and conclusions

In total 18 flights were performed under, in and above clouds. Six flights were cloud-free. We were able to obtain aerosol size distribution spectra and their evolution during cloud processing. In most cases the atmosphere was well mixed in the lower hundred meters, there were only few occasions with temperature inversions. High wind speeds, likely low-level jets, were frequently encountered above 100 m altitude.

## Outcome and future studies

Data publications and scientific manuscripts are in the making.

A further outcome is that guest instruments for INP sampling and a cloud probe were successfully flown and new payload developments will follow from this.

We envision future collaboration with FMI at Pallas to investigate aerosol cloud interactions in a different season, preferably winter.

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## References

<https://www.epfl.ch/labs/eerl/eerl-home-page/research/momucams/>

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**Is the information provided in the report confidential and should not be made available on the ACTRIS website?**

No, the information can be made public.

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**Please upload any documentations related to the access (Images, pdfs. Etc) - allow multiple uploads**

[VAP-PACE.pdf](#)

**Filename:** VAP-PACE.pdf **Size:** 591.9 kB



# Vertical aerosol profiles during the Pallas Ice Cloud Experiment 2022 - VAP-PaCE

# Matorova

Particle concentration  
Particle size distribution (PSD)  
Light absorption  
Lung deposited surface area (LDSA)  
CO<sub>2</sub>  
+ Sampling



PSD:  
SEMS + POPS

# Flights overview

## Temperature

