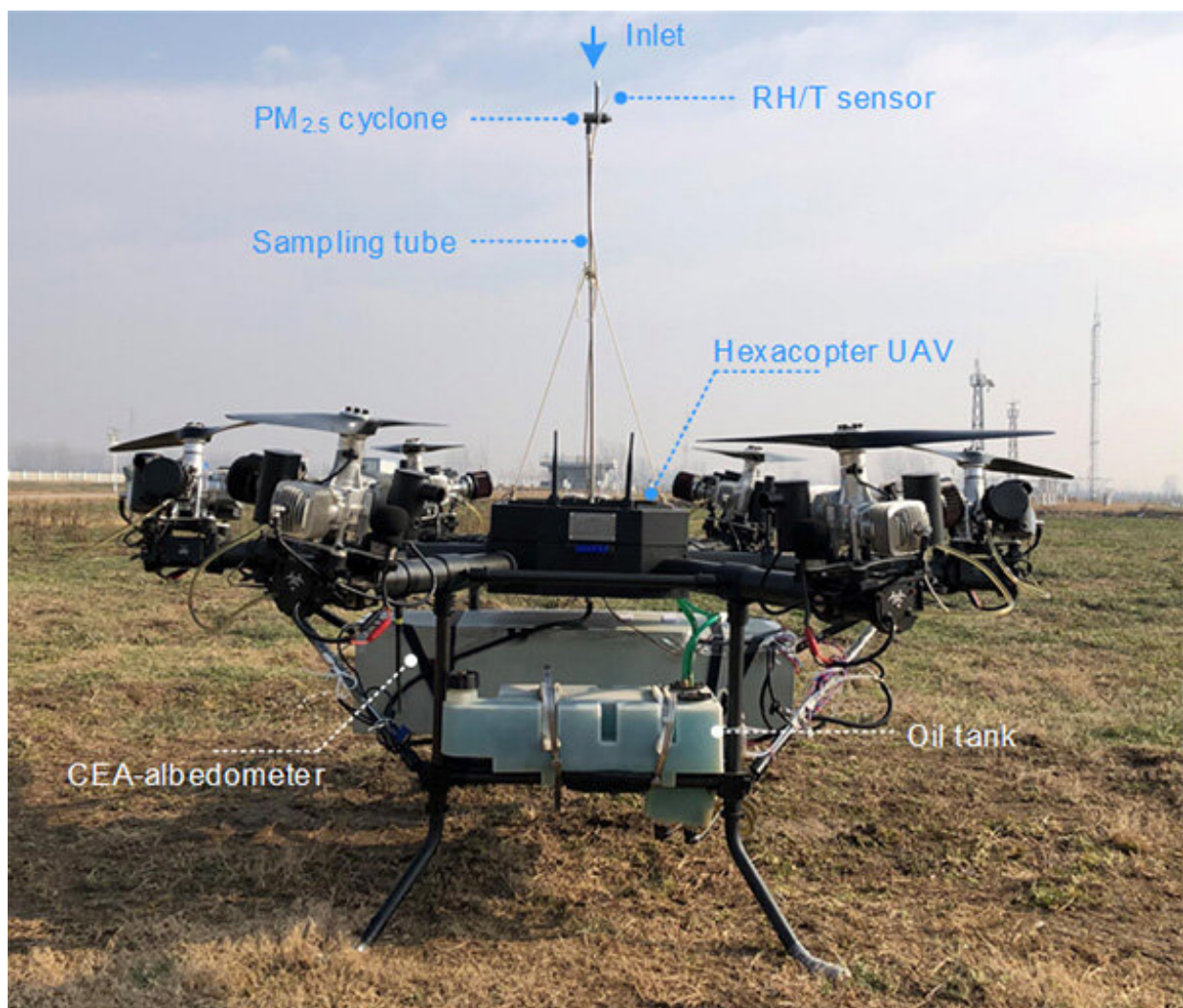


# Advanced detection technology developed for vertical profile of aerosol light scattering and absorption

June 21 2023, by Zhang Nannan



Credit: ZHOU Jiacheng

Researchers led by Prof. Zhang Weijun from the Hefei Institutes of Physical Science of the Chinese Academy of Sciences have achieved the first in-situ measurement of the vertical profile aerosol single scattering albedo (SSA). The study was published in *Optics Express*.

Aerosol SSA (the ratio of scattering to extinction coefficient) is a key input parameter for assessing [radiative forcing](#). Measuring the vertical [profile](#) of SSA is of important for understanding [aerosol](#) radiation interactions and aerosol-atmosphere boundary layer feedbacks. However, direct measurement of the SSA vertical profile remains challenging. Although some aircraft observations have been made, there are still large uncertainties. There is an urgent need to develop a new instrument to accurately measure the SSA vertical profile.

In this study, to obtain the SSA vertical profile, a new custom cage-based optical system, and high-precision temperature and current controller were adopted to solve the influence of vibration and temperature changes during flight.

Furthermore, in combination with a self-producing gas source and independent power supply, the unmanned aerial vehicle-borne cavity-enhanced albedometer (CEA) was developed.

Compared with the first CEA developed by the team in 2014, this system is improved in many aspects. It consists of a petrol-powered hexacopter (with a payload of 40 kg and an endurance time of more than one hour) and a miniaturized CEA, and was equipped with various auxiliary probes, including of a micro-aethalometer, an aerosol optical particle sizer, and an ozone sensor.

Now the system has been applied to the comprehensive observation experiment of aerosol optical vertical profiles at the Shouxian National Climatological Observatory from 2020 to 2021, which can provide a

valuable and unique tool and accurate observation data for studying the optical properties of aerosols and their influence on physical and [chemical processes](#) in the atmospheric boundary layer.

**More information:** Jiacheng Zhou et al, Unmanned-aerial-vehicle-borne cavity enhanced albedometer: a powerful tool for simultaneous in-situ measurement of aerosol light scattering and absorption vertical profiles, *Optics Express* (2023). [DOI: 10.1364/OE.493696](https://doi.org/10.1364/OE.493696)

Provided by Chinese Academy of Sciences

Citation: Advanced detection technology developed for vertical profile of aerosol light scattering and absorption (2023, June 21) retrieved 30 April 2024 from <https://phys.org/news/2023-06-advanced-technology-vertical-profile-aerosol.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.