NOAA Chemical Sciences Laboratory

Instrument Fact Sheet

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Photo credit: Patrick Cullis, NOAA/CIRES

POPS: Portable Optical Particle Spectrometer

Background :

Atmospheric aerosols play many important roles in the environment. Consisting of microscopic particles suspended in the air, aerosols scatter and absorb sunlight thereby exerting direct effects on climate and reducing visibility. Understanding the sources and consequences of these aerosols requires accurate size-resolved measurements of aerosol particle concentrations. The mass median diameter of accumulation mode aerosol in the troposphere typically lies between 100 and 250 nm. Hence, a lower size detection limit close to 100 nm is highly desirable for significant coverage of this important mode of particles. Low-cost, light-weight, and low power consumption instruments are highly desired for balloon sonde and UAS work, possible broad scale deployments and citizen science activities, and many other applications.

Description :

The NOAA CSL Portable Optical Particle Spectrometer (POPS, **Figure 1**) has been invented specifically to address the need of a sensitive and light-weight aerosol sensor for scientific studies on moving platforms. The development of the instrument was greatly accelerated by The NOAA OAR Special Early-Stage Experimental or Development (SEED) grant in 2013. Because this instrument is designed for small UASs and weather balloons, the total weight of the instrument must be kept as low as possible. High sensitivity and fast response time are also important. The instrument is completely autonomous and may be integrated to various platforms. **Figure 2** shows an incomplete list of platforms POPS has been on. POPS has been deployed in many places and around the world on the NASA DC-8 during the ATom mission. It was sent to the International Space Station and was used in a medical experiment in Great Britain.

Instrument Specifications :

- Single-particle detection
- 140 – 2500 nm particle diameter range
- Power consumption: 5W
- Weight: 600 g (750 g with a battery pack)
- Battery operation time: 5 hours.

Figure 1. The NOAA CSL POPS sensor.

A Commercialization Success :

- Licensed to Handix Scientific in 2015
- Handix is thriving:
  - » Hired over 10 fulltime employees
  - » Produced ~340 POPS
  - » Sold to customers in China, France, Germany, Japan, Korea, UK, and US
- Handix helped making POPS improvements
- Ultimate sign of success ⟶ We are now buying POPS from Handix!

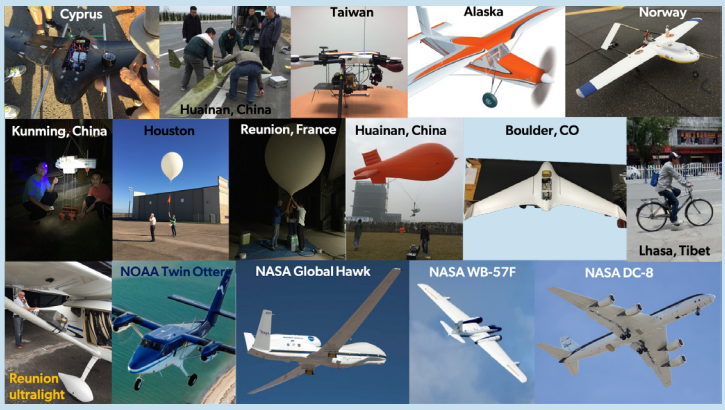

Figure 2. POPS has flown on various platforms around the world.

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