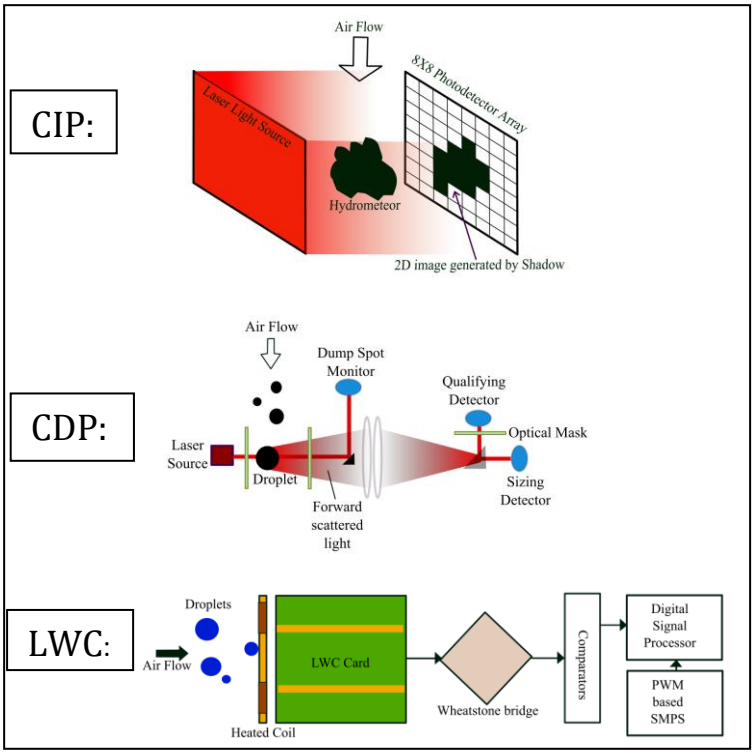
Cloud Combination Probe (CCP)

Simultaneous in-situ measurement of Droplet size distribution, imaging and liquid water content.

INTRODUCTION:

The Cloud Combination Probe (CCP) is an advanced, integrated instrument designed for in-situ characterization of cloud microphysical properties. It combines three proven measurement systems into a single probe: the Cloud Droplet Probe (CDP) for cloud droplets size distribution, the Cloud Imaging Probe (CIP) for hydrometeors imaging and their wide range size distribution, and a hotwire-based Liquid Water Content (LWC) sensor for direct measurement of liquid water content.



OBJECTIVES:

- To understand growth mechanisms of clouds
- To study aerosol-cloud-precipitation interactions.
- To study cloud's albedo and optical depth.

DATA OUTPUT:

- Cloud Droplet Size Distribution
- Cloud Droplet 2D images
- Cloud Liquid Water Content

MEASUREMENT AND WORKING PRINCIPLE:

The Cloud Droplet Probe (CDP) measures small cloud droplets (2–50 µm) by detecting the intensity of forward-scattered light as droplets pass through a laser beam; the scattering signal is used to determine droplet size and concentration.

The Cloud Imaging Probe (CIP) targets larger hydrometeors and works by capturing 2D shadow images of droplets as they traverse a laser-illuminated linear photodiode array, enabling analysis of particle size, shape, and morphology.

The Liquid Water Content (LWC) sensor operates using a hotwire technique, where cloud droplets striking a heated wire evaporate and cause cooling; the electrical power required to maintain the wire's temperature is directly related to the liquid water content in the sampled air.

KEY SPECIFICATIONS:

CIP

- **Droplet Size Range:** 12.5 µm – 1.55 mm
- **Upper Concentration Range:** up to 500 particles/ cm3
- **Number of Size Bins:** 62
- **Sampling Frequency:** Selectable 0.05 to 25 Hz

CDP

- **Droplet Size Range:** 2 µm to 50 µm
- **Upper Concentration Range:** 2,000 particles/cm3
- **Number of Size Bins:** 30
- **Sampling Frequency:** Selectable 0.05 to 25 Hz

LWC

- **Measured LWC Range:** 0 - 3 g/m3
- **Upper Detection Limit:** 3 g/m3

KEY FEATURES:

- Three-in-One Integrated System (CDP, CIP & LWC)
- Wide hydrometeors Size Range from 2 µm to 1.55 mm.
- Fast sampling rates (0.05 to 25 Hz)
- Real-Time 2D Imaging
- Direct and Derived Liquid Water Content

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