Sensors for Cloud and Aerosol Measurement from Remotely Piloted Aircraft

Gregory Kok, Darrel Baumgardner Matt Freer

Droplet Measurement Technologies
Cloud Probe Evolution
CDP Deployment

NatuC

TRAUMATIC BRAIN INJURY
Consciousness raising therapy

VERTEBRATE ORIGINS
Gone fishing

EATING IN THE GREENHOUSE
Are high-CO₂
Backscatter Cloud Probe (BCP)

Diagram showing the principle of operation of the Backscatter Cloud Probe (BCP). The sample volume is indicated at 12.5 cm. The light paths from the laser and collecting optics are shown, with angles of 144-156°.
IAGOS Deployment
BCP with Polarization Detection

- Incident light – linearly polarized
- Scattered light
  - linearly polarized same angle as incident light

- Incident light – linearly polarized
- Scattered light
  - polarized with different angle from incident light
Polarization Detection

Measurements on BAE-146 April-May, 2010, North Atlantic

Data and Figure Courtesy of James Dorsey
CCN Instrument Developments

- Original design is thermal gradient 0.5 m column
- New design using pressure modulation of supersaturation
- Considerably reduced size, power consumption and weight
- Prototype available 2016
Single Particle Soot Photometer (SP$_2$)

- Single particle black carbon incandescence, plus submicron aerosol sizing and counting
- Reduce capability to BC only
- Target 5 Kg weight, power consumption??
- Development beginning 2016
Instrumentation Perspectives

- Weight reduction—materials and 3D printing
- Electronics continue to evolve
- Fundamental requirements for power
- What capability is really needed to do the science?
Citizen Science
Delivery Science