

# Three-View Cloud Particle Imager (3V-CPI)

## General Description

The Three-View Cloud Particle Imager (3V-CPI) measures the size, shape and concentration of water drops and ice particles in clouds. The probe is a combination of three imaging instruments. Two of them comprise a 2D-S (Two-Dimensional Stereo hydrometeor spectrometer), in which two high-resolution (about  $9\ \mu\text{m}$  resolution) 2D probes image particles as they pass through laser beams that are orthogonal to each other. If particles also lie in the intersection of the sensitive areas of the two beams, they are seen by both 2D probes. In that case, the third instrument, a Cloud Particle Imager (CPI), is triggered to take a high-resolution picture, via a briefly illuminated high-resolution imaging array. This image has a pixel size of about  $2.3\ \mu\text{m}$  and so provides very high resolution for determining shapes and habits of ice crystals. The probe is particularly suited to imaging such crystals, but also provides good detection of other hydrometeors including large cloud droplets, drizzle and small rain drops, and other precipitation particles.

Some examples of the resolution possible are shown in the following images:



## Data Products

The data product at present is three separate image streams from each probe. The images from the 2D components will be processed to standard RAF 2D probe format, and from those images concentrations and sizes of hydrometeors

will be recorded in the standard archive files. The CPI images at present require special software, provided by SPEC, Inc. to NCAR and available to users on request. That software is based on IDL and requires IDL for its operation. The goal is, in the future, to provide in addition means of combining the information from the three data streams so that, when CPI images are available, all three views will be presented. The prototype software provided by SPEC, Inc., for this purpose also performs habit classification and calculation of the area, volume, and other characteristics of the hydrometeors.

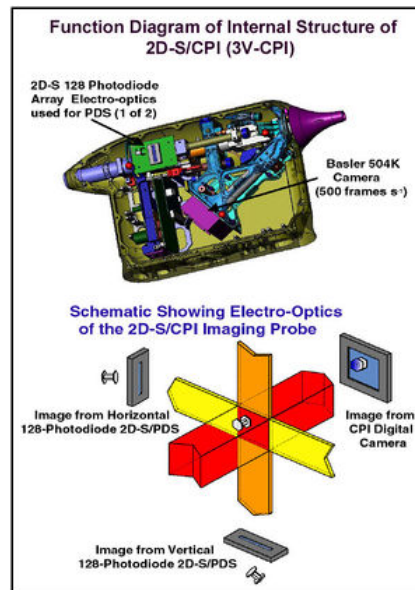
## References

The 2D-S component of this probe was described in this publication: Lawson, R. P., D. O'Connor, P. Zmarzly, K. Weaver, B. A. Baker, Q. Mo, and H. Jonsson, 2006: The 2D-S (Stereo) Probe: Design and Preliminary Tests of a New Airborne, High Speed, High-Resolution Particle Imaging Probe. *J. Atmos. Oceanic Technol.*: Vol. 23., No. 11, pp. 1462-1477.

The CPI component was described in: Lawson, R. P., B. A. Baker, C. G. Schmitt, and T. L. Jensen, 2001: An overview of microphysical properties of Arctic clouds observed in May and July during FIRE ACE. *J. Geophys. Res.*, 106, 14989–15014.

## Photo

from the SPEC, Inc., design drawing:



As it will be mounted on the GV for SEAC4RS:

