We have developed a multiphase, turbulent reaction chamber – called the Pi Chamber because of the internal volume of 3.14 m³ (with cylindrical wall installed).

It is capable of pressures ranging from sea level to 0.01 atmospheres, and can sustain temperatures of +55 to -55 Celsius, well within the range of tropospheric clouds. The chamber can be operated in expansion, static diffusion, or turbulent mode, depending on the requirements of a particular experiment. The turbulent environment is created via a temperature difference between the top and bottom surfaces within the chamber, inducing turbulent Rayleigh-Benard convection.

The Pi Chamber is fully operational and during the last year we have demonstrated its ability to generate clouds under a variety of conditions, including fully turbulent and steady state suitable for long-time sampling. Initial characterization experiments demonstrate the ability to sustain steady-state turbulent cloud conditions for times greater than one day, with droplet sizes in the range 10-50 micrometers.
Figure shows the current system (upper left), a turbulent cloud imaged with a laser-light sheet (right) and a plot of the cloud droplet size distribution versus time as a cloud responds to the transient injection of aerosol particles.