



Laboratory Measurements of the Size Distribution and Activation Ratio of Synthetic Ice Nuclei

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Overview

Laboratory measurement of the particle size distribution and cloud condensation nucleation activation ratio are conducted using two types of synthetic ice nuclei (IN). New Engineered Organic Nuclei (NEON) are fabricated by fermentation and so-called E-lysis of Gram-negative bacteria, which are harvested via centrifugation and resuspended in a NaHCO_3 buffer (pH of ~ 7.8) for final inactivation of lysis escape mutants. NEON is inactivated using 1.25 % (final concentration) glutaraldehyde (GA) and stored in a deep freezer. The NEON with GA solution is atomized using a Sparging Liquid Aerosol Generator (SLAG), which does not shear or impact the aerosols. The measured size distribution is compared to aerosols produced by the TSI Atomizer (Model 3076), which impacts generated droplets. The size distribution is measured using a TSI Scanning Mobility Particle Sizer Spectrometer (SMPS) and a TSI Aerodynamic Particle Sizer. A DMT Cloud Condensation Nuclei Counter (CCNC) operated at set of supersaturations and a TSI Condensation Particle Counter (CPC) is used to measure the activation ratio, which is important to determine effectiveness of the NEON as an immersion ice nuclei. The NEON results are compared to IN produced by burning silver iodine cloud seeding flares.

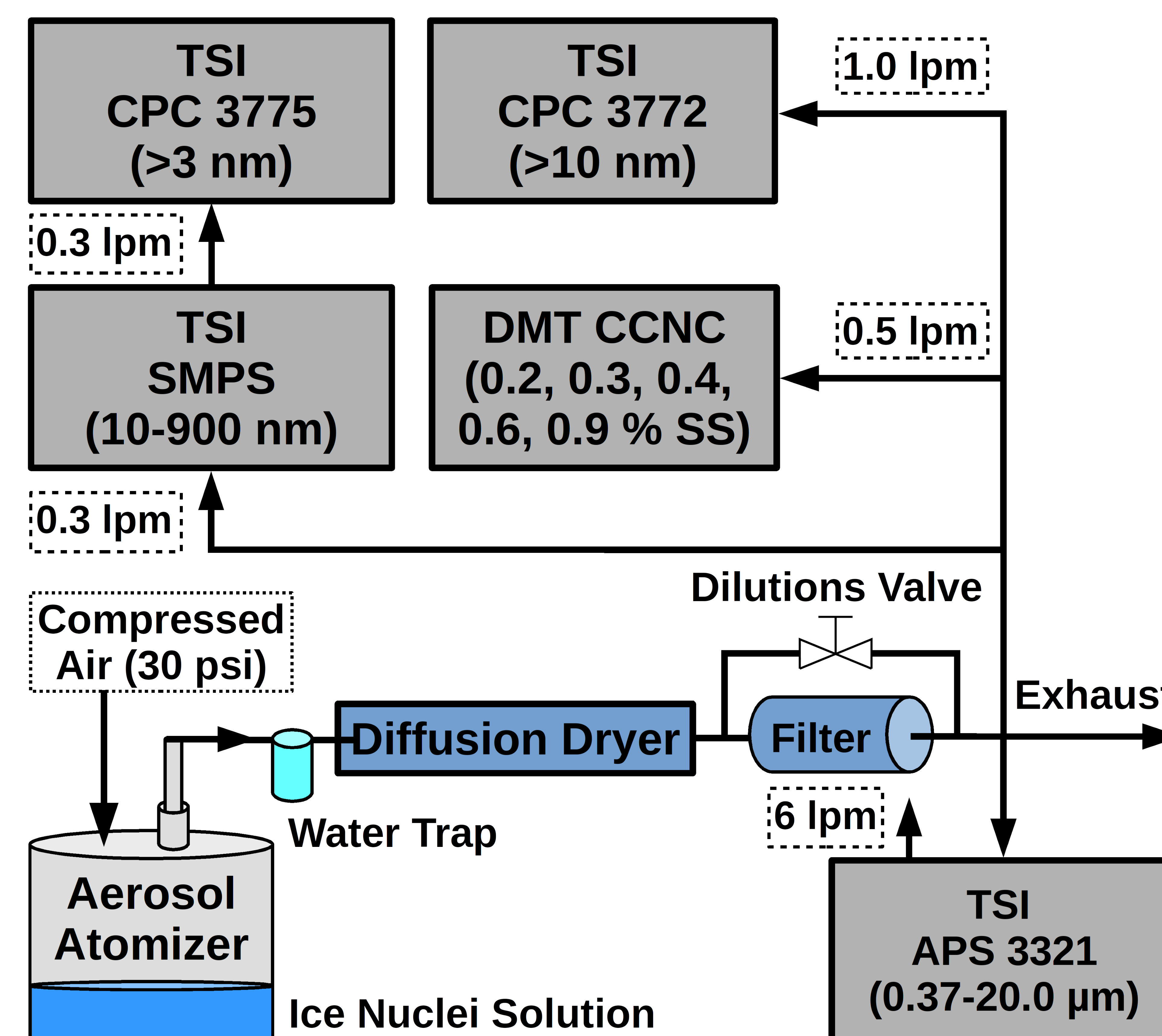


Image showing the instrument setup for obtaining the size distribution and CCN activation size of NEON.

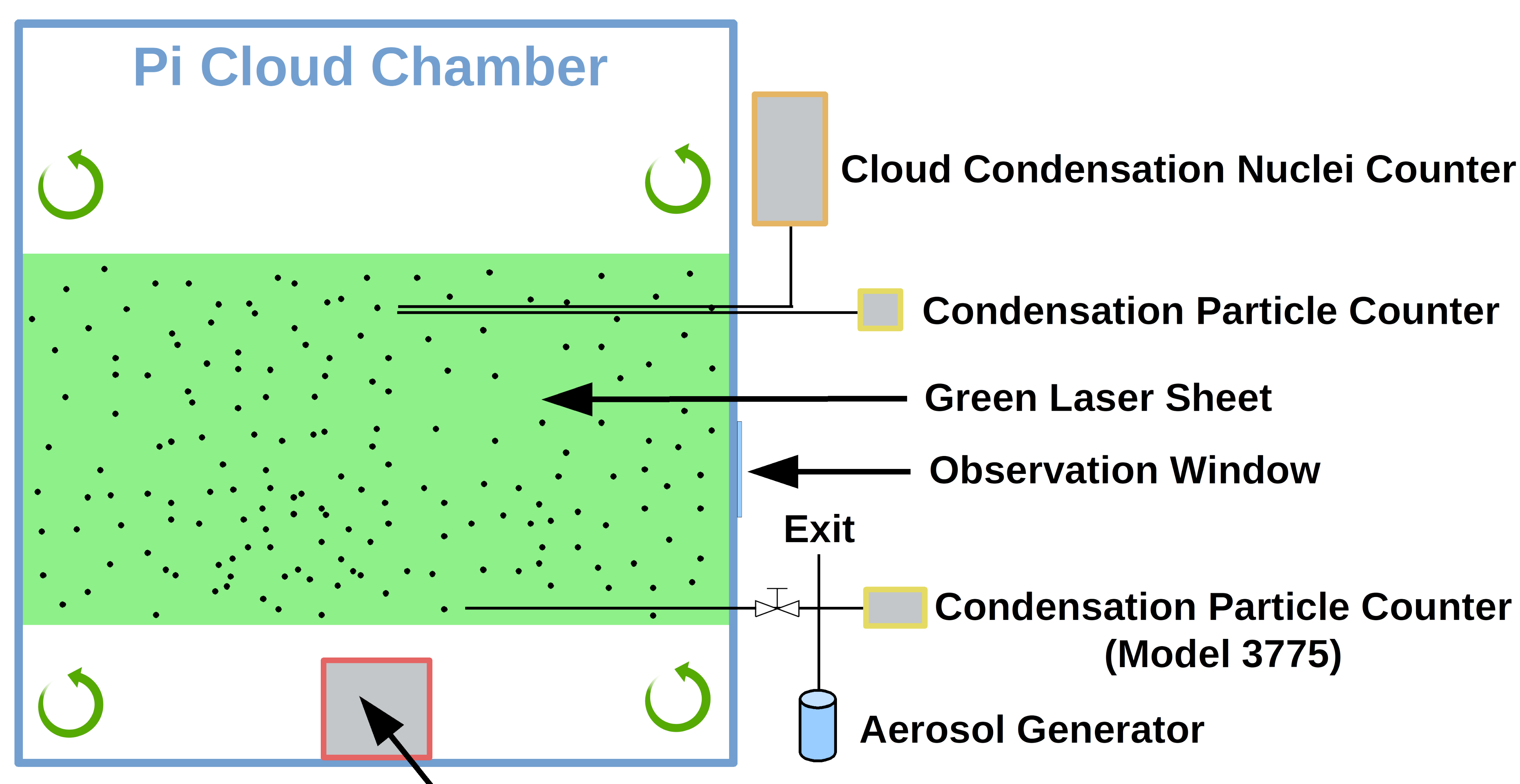


Image showing lab setup for Cloud Chamber experiment.

Results & Future Work

- Interpretation of measurement from TSI Aerosol Atomizer break large particles, like NEON. Hence, Sparging Liquid Aerosol Generator (SLAG) is used to atomize NEON.
- Develop software to process laboratory measurements.
- Conduct ice nucleation experiments to determine the effectiveness of NEON as immersion and contact ice nuclei.

Acknowledgments

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