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Title: Setup of the Pi Cloud Chamber for Cloud Seeding Flare Testing

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Abstract: The Pi Cloud Chamber at Michigan Technological University will be used to test Silver Iodide (AgI) cloud seeding flares. Before the first experiments can be conducted, preliminary work is required to define cloud conditions for the simulates and cleaning methods for the chamber. To ensure there is no contamination present after conclusion of the flare testing experiments, it is important to thoroughly clean the chamber walls with the appropriate solvents. The Pi Cloud Chamber is equipped with a large door that provides easy access for cleaning. To avoid contamination and simulate aircraft based cloud seeding, a flare burning and dilution system is required. The system needs to enable burning of flares within a laboratory environment, reproduce the air flow over flares at aircraft speeds, and provide particle concentrations similar to actual seeding conditions. A safety office approved system has been built that uses a 3 inch diameter metal tube to house the burning AgI flare with air flow supplied by two large blowers. Multiple sampling ports down stream of the burning flare enables measurements of aerosol size distribution from the seeding plume as it is diluted and cooled. Temperature conditions for the flare testing experiments range from 0 to -20 ^{0}C, with a focus on the -4 to -12 ^{0}C range. A high (1.0 g/m^3) and low (0.5 g/m^3) cloud liquid water content (LWC) will be tested. At each LWC, a high and low cloud droplet concentration / mean diameter pair will be simulated. The simulated pair values are determined using cloud microphysical observations obtained during weather modification projects in Mali, Saudi Arabia, and Wyoming. Mali, West Africa is a low aerosol concentration location that has cloud droplet concentrations of 140 cm^{-3} and 19.6 um diameters when the LWC is between 0.45 and 0.55 g/m^3. In contrast, Saudi Arabia is a high aerosol concentration location that has cloud droplet concentrations of 220 cm^{-3} and 15.6 um diameters when the LWC is between 0.45 and 0.55 g/m^3. Future work includes experiments where AgI particles are inject at realistic concentration into the Pi Cloud Chamber which is setup to simulate prescribed cloud conditions.