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Abstract: The North Dakota Citation Research Aircraft conducted several recent field projects where in-situ cloud physics instruments made measurements in thunderstorms. Cloud sampling instruments included the two-dimensional sterographic probe (2D-S), the cloud droplet probe (CDP), the two-dimensional cloud imaging probe, the Nevzorov hot wire probe, and the King hot wire probe. Typically, the recent field projects have concurrent remote sensing observations from lidar and radar systems. Observations are available in mixed-phase and ice clouds where non-spherical particles are present. For example, pure ice particles are observed in thunderstorm anvils between an altitude of 29,000 and 40,000 ft. It is well-known that accurate remote sensing retrievals in ice containing clouds need to take into account the observed shape of particles and not simply assume spherical particles. However, it is typically assumed that particles are randomly distributed in space. If particles are not randomly distributed but cluster together in distinct regions, current remote sensing retrievals are likely to be inaccurate. To determine the extent that particle clustering has on radar reflectivity and lidar back-scattering, high-frequency particle probe observations are analyzed to determine the extent of spatial clustering in different cloud conditions. Particle-by-particle data from the CDP and 2D-S are analyzed to calculate the uncertainty introduced in remote sensing observations by the observed particle clustering.