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TURBULENCE INDUCED FLUCTUATIONS IN CLOUD SATURATION RATIO: DOPPLER RADAR MEASUREMENTS AND IMPLICATIONS FOR DRIZZLE FORMATION

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ABSTRACT

This paper presents a statistical examination of in-cloud updraft and downdraft velocities using new ARM scanning Doppler radar and radiosonde measurements. The measurements, together with moments and other statistical properties derived from them are used in conjunction with adiabatic parcel and entrainment models to derive the properties of turbulence-induced fluctuations in saturation ratio and cloud droplet size. An especially important parameter for models of cloud droplet evolution and dispersion and also for predicting conditions at the drizzle threshold is the ratio of saturation ratio fluctuation variance to correlation time [McGraw and Liu, GRL, 33, L03802 (2006)]. The goal of the present analysis is to develop methods to estimate this key turbulence parameter needed in the kinetic potential theory of drizzle formation from remote sensing methods and in particular from the Doppler radar measurements.