Vertical Air Motion Measurements in Large–Scale Precipitation

Contributors

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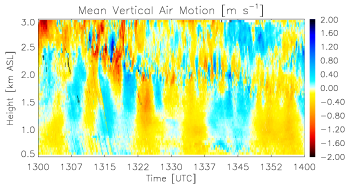
Research Highlight

Simultaneous measurements of vertical air motion and raindrop size distribution parameters in precipitation are challenging. The ARM W#band radars (95#GHz), despite being used primarily for cloud sensing, offer unique insights in precipitation due to the presence of non#Rayleigh scattering signatures in the recorded Doppler spectra.

Unique, non#Rayleigh backscattering signatures allow the retrieval of vertical velocity and precipitation parameters, applicable within precipitation at low#to#moderate rainfall rates (from 1 mm/hr to 30 mm/hr). Retrieved precipitation parameters are in solid agreement with collocated ARM surface disdrometer observations (e.g., Giangrande et al. 2009). Fine scale coherent structures, as well as evidence of drop sorting due to differential terminal velocity and wind shear, are visible in retrieved fields. The findings present compelling arguments for the use of ARM W#band radars as high#resolution, range#height disdrometers in light#moderate precipitation. These measurements also may complement various ground#based radar and profiler measurements to improve our understanding of precipitation processes.

Currently, measurements from ARM Mobile Facility (AMF) 95#GHz cloud radar are being processed for long#term retrievals of mean vertical air motion in precipitating clouds. Preliminary analysis of the retrievals of vertical velocities during the Niamey, Niger, and Germany's Black Forest AMF deployments have revealed distinct changes in the characteristics of air motions over the two regions in warm season precipitation.



Time#height mapping of the retrieved vertical air motion for the 1 May 2007 event at SGP.

Reference(s)

Giangrande SE, EP Luke, and P Kollias. 2009. "Retrievals of precipitation parameters using non–Rayleigh scattering at 95–GHz." Journal of Atmospheric and Oceanic Technology, , . ACCEPTED.

Working Group(s)

Cloud Properties