Characteristics of a heavy rain event observed by a 1290-MHz wind profiler in the southern coast of Korea on 25 August 2014

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During summertime, heavy rainfall often occurs in the southern coast of South Korea in association with mountains and ocean nearby. A large amount of heat and moisture from ocean can contribute to a rapid development of mesoscale convective systems along the coast during this season. However, its mechanism or dynamics to develop the mesoscale convective system is not fully known. In this study, we examine the characteristics of a heavy rain event occurred near Busan in the southern coast of Korea on 25 August 2014, observed by a 1290-MHz wind profiler, S-band radar, and Parsivel disdrometer that recorded a maximum rainfall rate of 112 mm hr^{-1} (1300 LST 25).

We examined the vertical characteristics of radar reflectivity, Doppler velocity (*W*), and spectral width up to ~10 km level during periods of stratiform and convective rain (0500~1500 LST 25) and also performed a quasi-velocity azimuth display (Q-VAD) analysis to investigate horizontal convergence and divergence features from Doppler radial velocities observed along the four off-vertical beams of the wind profiler. It was shown that there was pronounced convergence near a melting layer level and weak divergence below, probably related to melting of snow aggregates during the stratiform rain. During the stratiform and convective rain, drop size distributions with mass-weighted mean diameters from the Parsivel measurements were also analyzed.

Vertical air motion (*w*) estimated from the relation of $w=W-V_f$ (terminal fall speed, downward negative) showed similarity with those by modeling wind profiler Doppler spectra. The S-band radar observations at Bisl mountain were examined together with the wind profiler observations as the wind profiler was located about 60 km south of the S-band radar. Doppler velocity fields at 0.53° elevation indicated that there exists a convergence below about 2 km level with a rapid change in wind shear above this in the areas of convective rain. This is related to an occurrence of a cold pool as a relatively cold outflow encounters warm and moist air from south, thereby strengthening the convergence and enhancing updrafts in these convective areas.

Keywords: heavy rainfall, wind profiler, Parsivel disdrometer, convergence