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Observing the influence of low-level moisture on rainfall behavior using vehicle-based remote sensing

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In this study, we examined the influence of low-level moisture on rainfall behavior in the southern Korean Peninsula using remote sensing of the mobile vehicle platform. An intensive dataset, with high temporal resolution rawinsonde soundings and global navigation satellite system (GNSS) observations in target area, was used. We analyzed the low-level thermodynamic structure in terms of the relationship between precipitable water vapor (PWV) and heavy rainfall. Results demonstrated that an increase in precipitation on the leeward side of the mountainous region coincided with the prevailing winds on the southeasterly flank of the windward site. The probability of heavy rainfall increased in the highest PWV bin (> 60 mm). Interestingly, the vertical structures of the horizontal wind speed indicate a low-level jet (LLJ) with a maximum of ~40 m s^{-1}, ~3–4 km where low-level moisture tends to be concentrated. In addition, the vertical variability of the horizontal wind speed in the highest PWV bins corresponds to considerable changes in upslope flows for all precipitation bins, indicating that the LLJ along with strong low-level moisture of ~3–4 km is an important indicator of rain occurrence in the downstream mountains. The observational evidence base obtained from mobile vehicle platform equipped with GNSS and rawinsonde sensor can provide some insights to improve the predictability of heavy rainfall in the southern Korean Peninsula. In future, combined analysis using numerical modeling, radar observations, satellites (e.g., SSM/I, GK-2A) and other upper-air observations (e.g., wind profiler and Doppler wind lidar) will be conducted.