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Observational study and High Resolution Numerical Experiment for Localized Heavy Precipitation Events in Seoul metropolitan area

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Localized heavy rainfall, which is a typical severe weather phenomenon in the Korean Peninsula, tends to be increased in terms of the intensity and the frequency. Especially, the frequency of warm-season torrential rainfall events more than 30 mm/h precipitation has increased threefold in Seoul, a metropolitan city in South Korea, in recent 30 years. Localized heavy precipitations occur in the very small spatial and temporal scales in comparison with other heavy precipitation systems such as synoptic scale frontal system in South Korea. There is generally known to localized heavy rainfall events in South Korea arise from mesoscale convective systems embedded in these synoptic scale disturbances along the Changma front, or from convective instabilities resulting from unstable air masses over the Korean Peninsula.
In order to investigate a localized heavy precipitation system in Seoul metropolitan area, observational analysis based on storm classification algorithm and numerical experiment based on Advanced Storm-scale Analysis and Prediction System (ASAPS; which was developed by National Institute of Meteorological Sciences, Korea Meteorological Administration) for typical events. Storm classification algorithm should be considered to describe convective precipitation and is being developed and improved for detecting convective storm and an application to convective scale quantitative precipitation Estimation. ASAPS is designed for under 1km resolution and every 1hour update for targeting convective scale severe weather in the local area. In addition to, primary physical structures related to the localized heavy precipitation with the convective scale diagnostic fields, which are storm relative helicity, instantaneous contraction rates, and so on, were investigated based on the ASAPS results of convective scale resolution. For example, in the localized heavy precipitation event, which occurred in 1 July 2016, synoptic scale analysis was preceded through synoptic scale observation and reanalysis data. Convective scale precipitation system embedded in synoptic scale system is well observed through storm classification algorithm. ASAPS experiment showed a reasonable performance. The ASAPS simulations of the more recent initiation times performed better in aspect to the intensity and the location of precipitation. The physical structures of convective scale heavy precipitation system are described using diagnostic variable in more detail.

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