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# Classification of Atmospheric Vertical Environment Associated with Summertime Heavy Rainfall in Seoul

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The socioeconomic damage caused by heavy rainfall has steadily increased in Seoul, capital city of South Korea, due to the high density of the population and the complexity of buildings despite aggressive efforts to prevent its damage. The heavy rainfall is deeply related to the growth of convective cloud, which is due to the structure of synoptic weather and local thermal instability. The sounding data derived from rawinsonde is useful for analyzing the motion of vertical airflow by synoptic weather condition and assessing local instability. In this study, we tried to understand the evolution mechanism of heavy rainfall through classifying the synoptic weather patterns that cause heavy rainfall and the sounding related to heavy rainfall in Seoul. The days with rainfall amount greater than 25 mm/day were referred as heavy rainfall day of summertime (June, July, and August) in Seoul from 2009 to 2018. The synoptic weather patterns were classified by using COST733 software. Input data for COST733 is NCEP_FNL (1˚ x 1˚) reanalysis data and method for clustering weather patterns is K-means. The sounding launched four times a day (00, 06, 12, 18 UTC) at Osan were classified into three types that are Loaded gun (drying air penetrates over moist lower air), Thin Tube (the wetness of the whole atmosphere), and Inverted V (moist air penetrates over dry lower air). As a result, synoptic weather pattern was classified nine categories, which well showed a tendency to change with extension of North Pacific high and location of low through the Korean peninsula. Especially, the inflow of humid low level air caused by North Pacific high appeared in the all cases. TT had the highest relevance among the three patterns of TT (56.8%), IV (13.6%), and LG (9.1%). The maximum value of daily precipitation (300.5 mm/day) appeared when sounding were TT pattern and trough passed through over the Korean peninsula. In the future, we'll try to understand the interaction between synoptic weather and sounding patterns by using remote sensing data.