

## ***Interactive comment on “Geostatistical assessment of summertime rainfall observations in Korea based on composite precipitation and satellite water vapor data” by Sojung Park et al.***

### **Anonymous Referee #3**

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This study classifies rainfall systems in Korea on the basis of their spatiotemporal structures by analyzing the observed precipitation, water vapor and cloud data. The subject is of an interest to not only to meteorologists but also to hydrologists. The paper is well organized but needs improvements before it can be accepted for publication. It also needs substantial improvements in writing. Below are my specific comments:

(1) It looks that the rainfall analysis utilizes only the 1-km KMA analysis data. If so, Fig. 1 may not be needed - it can confuse some readers. Please see the comment (2) below for related concerns.

(2) Page 20, line 24: "the portion of weather stations" -> not clear what "weather sta-

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tions" imply here. If this implies the 600 real stations in Fig. 1, the authors have to provide how they applied their analysis tools to the irregularly distributed stations. If it implies each grid points of the KMA analysis, this must be indicated ("grid points" instead of 'weather stations") and delete Fig. 1.

(3) Provide the formulation of the weighting function  $w_{ij}(d)$  in Eq. (7) and explain why the specific form is selected to represent the spatial variations.

(4) Page 7, line 20: This result is trivial consequence of classifying the precipitation system in terms of a number of data points; if rainfall occurs only over a small number of points, its spatial scale is limited by design. Their selection of 3 mm/h as the threshold value between heavy and light precipitation may cause the lack of relationship between precipitation intensity and spatial scales. Nam et al. may be a good reference for this. In fact, this result can depend on the selection of the threshold value. The authors need to explain the choice of 3 mm/h as the threshold.

(5) Page 7, line 22 - Page 8, line 15: The authors need to clearly state how the analyses in this block are related to the "propagation of precipitation systems". Analyses in this block are directly related to spatial structures (e.g., shape and orientation); please explain how can these features be related to "propagation".

(6) The spatial shape differences between the three rainfall types (in the same block as above): the asymmetry indicated in the spatial correlation (Fig. 4) does not correspond well to that depicted in the radar echo (Fig. 5). The directional difference in the e-folding scale for the all three systems are about 25% (5km/20km for HPFP; 10km/40km for HPMP and LPMP) Of the mean scale (i.e., aspect ratios of  $\sim 1.3$ ) while the radar echoes suggest larger aspect ratios for HPFP and HPMP ( $\sim 1$ ). This is not consistent with their interpretation of rainfall system in Page 8, line 10: how often a squall line is of an aspect ration of 2?

(7) Page 8: If the satellite data cannot clearly distinguish the areas of water vapor from those without, how much can we trust the analysis based on the data? Can they

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provide data quality control of the satellite data?

(8) Page 8, line 33: The only similarity between Fig. 2 and Fig. 6 is that the autocorrelation for HPFP decreases more rapidly than those for HPMP and LPMP. The separation between HPFP and HPMP/LPMP in Fig. 6 is much smaller than in Fig. 2 as well. Overall, it's difficult to establish similarity between the spatial scales of water vapor and rainfall. The authors need to provide clear explanations on how to relate the structures based on water vapor scales (Fig. 6) to that based on rainfall (Fig. 2). Overall, it is difficult to do much more of the satellite vapor analysis towards the rainfall structure over Korea.

(9) Temporal correlation analysis: It's not clear what we can learn about the rainfall systems from the temporal correlation characteristics. The e-folding scale differs by only 30 mins among the three types. The time scale of 1-1.5 hours seems to indicate that all three rainfall types are related to convective systems, either isolated or clustered. Does this provide any insights to separate the characteristics of the three rainfall types? Also, it's not clear how the water vapor analysis can be related to the rainfall characteristics.

(10) Considering the aspect ratio and spatial scales, the examples in Fig. 11 seem more relevant for convective clusters (may be imbedded within a frontal structure) than a frontal system.

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