

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-343

Anonymous Referee #1

Referee comment on "Rainfall patterns in the 24 East Asian mega-cities using a complex network" by Kyunghun Kim et al., Hydrol. Earth Syst. Sci. Discuss.,
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In this study, Kim et al. analyse the spatial dependence of precipitation in 24 cities in East Asia through the complex network framework and explain the results according to the major atmospheric patterns in the area. The manuscript is well structured, and the conclusions are based on sufficient analysis of results. However, while I appreciate the application of mutual information and multiresolution community detection in East Asia, I have concerns about the novelty of using networks to study precipitations, but also on the adherence of the paper to many of the formal rules of scientific writing.

Major Comments

- As also the authors point out, the complex network framework is widely used to analyse the spatial dependence of precipitation. Thus, its use does not provide novelty. The authors should better clarify the original contribution of the study. Has the study area been analysed by complex network yet? Are mutual information and multiresolution community detection novel frameworks? Has the study ground-breaking results?
- I do not understand the significance of the representatives' selection from groups. Why do the authors select these? Are the nodes used in the following analyses? Why are they important?
- Line 178: I am not sure about the reason why Seoul does not belong to any cluster. The authors explain that the distance is great from other nodes, but the distance between Seoul and Shenyang is 560 km and it is less than the distance from this latter city and Beijing (about 630) and they belong to the same cluster. Can the authors better justify the result?

- The references should follow the journal's guidelines: the first name initials after the last name. Please, check the references: the authors have often exchanged last and first names.
- Tables and maps are redundant. It would be better if the authors summarize the information in a single figure, rather than duplicate the results in a table and a map. For example, table 3 and figure 4 can be summarized in a map in which a continuous colour scale could represent the adjacency information entropy values and different sizes of points could represent the rank. Even table 4 - figure 5 and table 6 - figure 6 are redundant.

Minor Comments

- There are several grammatical errors in the manuscript. I request the authors to correct them. For example, Line 9, "Despite the significant economic impacts, however, the understanding..." should be "Despite the significant economic impacts, the understanding...". Line 11, "...discussed the technique's its applicability." should actually be "...discussed the technique's applicability."
- Some sentences are not clear to me, the authors should explain better the meaning of the following sentences:

- Lines 63-64: "This is because the weights used as input data in each analysis enabled the relationship between regions to reflect in the network and be analyzed.";

- Lines 103-104: "Generally, actual systems such as transportation systems or the Internet do not require links to be defined. However, if uncertainty occurs in the connection, researchers must define them.";

- Lines 154-155: "Various cities had maximum weights for each node, whereas the minimum weights were restricted to a few cities."

- Line 43: the first mathematician who formulated complex network theory was Leonhard Euler, in 1735.
- Figure 1 and Figure 5: delete "urban" from the labels.
- Section 3.3: the symbols in the formula are not well defined. The authors should better clarify the meaning of the symbols used. For example, what do v_i , v_j , c_u , and n_j mean?