

## ***Interactive comment on “Exploring nonlinear associations between atmospheric new-particle formation and ambient variables: an information theoretic approach” by Martha A. Zaidan et al.***

### **Anonymous Referee #2**

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This study used the information theoretic approach (i.e. MI method) to explore nonlinear associations between atmospheric new particle formation (NPF) and ambient variables. The study demonstrates that the same results can be obtained by MI method which operates without supervision and physical insight. The authors suggest that the method is suitable to be implemented widely in the atmospheric field. The manuscript is well organized and written. As it's the first time an information theoretic approach used in NPF study, in my opinion, this manuscript is suitable for publication in ACP provided that the following comments are addressed.

General comments:

C1

1. I recommend that some modifications need to be done for the introduction. The introduction has too many paragraphs. The fourth, fifth and sixth paragraph can be merged. In those paragraphs, the authors only cite Hyvonen et al., (2005) paper but take lots of sentences to describe their methods. I recommend that some other references (or methods) should be cited here and it's better to use only 1 or 2 sentences to summarize their methods. Moreover, comparing with other methods, in the introduction the authors need to explain why the information theoretic approach is better or more suitable method to analyze the atmospheric data related to NPF.

2. As the authors introduce a new method to analyze the long-term atmospheric data, in the MS text the advantages and disadvantages of this method compared to common methods should be discussed in detail. An additional section and figure would be better for this discussion.

Specific comments:

Page 4, Line 26: You don't need to mention Weber et al.'s proxy if they are not used in your paper.

Page 5, Line 16 & 17: The instructions about figure are not needed here.

Page 10, Line 14: Is the water concentration similar with the relative humidity? You can give some hypothesis based on chamber studies from references.

Page 10, Line 27 & 28 & 29: I would say that the correlation with O<sub>3</sub> is also related to the formation of OH and H<sub>2</sub>SO<sub>4</sub>.

Figure 1 'Hyytiälä station' need to be changed into 'SMEAR II station'

Figure 7 The plots of nucleation, Aitken and accumulation in the left panel are not needed in this kind of figure. You can define those in the MS text. Please add the labels for y-axis and colorbar.

2018.

C3