

The manuscript entitled “Investigating the contribution of grown new particles to cloud condensation nuclei with largely varying preexisting particles - Part 2: Modeling chemical drivers and 3-D NPF occurrence” has been reviewed by two referees. Both referees suggested “accepted subject to minor revisions” and listed a detailed list of required improvements. The authors considered or replied to all the comments of the two reviewers and got the paper up to a level where a publication in ACP is acceptable and recommended.

This manuscript is easy to read and to follow. The results presented in the text and figures are plausible and interesting for the community. The paper mentions the uncertainties or missing knowledge when applying a regional model like WRF-CHEM to study the phenomena of new particle formation and points to improvements or different methods that should be considered to tackle this topic. Following the statement mentioned under reviewer 2, “All models are wrong, but some are useful.” this manuscript will initiate new research on NPF.

Here are some small comments to consider:

One of the major comments from reviewer 2 was the use of objective statements throughout the paper. The authors have considered this carefully; however, in the abstract, you should still change the second sentence to:

“The model replicated the occurrence of NPF and the growth pattern of newly formed particles, and the performance to meet the benchmark, i.e., 25 absolute mean fractional bias  $\leq 50\%$  and mean fractional error  $\leq 75\%$ , in replicating number concentration of particles in the size range of 10–40 nm in five events between June 29 and July 6.”

Page 4, line 17: Please change the sentence to: “For measurements took place between June 14 and 30, 2019. ...”

Page 5, line 9: It would be helpful for the readers to provide the names, or the physical characteristics of the organics applied.

Page 5, line 20: I would change this sentence to: “The simulated CN<sub>10–40</sub> showed a higher agreement with the observations during June 29 – July 6 (unshaded area in Fig. 2a) than that ...”

Page 7, line 13: It would be interesting to include the observed and simulated growth characteristics of the events here in the text or in a small table.

Page 8, line 31: Delete the word “successful” as it is very subjective and not meaningful in this context.

Figure 5: Please add after non-NPF days (a and c) and after NPF days (b and d) if this is correct!