Journal: ACP - MS No.: acp-2020-84
Title: Molecular Insights into New Particle Formation in Barcelona, Spain
Author(s): Brean et al.

RESPONSE TO THE EDITOR

Referee comments in this text will appear in blue, responses in black, and where new text from the manuscript is quoted, it will appear in red, and **bold** where text has been inserted into a larger section

Comment 1: *Referring to the first comment by referee 1, the multiplication factor in calculating CS should indeed be 2πD, not 4πD as in equation 1 or incorrectly given in Kulmala et al. 2012. Note that in the original paper by Kulmala et al. 2001 which introduced CS, there is 4πD but that is multiplied by the particle radius, not diameter as currently in practice. Unfortunately, this has caused plenty of confusion during recent years. I would encourage the authors to correct this point: at the end it has little influence on the actual results, affecting mainly the absolute values of reported CS.*

Response 1: This has been amended in the methods section, further, we have fixed these values both in our figures (Figures 3, and S2) and in the text (line 280)

Comment 2: *In general, the paper is very clearly written and with a proper language. However, the following should be checked out:*

1) in many places it reads "between M-N" although it should be either "between M and N" or "in the range of M-N",

2) in some of the new text, articles seems to be missing,

3) the text in section 2.4 requires some improvements, please check out.

Response 2:
1) These have been fixed through the text and supplement
2) These have been added throughout the text, alongside an error in one of the references in-line
3) We have amended the final paragraph of this section to now read
"…where N_C, N_H, and N_N, are the number of carbon, hydrogen, and nitrogen atoms respectively. N_O is the number of oxygen atoms minus $3N_N$ to account for -ONO_2 groups, N_{C0} is 25 (the carbon number of ***an alkane with a saturation mass concentration of*** *1 μg m^{-3}), b_C, b_O, b_{CO}, and b_N are 0.475, 0.2, 0.9 and 2.5 respectively, and represent interaction and nonideality terms. The final term of equation (4)* ***account for*** *-ONO_2 groups, each reducing the saturation vapour pressure by 2.5 orders of magnitude. C^* values are calculated at 300 K and not corrected for temperature, as 300 K is within 1 K of the campaign average temperature."*

Comment 3: *The term "high ozone" does sound scientifically correct, should it rather be "high ozone concentration"?*

Response 3: This has been added to the relevant lines (264 & 480)

Comment 4: *On lines 391-392 in the file marked by track changes, should one write "…with an increasing temperature"?*

Response 4: This has been changed and now reads as follows

"Model studies of sulphuric acid-amine nucleation show a decline in nucleation rate ***with an increasing*** *temperature"*

Comment 5: *The information in Yan et al (2018) in the reference list seems to be incomplete. Please correct.*

Response 5: This has been amended. Alongside this, we tidy up minor errors in some other references.