

## Response to the Editor Decision:

Dear authors,

Thanks for the revisions. Your publication is almost ready for publication after the following minor issues have been corrected:

- The mathematical description of Eq. 1 and 2 is not fully correct. Please add correct units to fit coefficients and equation (i.e. that the correct concentration unit follows from the right side of the equation). It would also be helpful for the reader to see goodness of fit parameters (e.g. R-squared) for the your new mechanistic parameterization (e.g. in Fig. 8 and/or within the text).
- Maybe also make clear that these are empirical equations that do not follow a physical law (e.g. you could re-name 3.4 to "Empirical parameterizations").
- Units in Fig A3 are missing (y-axis).

Thanks and kind regards

Paul.

Dear Editor,

Thank you for your feedback! We revised the manuscript according to your suggestions. Here are the details:

Regarding point 1): For Equ. (1) and (2), we added the correct units to the equations as well as to the fit coefficients, where needed. Further, the goodness of fit for the new mechanistic parameterization with  $R^2 = 0.82$ , and the goodness of fit for the new INAS density parameterizations with  $R^2 = 0.78$ ,  $0.78$  and  $0.85$  were added to the text (see lines 464 – 466 and lines 488 - 489).

Regarding point 2): We renamed the section 3.4. to 'Empirical parameterizations', as suggested.

Regarding point 3): We added the unit 'in  $\text{cm}^{-3}$ ' to the y-axis label in Fig. A3.

Thanks again and best regards,

Julia Schneider, on behalf of all authors