We would like to thank Referee 1 for the useful comment, which helps us to improve the manuscript. Below is the original referee comment (*shown with italicized font*) and our reply is below that (standard font). Updates to the manuscript are also specified below (added and unchanged text).

I would really like to thank the authors for the work they have done. The manuscript has substantially improved since the previous iteration, addressing most of the issues that the reviewers have raised. I recommend it for publication after a minor point is addressed.

*Although the authors have added a comparison between the modelled and measured INPs in Sect. 2.2, I would like to see a more precise comparison (the data used for the comparison does not have enough information on temperature). For example, Creamean et al., 2018 measured INP concentrations in a close by location, covering the period of this study, reporting concentrations between 6*10^-4 and 2*10^-2 per L at a similar temperature to 258 K. I appreciate they used a filter, singular description-based technique which potentially would make all the existing "INP" to freeze. Would it possible to compare the modelled "INPs that produced ice" over a representative timescale to compare to those measurements by Creamean et al., 2018 or other relevant measurements?*

Creamean, J. M., Kirpes, R. M., Pratt, K. A., Spada, N. J., Maahn, M., de Boer, G., Schnell, R. C., and China, S.: Marine and terrestrial influences on ice nucleating particles during continuous springtime measurements in an Arctic oilfield location, Atmos. Chem. Phys., 18, 18023–18042, https://doi.org/10.5194/acp-18-18023-2018, 2018

We interpreted this comment so that it includes two parts: 1) information on temperature dependency of the ice nucleation scheme and 2) compare the modelled INP concentrations (simulated freezing based on instrument setting) to those measurements by Creamean et al. (2018) and others.

In the manuscript we focus on the 258 K (about −15 °C) temperature, because this is the minimum (cloud top) temperature seen in all our simulations. Moreover, the maximum in-cloud temperature is about 260 K, which means that ice nucleation takes place in a narrow temperature range. For this reason, we use the constant contact angle ice nucleation approach. The scheme is tuned for our case, so that it is valid close to −15 °C cloud temperatures. Extrapolation to other temperatures such as −20 °C or −10 °C often reported in the literature is not possible with this approach. For example, the CFDC instrument calculations (Sect. 2.2) showed that the ice crystal concentration resulting in from the maximum background aerosol would be 1.8 L^{-1} at −15 °C, but an extrapolation to -10 °C would give zero ice crystals while all droplets (16.5 L^{-1}) would freeze at −20 °C. Because our parametrization is not valid for extrapolation and it is adjusted for the simulated cloud conditions focusing mostly on resulting reasonable cloud ice crystal number concentration, we are not examining the temperature dependency in the manuscript. We clarify this in Sect. 2.2 (line 184) with this addition:

…angle was increased from 0.50 to 0.57 to enhance freezing at these relatively high temperatures (see Appendix A in Ahola et al. (2020)). This value is within the range of 0.36–0.73 representing surface soil, quartz and sand (Khvorostyanov and Curry, 2000). Assuming a constant contact angle means that the ice nucleation parametrization is valid for a narrow temperature range which in our case means in-cloud temperatures of about 258K. For this reason, we are not examining temperature dependency, but focus on the 258K temperature.

Creamean et al. (2018) used a drop freezing cold plate technique to measure INP concentrations as a function of temperature. The cold plate was cooled variably within a 1–10 °C min^{-1} range from room temperature until around −30 °C. As explained above, our ice nucleation approach is valid for about −15°C temperature, so we can simulate cooling up to that temperature. Following the CFDC instrument method described in the manuscript (Sect 2.2), but now integrating also over temperature down to −15°C gives ice crystal number concentrations of 2.0 and 0.5 L^{-1} for the 1 and 10 °C min^{-1} cooling rates, respectively. As it is expected, these numbers are consistent for with the 1.8 L^{-1} obtained for the CFDC. Because the results are consistent and this goes quite far from our topic, there is no need to add these calculations to the manuscript.

What comes to the INP concentration values reported by Creamean et al. (2018), these agree with the previous findings as summarized by Murray et al. (Opinion: Cloud-phase climate feedback and the importance of ice-nucleating particles, Atmos. Chem. Phys., 21, 665-679, 2021). In fact, Creamean et al. (2018) is one of their sources when reviewing previous INP measurements. The values reported by Creamean et al. (2018) and more broadly Murray et al. (2021) are covered in our simulations, where the background INP concentration ranges from zero up to above-mentioned maximum of 1.8 L^{-1} (as would be seen with the CFDC instrument).