Reviewer #1: Review of "New particle formation leads to enhanced cloud condensation nuclei concentrations at Antarctic Peninsula" by Park et al.

This study tackles the result of continuous size distribution and cloud condensation nuclei (CCN) measurements in the King Sejong research station located North of the Antarctic Peninsula for the whole year 2018. The work presents a consistent and continuous set of data for the physical characterization of aerosol particles which enabled to assess the significant occurrence of NPF, principally during the summertime. Authors addressed the new particle formation events observed (97 in total), as well as the source point – specifically looked out among marine, sea-ice, a multiple-origin study cases -, and discussed possible chemical drivers of the observed new particle formation events. Finally, the study focused on the CCN result in relation to the observed NPF. The paper is generally well written, and I suggest the publications in ACP after the revisions/clarifications on the following points:

We sincerely appreciate all valuable comments and suggestions, which helped us to greatly improve the quality of the manuscript. We corrected the manuscript point by point accordingly.

General comments:

The study undeniably complements the knowledge on NPF and its occurrence in the remote Antarctic field. In the context of polar region, NPF statistic based on seasonality would be an asset while showing occurrence during summer / winter and the transitions period of the melting and refreezing of the ocean. (Suggestions: Examples of 'typical' event, with size distribution surface plot would introduce nicely the discussed topic).

Response: Typical NPF events (e.g., burst event, nucleation with growth) were shown in Figure S3 as suggested by reviewer (Please, see reviewer's comment in RC11). To clarify the seasonality of NPF event, we included the average number size distribution of particles observed during summer (December to February), winter (June to August), and the transition periods of the melting of the ocean (September to November) and refreezing of the ocean (March to May) (Figure S4).

Page 13, Line 332: "In order to investigate the seasonal characteristics of NPF event, we compared mean size distributions of aerosol particles for summer, spring (transition period of the melting ocean), and autumn (transition period of refreezing of the ocean) (Figure S4). Trimodal distributions were presented in all seasons excepting winter when nucleation mode or particle formation was not observed. For instance, a trimodal distribution was seen at 7 nm, 30 nm, 122 nm during summer months. The number concentration of nucleation and Aitken modes were higher than the accumulation modes, indicating that NPF event regulates the aerosol processes in Antarctic peninsula. The largest mode at 126 nm or 103 nm may be due to a combination of primary (produced by bubble-bursting process) and secondary (produced by gas-to-particle conversion process) aerosol components. Results are broadly in line with previous results published from the Arctic and Antarctic regions. A ship-borne field campaign over Arctic Ocean found a trimodal distribution at 18 nm, 53 nm and 150 nm for open-ocean marine Arctic NPF event (Park et al., 2020). Lachlan-Cop et al. (2020) presented k-mean cluster analysis of particle size distribution measured at Halley, Antarctica, showing a nucleation peak at 15 nm for "nucleation" ultrafine category and a nucleation peak at 27 nm for "bursting" ultrafine category."

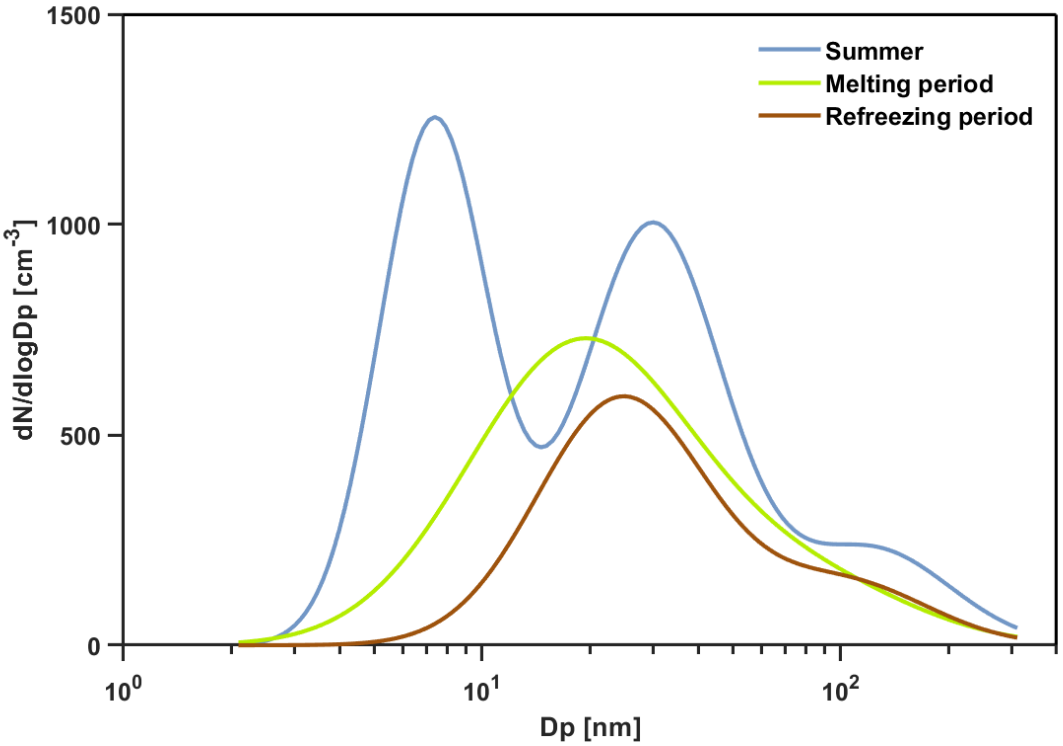

Figure S3. Mean size distributions of aerosol particles for summer (December–February) and transition periods of the melting of the ocean (September–November) and refreezing of ocean (March–May), when NPF event occurred. The average size distribution of aerosol particles for wintertime (June–August) was not displayed because we did not detect NPF events during the season.

The source attribution was thoroughly investigated and well described in the study case subsections. Without direct measurement of precursor gases at site, potential source for NPF can only be discussed rather than undeniably explained, which clearly expressed in the manuscript. However, one big argument is the local fauna, and whose emission surely influence the observation, and this possibly independently of the air trajectory due to its close vicinity. Discussion could be developed in that regard (Suggestion: the use wind data could then be relevant).

Response: Thanks for raising this issue. We did not measure the precursor gases. Out of 97 observed NPF events, 2 NPF events (4 February 2018 and 18 February 2018) were associated with local fauna. We presented the contour plots of the size distributions and wind roses when predominant wind possibly passing over a penguin colony (around 2 km away from our observation site) in Figure S8. We discussed the influence of local fauna such as penguin colonies on NPF event as given below.

Page 20, Line 513: “In fact, 2 NPF events (4 February 2018 for marine air mass origin and 18 February 2018 for multiple air mass origin) were observed when winds were seen to originate from the south sector where strong emission from the penguin colonies (southeast sector of 106–140º). Figure S8 showed the contour plots of the size distributions and wind roses during those days. Although we did not directly measure the precursor gases such as ammonia and

amine that can trigger the NPF, we can speculate that the fauna on the land or at the shore such as penguin and seabird colonies could not be excluded as the potential source of NPF events locally although highly productive and ice melting Weddell sea is coinciding with southeast direction too. Previous studies reported that precursor gases for NPF (e.g., ammonia) can originate from the decomposition of excreta from seabirds and penguins (Lachlan-Cope et al., 2020; Legrand et al., 1998; Liu et al., 2018; Schmale et al., 2013). More recently, Quéléver et al. (2022) proposed that nitrogen-containing species could be land-sourced (e.g., from a high penguin population during the summertime) or marine-sourced (e.g., from the biological activity of plankton in the ocean and melting sea ice). The ammonia from seabird-colony guano is a key factor contributing to bursts of newly formed particles, which are observed in the summertime Arctic (Croft et al., 2016)."

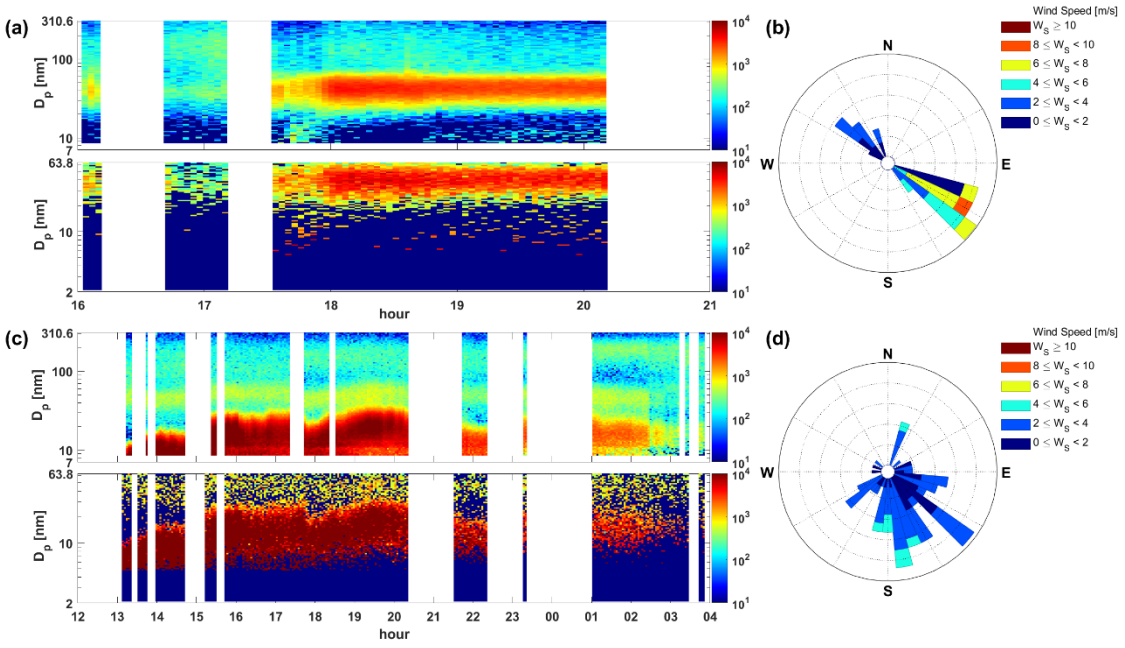

Figure S8. (a) Contour plots of the size distributions and (b) wind rose on 4 February 2018 and (c) contour plots of the size distributions and (d) wind rose on 18 February 2018. The southeast direction (106–140º) is designated as a sector where strong emission from the penguin colonies may originate. The x-axis represents local time.

The contribution of NPF to CCN would find benefits in a strong(er) linkage rather than with observations of increased CCN after occurrence of NPF solely, possibly using the hygroscopicity factor in relation to growing particles. Alternatively, the authors could rise conscience in the missing link between the two datasets and the need for dedicated studies/measurement in the future.

Response: The reviewer made a good point. To clarify the connection between growing particles and CCN, we determined the increase in the mean CCN concentration at different SS during growth times compared with background times based on the method by Chang et al. (2022). The sentence and figure were included as follows.

Page 22, Line 574: "To understand the contribution of growing particles on the CCN

concentrations during NPF event, we determined the increase in CCN concentration during growth periods (i.e., growth to smaller than 40 nm particles and growth to larger than 40 nm particles) compared to baseline values (black) under different supersaturation conditions (Figure 10), according to the method suggested by Chang et al. (2022). When particle growth was smaller than to 40 nm (growth ≤ 40 nm), the mean CCN concentrations increased by 59–178 cm^{-3} for a SS of 0.2 %–1.0 %, representing a 172.3–216.7 % increase compared to the values during baseline conditions. When particle growth was larger than to 40 nm (growth > 40 nm), the mean CCN concentrations increased by 57–227 cm^{-3} for a SS of 0.2 %–1.0 %, representing a 169.9–249.1 % increase compared to baseline values. Our results indicate that particles formed from NPF events can lead to the significantly enhanced CCN concentration in Antarctic Peninsula, and this effect is more pronounced if we consider particle growth larger than 40 nm, consistent with ship-based observations (Chang et al., 2022) and aircraft-based observation (Willis et al., 2016) in the Canadian Arctic during summer."

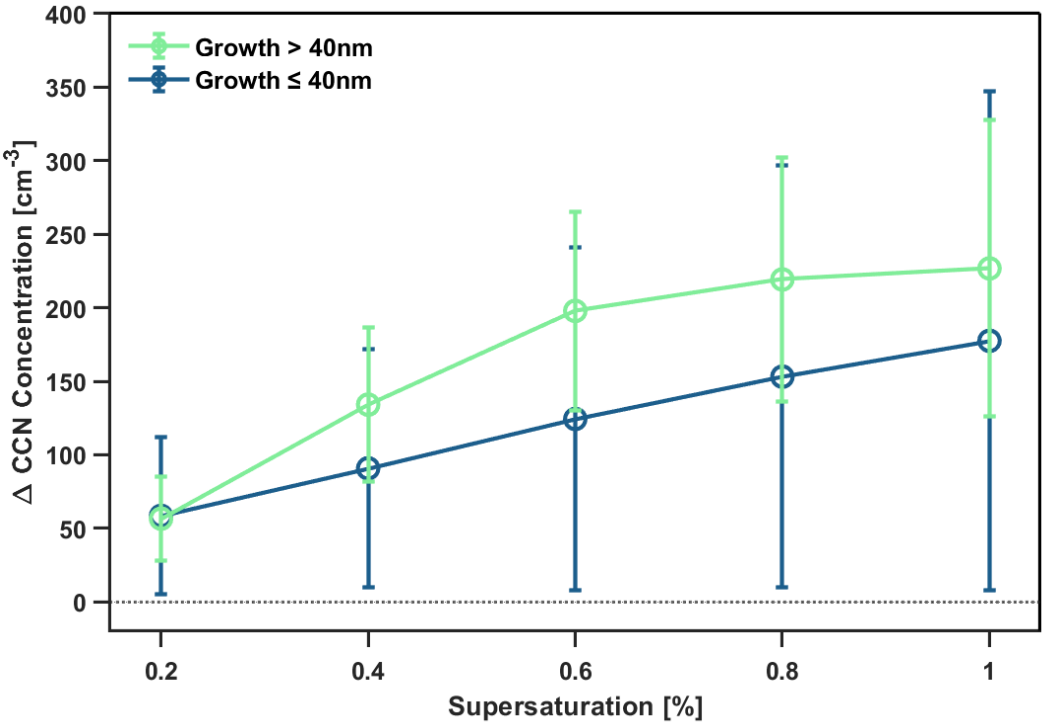

Figure 10. The increase in CCN concentration during growth to larger than 40 nm particles (green) and smaller than 40 nm (blue) times compared with background times at five different supersaturations.

Specific Comments (RC):

RC1 (**Abstract**) Since the study present a year-long dataset of size distribution, one could expect general information on the seasonality and frequency of NPF observed throughout the year. This would bring context and significance to the abstract.

Response: As suggested by reviewer, we added the information on the seasonality and frequency of NPF to the abstract.

Page 1, Line 20: "Clear annual and seasonal patterns of NPF were observed: high concentration and frequency of nucleation-mode particles in summer (December–February: 53 NPF cases)

and undetected nucleation-mode particles in winter (June–August: no NPF cases)."

RC2 (**§1, L.53-L.55**) Have the authors considered possible anthropogenic activity as well as the newly emerging land vegetation as a possible source of NPF to be mentioned in introduction as well.

Response: We mentioned additional possible sources of NPF such as local anthropogenic pollution and land ecosystems in introduction.

Page 3, Line 77: "At continental South Pole NPF event are commonly associated with the local anthropogenic pollution during calm weather conditions (Park et al., 2004). In addition, the biomass burning aerosol from South American continental outflow has been observed at Troll Research Station (Fiebig et al., 2009). During the daytime, higher radiation enhances photo-active emissions from land ecosystems (mosses, grasses, and lichens) of the Antarctic Peninsula and can lead to NPF and aerosol growth (Decesari et al., 2020; Quéléver et al., 2022; Schmale et al., 2013). However, land sources are rather unlikely due to a small footprint of emerging land and the associated short overpass over the sparse vegetation."

RC3 (**§1, L.57-L.58**) I suggest adding Sipilä et al. (2016, https://doi.org/10.1038/nature19314) as a key reference for showing the role of Iodic acid in NPF in Marine & Polar environments.

Response: Thank you very much for the information. We added the reference as given below.

Page 3, Line 69: "Indeed, Sipilä et al. (2016) measured iodic acid (HIO_3) in Antarctica and found that the Antarctic oceanic regions may be strong sources of molecular iodine, which is then converted to HIO_3 in gas-phase reactions."

RC4 (**§1, L.71-L.75**) Let me bring to your attention the publication of Quéléver et al. (2022, https://doi.org/10.5194/acp-22-8417-2022) reporting new particle formation at the Marambio station during the early 2018 (incl. measurement period of the present study), also reporting particle characterization based on size distribution. This reference could also bring context in the discussion presented later in (§3.3.1 and §3.3.2) regarding the relationship between NPF occurrence and meteorological parameters and potential (chemical) source of NPF.

Response: The reference (Quéléver et al., 2022) was addressed in the introduction and discussion sections.

Page 4, Line 90: "To date, number size distribution of particles > 3 nm has been reported by Asmi et al. (2010) at Aboa during from December 29, 2006 to January 29, 2007; by Pant at al. (2011) at Maitri from January 1 to February 28, 2015; by Weller et al. (2015) at Neumayer from January 20 to March 26, 2012; by Jokinen et al. (2018) at Aboa from November 2014 to February 2015; by Weller et al. (2018) at Kohnen during January 2015 and 2016; by Quéléver et al. (2022) at Marambio during the austral summer between January 15 and February 25, 2018; and by Brean et al. (2021) during the PI-ICE cruise from January 25 to February 4, 2019."

Page 12, Line 308: "Recent studies concluded that Antarctic NPF occurred under combined high solar radiation, high temperature and low RH conditions, similar to previous study measured at the Marambio Antarctic research station (Quéléver et al., 2022). Quéléver et al. (2022) found all NPF events were observed during the daytime with high solar radiation (clear-sky conditions), mostly with above-freezing temperature and with low RH."

Page 18, Line 450: “The FR, GR, and CS values agreed well with those reported in previous studies at other Antarctic sites (Järvinen et al., 2013; Kim et al., 2019; Kyrö et al., 2013; Weller et al., 2015), but significantly lower than the values reported by the Quéléver et al. (2022), who showed the average FR and GR were 0.686 cm^{-3} s^{-1} and 4.2 nm h^{-1}, respectively.”

RC5 (**§2.1, L.107-L.108**) Please clarify for each CPCs if this corresponds to measurement incl. ultrafine particle (corresponding data CN2.5) or particles larger than 10 nm (corresponding data CN10), if mentioned already in the method, there is then no need to specify it later (e.g., L.233 – L.234 or in the caption of Fig.2).

Response: To clarify this issue, we explained for each CPCs in experimental methods and removed the information later.

Page 5, Line 133: “Two condensation particle counters (TSI model 3776 CPC and TSI model 3772 CPC) were used to measure the total number concentration of particles larger than 2.5 (corresponding data $CN_{2.5}$) and 10 nm (corresponding data CN_{10}) every 1 s, respectively.”

RC6 (**§2.2, L.155-L.159 & L.165-L.168**) Could you explain the reason for the BC comparison between North Atlantic Ocean and Southern Ocean (where northern hemisphere is usually more influence by anthropogenic factors)? The environment being significantly different, I would suggest to clarify the context or to revise the relevance of this additional information to the manuscript.

Response: We agree with the reviewer’s comment. Since environmental conditions could be significantly different, the statement on the BC comparison between North Atlantic Ocean and Southern Ocean was removed. We newly added the information about BC concentration measured in Antarctic regions as given below.

Page 8, Line 187: “Hara et al. (2019) measured BC concentration at Syowa station Antarctica from February 2005 until December 2016. They found that the daily median BC concentrations were below the detection limit (0.2 ng m^{-3}) to 63.8 ng m^{-3} at Syowa Station (median, 1.8 ng m^{-3}; mean, 2.7 ng m^{-3} during the measurement period). During the ACE-SPACE expedition, BC concentration reach its background levels of 19.2 ng m^{-3} (Schmale et al., 2019). Arctic shipborne-observations measured BC concentration throughout the Arctic Ocean and Pacific Ocean during the summer of 2017, all pointing to pristine clean marine air masses with BC values of approximately 20 ± 10 ng m^{-3}. (Park et al., 2020).”

RC7 (**§3.1**) I would suggest to re-assess the structure of the subsections within 3.1 in order the easily follow the story line of the analysis by, for example, adding a subsection for the meteorological parameters influencing the aerosol particles and their formation (L. 248).

Response: Based on the reviewer’s comments, we added a subsection for the meteorological parameters influencing the aerosol particles (3.1.2. Influence of meteorological parameters on NPF events).

RC8 (**§3.1.1, Table 1 & L.230**) Please reformulate the caption for Table 1: e.g., “Monthly median for total particle number concentration >10 nm (CN10) ….”. I also suggest to add, in the caption, that the data are filter for pristine / clean conditions only (i.e., data when BC <50 ng.m-3). Finally, review the sentence **L.230** accordingly as **Table 1** does not show the time series for one-hour average but it recaps monthly median values for the year 2018.

Response: We reformulated and modified the caption of Table 1. Also, to clarify this, we rewrote the statement as given below.

Page 10, Line 263: "In addition, monthly medians for total number concentration of particles, size-segregated particles number concentration, CCN number concentration at supersaturation of 0.4%, and metrological parameters are included in Table 1."

RC9 (**§3.1.1, Figure 2**) CN2.5 is visible only from Jan. to Mar., it would be worth to comment on that in the text as well. Also consider to use color set that are color blindless-friendly (e.g., other than green and red in the same plot). (**L.244-L.247**) The correlation analysis CN10 vs NNUC could be more relevant with a bigger data set rather than with monthly averaged values, why not using the one-hour data?

Response: Thank you for pointing this out. We only measured CN 2.5 from January to March due to the instrumental malfunctions. We added the information in the caption of Figure 2 as follows. According to the reviewer's comment, the color of the coastal samples on Figure 1 has been changed. The correlation between CN_{10} and N_{NUC} was calculated by using hourly data and the sentence was modified.

Page 35 (caption of Figure 2): "CN 2.5 data are only available from January to March due to the instrumental malfunctions."

Page 11, Line 276: "Furthermore, the hourly average CN_{10} value was positively correlated with the hourly average N_{NUC} (R = 0.88; not shown), implying that the summer maximum of total particle number concentrations was largely influenced by newly formed particles in the Antarctic atmosphere."

RC10 (**§3.1.1, L.270-L.272**) Although the authors focus first on specific meteorological parameters influencing NPF, I suggest to strongly insist on the combination high PAR, high temperatures, low RH altogether rather than finding explanation with one parameter alone. Furthermore, high windspeed would enhance mixing of the emitted compounds and accelerate transport (possibly from further away). Please add reference for enhanced VOC in high windspeed conditions.

Response: As suggested by the reviewer, we added the reference for enhanced VOC in high wind speed conditions. The sentence for enhanced VOC in high wind speed conditions was rewritten accordingly.

Page 12, Line 308: "Recent studies concluded that Antarctic NPF occurred under combined high solar radiation, high temperature and low RH conditions, similar to previous study measured at the Marambio Antarctic research station (Quéléver et al., 2022)."

Page 12, Line 303: "A possible explanation for the wind speed independence is that an increase in wind speed contributes to the increase of cluster size ion number concentrations by friction processes (Virkkula et al., 2007), but it was also accompanied by cloudy conditions."

RC11 (**§3.1.2, L.276 -**) The section 3.1.2 depicts the statistics on the observed NPF events. I would suggest to first mentions the numbers of event observed with a brief description of representative event types (if such grouping can be done), e.g., burst events, nucleation transported + local growth, etc.… incl. example with size distribution surface plot.

Response: We described two types of NPF events including the contour plots of the size distributions as follows.

Page 13, Line 323: "The NPF events were classified into: (1) burst event and (2) nucleation with growth event according to the classification by Dal Maso et al. (2005) as seen in Figure S3. The burst events and nucleation with growth events were observed on 1 January 2018 and 16 December 2018, respectively."

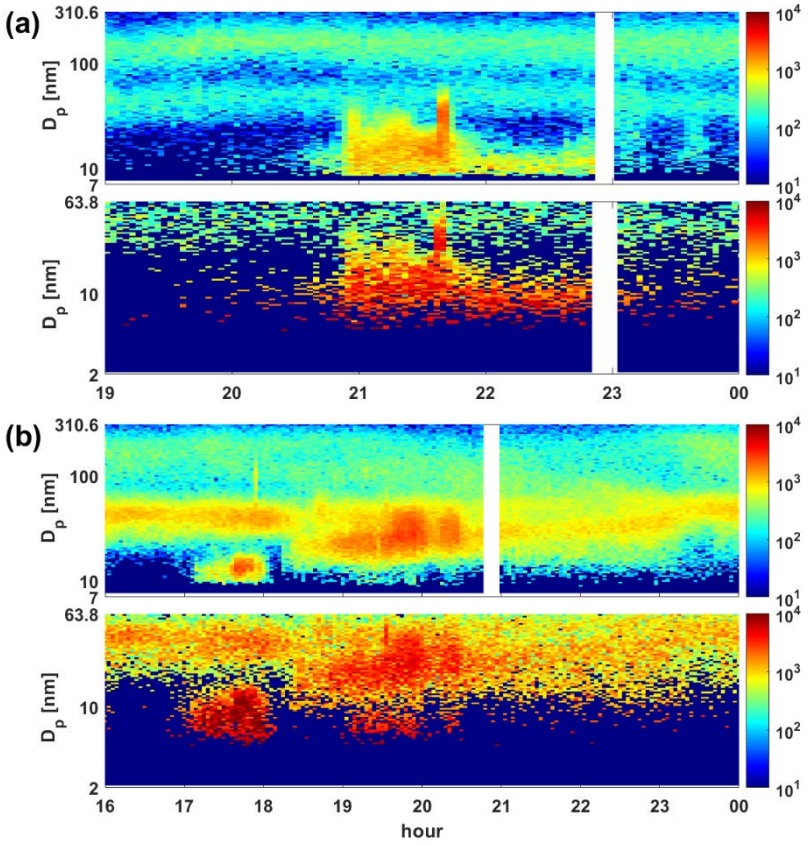

Figure S3. Example of two types of the NPF based on the SMPS data. (a) burst event (1 January 2018) and (b) nucleation with growth (16 December 2018).

RC12 (**§3.1.3, L.301** -) The start of the section reintroduces the NPF / nucleation presented in the earlier section, I would recommend restructuring the section 3.1. in order to follow a coherent path on the descriptions of NPF events, without reintroducing NPF observation on every subsection.

Response: Based on the reviewer's comment, we restructured the section 3.1. To avoid the description of NPF events repeatedly, we changed the order of section 3.1.3 and 3.1.4 and also modified the sentence.

RC13 (§3.2) For each case study, the manuscript shows the result of CCN data for one supersaturation ratio only, could the authors develop on the reason for using this data only rather than comparing with the information brought with the other super saturation ratio. RCx (**§3.3.2, L.426** -) Here as well, I suggest adding Sipilä et al. (2016, https://doi.org/10.1038/nature19314) as a key reference for showing the role of Iodic acid in

NPF in Marine & Polar environments.

Response: To clarify this issue, we included the CCN concentration at five different supersaturations for each case study (Figure 6-8). Also, we added the time series of daily mean CCN concentration under five different supersaturations (Figure S9). As suggested by reviewer, we added the reference as well.

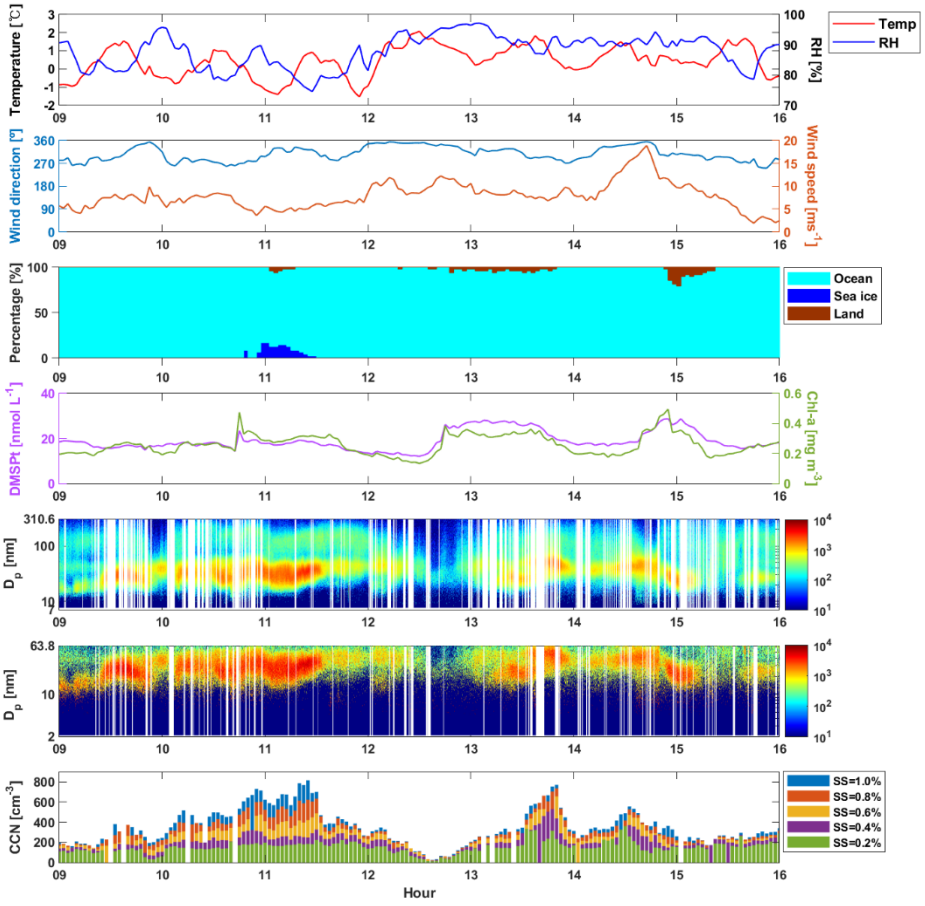

Figure 6. Marine NPF event observed from December 9–15, 2018. From top to bottom, the plots are as follows: meteorological variables, the residence time of air masses that passed over the ocean, sea ice and land areas; number size distribution with the standard-SMPS and nano-SMPS, and CCN number concentration. The x-axis represents local time.

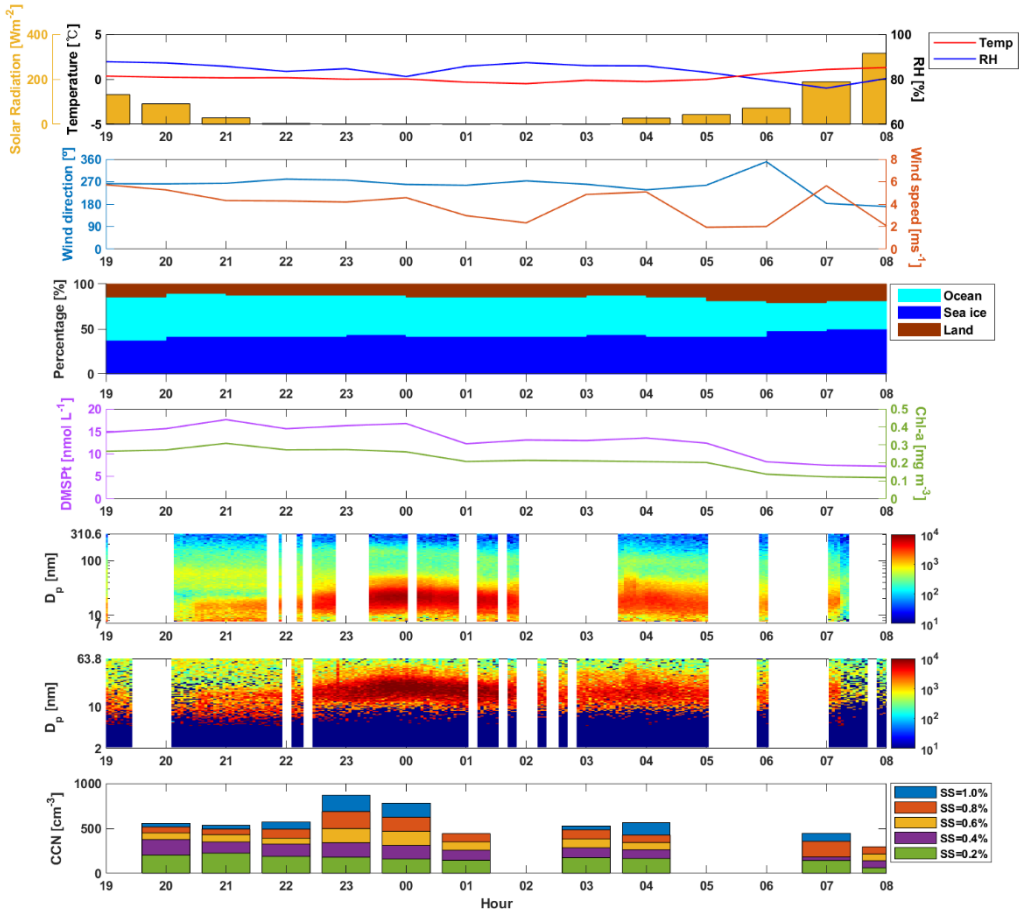

Figure 7. Sea ice NPF event observed from January 2–3, 2018. From top to bottom, the plots are as follows: meteorological variables, the residence time of air masses that passed over the ocean, sea ice and land areas; number size distribution with the standard-SMPS and nano-SMPS, and CCN number concentration. The x-axis represents local time.

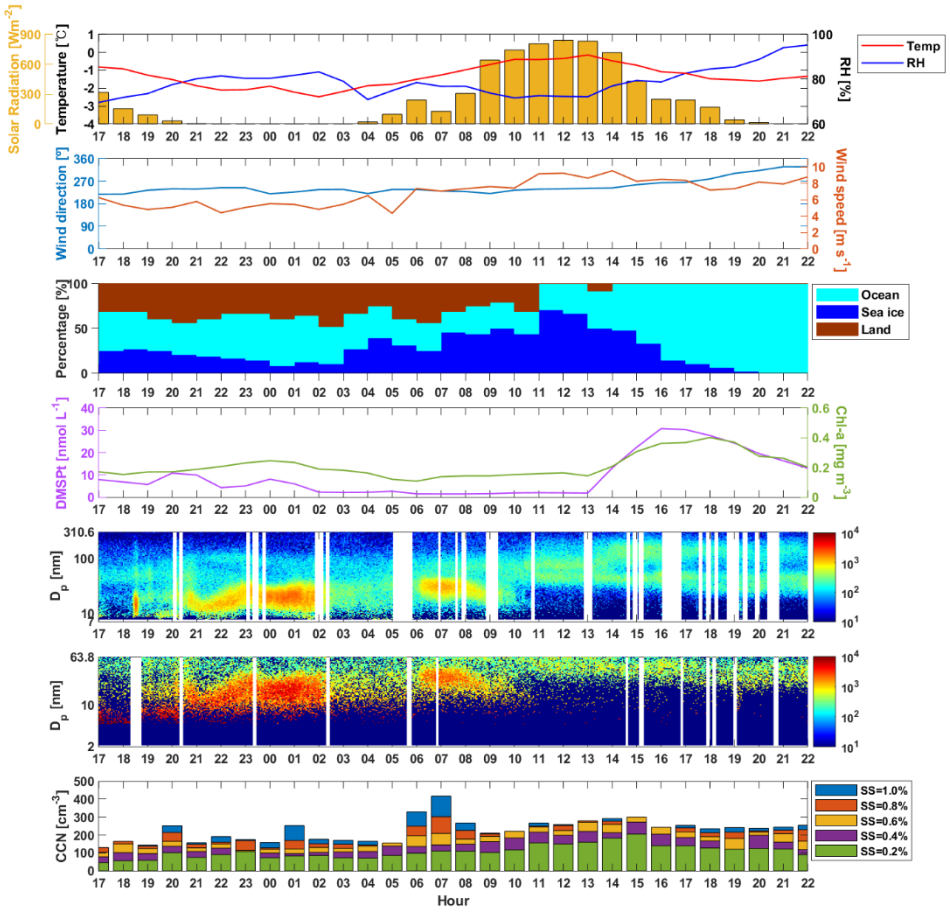

Figure 8. Multiple NPF event observed from November 16–17, 2018. From top to bottom, the plots are as follows: meteorological variables, the residence time of air masses that passed over the ocean, sea ice and land areas; number size distribution with the standard-SMPS and nano-SMPS, and CCN number concentration. The x-axis represents local time.

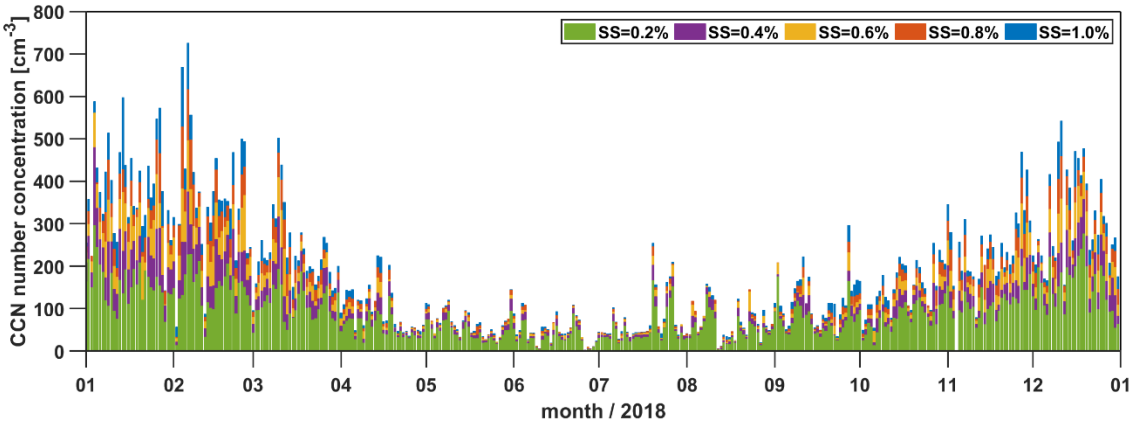

Figure S9. Time series of daily mean CCN concentration under different supersaturation conditions.

RC14 (**§3.3.2, L.452 -**) The presence of Penguins close (~2 km) to the measurement location is a determinant parameter impacting the frequency of NPF. Earlier in the section, the authors

discussed extensively on the air mass origin, however this now bring a strong local source for chemicals bases such as ammonia that can trigger NPF. This, however, could only be validated by direct measurement of precursor gases. Hence, I highly recommend discuss this further, as well as the need for gas phase measurement. As such, a close emission point will likely interact with the result interpretation incl. from most / all the air mass origin. Furthermore, if pinguins / birds are only present in the surrounding seasonally, I would further suggest a comparison on the frequency / intensity of the NPF observed between e.g., breading season and start of the spring.

Response: This is a similar question to the one above. Again, we did not measure the precursor gases. Out of 97 observed NPF events, 2 NPF events (4 February 2018 and 18 February 2018) were associated with local fauna. We presented the contour plots of the size distributions and wind roses when predominant wind possibly passing over a penguin colony (around 2 km away from our observation site) in Figure S8. We discussed the influence of local fauna such as penguin colonies on NPF event in the manuscript (Page 20 and Line 513) and the importance of measurements of precursor gases (Page 24 and Line 620).

Page 24, Line 620: "However, further detailed measurements of the chemical properties of aerosol particles and precursor gases (e.g., ammonia) during NPF events are required to better understand the contribution of these compounds to the formation and growth of aerosol particles and to explore their impacts on CCN formation in the remote Antarctic environment."

RC15 (**§3.3.3, L.469 -**) Could the authors bring clarity on the connection between the size distribution data and the CCN data. It is a critical point of this study, as NPF and CCN do not occur at the same time, it would be interesting to account for parameters associated with CCN formation in connection to NPF (particle number/diameter, sinks, survival probability …) Have the authors considered CCN transported from another source (i.e., primary particles)? Alternatively, the authors could present the result given with supersaturation ratio and discuss the link with hygroscopicity (CCN data) and growing particles (DMPS data). I then suggest referring to Chang et al. (2022, https://doi.org/10.5194/acp-22-8059-2022) to complement the analysis.

Response: In the present study, we did not consider the contribution of sea spray aerosols to CCN formation. In the future, we will investigate the physical properties of primary aerosols in Antarctic peninsula and its contribution to CCN using the size distribution data obtained up to coarse mode particles as well as chemical composition information. To clarify the connection between growing particles and CCN, we determined the increase in CCN concentration during growth time (i.e., growth to lower than 40 nm and growth to larger than 40 nm) compared with baseline values at different supersaturations, based on the method by Chang et al. (2022), as shown in Figure 10.

Technical comments (rmc):

TC1 (**Title**) Suggestion to revise the title by replacing the preposition "at" by "in the Antarctic Peninsula".

Response: It was corrected.

TC2 (**Abstract, L.24-L.27**) Suggestion to reformulate as there is no direct measurement of

DMS/DMSP. → E.g. “Our estimation of DMPS concentration from satellite chlorophyl data suggest that product of biogenic precursor could be a component of marine NPF, …”.

Response: We have corrected this in the abstract as follows:

Page 1, Line 27: “Satellite-estimates for sea surface dimethylsulfoniopropionate (DMSP; a precursor of gaseous dimethyl sulfide) data showed that the production of oceanic biogenic precursors could be a key component in marine NPF events.”

TC3 (**§2.1, L.129-L.130**) CCNC supersaturations either 20%, 40%, 60%, 80% 100% or supersaturation ratio of 0.2, 0.4, 0.6, 0.8, 1.

Response: It was corrected.

TC4 (**§3.1.3**) “size spectra” → “size distribution spectra”

Response: It was corrected.

TC5 (**§3.1.3, L.390**) “evets” → “events”

Response: It was corrected. Thank you for finding this error.

TC6 (**§3.3.2, L.413 & L.418**) Please consider the product of oxidation of DMS are those responsible for the NPF. Condensable vapors: Sulfuric acid and Methane sulfonic acid.

Response: We added the information (Page 19 and Line 474).

Newly added references

Brean, J., Dall'Osto, M., Simó, R., Shi, Z., Beddows, D. C. S., and Harrison, R. M.: Open ocean and coastal new particle formation from sulfuric acid and amines around the Antarctic Peninsula, Nat. Geosci., 14, 383–388, https://doi.org/10.1038/s41561-021-00751-y, 2021.

Chang, R. Y.-W., Abbatt, J. P. D., Boyer, M. C., Chaubey, J. P., and Collins, D. B.: Characterizing the hygroscopicity of growing particles in the Canadian Arctic summer, Atmos. Chem. Phys., 22, 8059–8071, https://doi.org/10.5194/acp-22-8059-2022, 2022.

Croft, B., Wentworth, G. R., Martin, R. V., Leaitch, W. R., Murphy, J. G., Murphy, B. N., Kodros, J. K., Abbatt, J. P. D., and Pierce, J. R.: Contribution of Arctic seabird-colony ammonia to atmospheric particles and cloud-albedo radiative effect, Nat. Commun., 7, 13444, https://doi.org/10.1038/ncomms13444, 2016.

Dall'Osto, M., Sotomayor-Garcia, A., Cabrera-Brufau, M., Berdalet, E., Vaque´, D., Zeppenfeld, S., van Pinxteren, M., Herrmann, H., Wex, H., Rinaldi, M., Paglione, M., Beddows, D., Harrison, R., Avila, C., Martin-Martin, R.P., Park, J., Barbosa, A.: Leaching material from Antarctic seaweeds and penguin guano affects cloud-relevant aerosol production, Sci. Total Environ. 831, 154772, http://dx.doi.org/10.1016/j.scitotenv.2022.154772, 2022.

Decesari, S., Paglione, M., Rinaldi, M., Dall'Osto, M., Simó, R., Zanca, N., Volpi, F., Facchini, M. C., Hoffmann, T., Götz, S., Kampf, C. J., O'Dowd, C., Ceburnis, D., Ovadnevaite, J., and Tagliavini, E.: Shipborne measurements of Antarctic submicron organic aerosols: an NMR perspective linking multiple sources and bioregions, Atmos. Chem. Phys., 20, 4193–4207, https://doi.org/10.5194/acp-20-4193-2020, 2020.

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