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Comment on acp-2022-71

Anonymous Referee #2

Referee comment on "Significant continental source of ice-nucleating particles at the tip of Chile's southernmost Patagonia region" by Xianda Gong et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-71-RC2, 2022

General Comment

In the current manuscript, aerosol particle samples were collected close to Punta Arenas, Chile, on Cerro Mirador at the southernmost tip of South America between May 2019 and March 2020. The objective was to evaluate the capability of these particles to act as ice nucleating particles (INP) and to identify their possible sources. Also, the INP data were complemented with meteorological data, air mass backward trajectories, and lidar observations. I consider that this study is relevant for the ice nucleation community and it is especially important for the Southern Hemisphere due to the lack of studies in this region. Also, I think that the database generated in this study is valuable because of the long-term sampling time. The present manuscript is within the ACP scope and it can be accepted for its publication once the following minor comments are considered.

Minor comments:

Line 6 Why do the authors state that 90% and 80% of the INP are proteinaceous material. I mean, how did you calculate these percentages? I could not find any chemical analysis to determine the quantity of proteinaceous material within the samples.

Line 58 In this part the authors mention that it is important to perform INP measurements in the Southern Ocean; however, the samples were collected in a mountain close to the coast and not in the open ocean. Therefore, it is very likely that the present results were influenced by continental aerosol sources.

How far away is Punta Arenas from Cerro Mirador? Can anthropogenic particles emitted in Punta Arenas influence the measurements performed in Cerro Mirador? Also, are there

fertile soils close to your sampling site? Or why did you compare your results with O'Sullivan et al. (2014)? The description of the sampling site needs to be improved.

Line 76 I suggest changing the word "aerosols" to aerosol particles. Also, it is mentioned that the used filters contain a pore size of 800 nm; however, afterward it is mentioned that the analysis was performed for particles >500 nm. Please explain this discrepancy.

Line 78 What was the used aerosol sampler?.

Line 85 Can the authors please elaborate more on the sample storage protocol? Is there any chance that the samples could have experienced a memory effect when stored at -20C? For how long were the samples stored prior to the ice nucleation analysis? Did the authors evaluate the impact of long-term storage?

Line 94-95 I am wondering if the PCR-tray with the sample was heated or if the heat was only applied to the sample?

Line 121 I believe that "V" corresponds to the volume of the liquid deposited on each well instead of the air volume. Please clarify this.

Line 149 - 150 Describe in more detail how ns was calculated.

Line 175-178 This classification should be in the methods section.

Line 203 I do not understand why the authors compare their results with those from Tobo et al. (2013) and the former study was performed on aerosol particles from a forest while the present study focuses on coastal particles.

Line 228-229 Why did you choose these temperatures or do they refer to a range of temperatures?

Figure 3b I did not completely get the purpose and meaning of panel b.

Line 269 According to Figure 4, the black dots correspond to the heated samples and the

red dots to the unheated samples; however, in line 269 the authors state the opposite. Also, this is not consistent between the text in the figure caption and the figure legend.

Line 324 and 375 Why Samples 11 and 12 were selected for the case study? It is unclear to me what was the motivation to have the Case study and also the cluster analysis performed in Section 3.5. Is it not better to remove the Case study and to add those 2 samples to the cluster analysis shown in Section 3.5?

Line 328 Please add the used software to get the air mass the backward trajectories in the Methods.

Line 330 I am wondering how valid it is to correlate the meteorological data from the airport with the INP data from the Cerro Mirador.

Line 401 Based on the heat treatment analysis the authors state that some INPs were of biogenic origin; however, it is unclear what is the source of bulk INPs, i.e., those that are not of biogenic origin?