Singh et al.: “Exploring the drivers of Cloud Condensation Nuclei in the Indian Sector of the Southern Ocean” aims to investigate the relationship between cloud condensation nuclei (CCN) and several other factors, sea spray, biological signals, utilising satellite-retrieved datasets. The campaign was conducted between the latitudinal bands of 20° S and 68° S on the board of ORV SA *Agulhas* between the austral spring-summer; between 11 February to 28 March, 2025, therefore presenting recent observations.
The manuscript is clearly written, although at certain parts some clarifications should be employed. The manuscript consists of 2 tables, 8 figures and 93 references. All of the figures have multiple panels.
Methods are explained well. The Reviewer generally agree with the conclusions and interpretations of the Authors but would like to draw the attention to the following matters. Should those be addressed, the Reviewer would have no further objections for publishing the paper.

Technical comments:

Line 13: typo: „thHighlightede”.
Line 19: the journal requests spaces between number and the unit (including the percentage signs) for figures. This should be adapted to the text body as well.
Line 147: italicise *Agulhas* to follow the ship naming convention.
Line 216: RH has been defined before.
Line 267: update the equation with a multiplication symbol and *S*.

Line 326: one-character variables (like *Q*) should be italicised. Please apply the same format on other occurrences (fore example, N_d at line 329, 331, *S* at line 335, and so on).
Line 342, 349 and 353: were the 30 and 50 % values intended to be written as 0.3 % and 0.5 % for *S*? If not, then it is not clear, where do those values come from.
Line 353, 354, 387 and so on: please verify that en dashes are used for indicating ranges.
Line 378: the maximum CCN concentration value is assumed to be on the highest *S*, but a confirmation would be desired.

Line 398: a space between “median:” and “112”.
Line 487: while the APS does not distinguish between water-activatable particles, it can be safely assumed that the smallest particles it can measure are all CCN-active due to their (relatively large) diameters. In this environment, only sea spray is expected to be captured by the APS, however. Of course, most of the CCN-active particles should be between 50–200 nm, which the APS cannot measure.

The citations are generally in order, with the exception of these items:
Line 290: it seems that the Copernicus reference from the reference list is missing. It is not clear, what role does Mansour et al. (2023) play at this text.
Line 516: Humphries et al., 2016 seems not to be the in reference list.
Line 580: McFarquhar et al., 2022 seems not to be in the reference list, also contains a typo.
Line 936: the Twomey-reference is not in the alphabetical order.

General comments and questions

Line 339: while true, the upper limit of the CCN concentrations increased in respect of the supersaturation, the difference between $S = 0.4$ % and $S = 1.0$ % ($\Delta CCN = 15$ cm^{-3}) seems negligible compared to the CCNc instruments’ counting performance and the observed SDs. This suggests rather that most of the CCN-active particles already activate even on $S = 0.4$ %. To prove this, a histogram could be presented with several statistics (Kurtosis, skewness). (Also, since the

second column of the CCNc was set to $S = 0.4$ %, it is implied that the Authors expected that majority of the particles can activate around this S. In pristine environments, this is often true.)

Line 368: “The concurrent rise and fall across all five S levels suggests that the aerosol populations within the study area during this expedition were relatively uniform and broadly distributed across sizes…”: how can the aerosol population be described only from the CCN concentrations? Or does the Reviewer not understand this sentence well?

CCN is expected to be governed via multiple variables. Chlorophyll a (as a biological signal) seems to be a major contributor, but correlations might not properly uncover the relationships. Therefore, if possible, it is suggested to try multilinear regression between the CCN concentrations and the available variables, and report, if strong relationships have been found.

Unfortunately, there was no condensation particle counter or mobility particle size spectrometer deployed during the campaign, which is one weak point. With these, the derived parameters could have been extended (activated fraction, critical diameter, hygroscopicity parameter). If planning more campaigns, these instruments are advised.

The second problematic point is the short measurement campaign. This only allows for season-specific observations, interpretations, while different seasons might have different mechanisms. If possible, a general overview of seasonality of the Southern Ocean would be beneficial to add (even into a supplement), as a Reader might not have sufficient knowledge on this topic. Contrary, the open-sourced dataset is really valuable, as this paper can add a piece for the puzzle for investigating the Southern Ocean.