Interactive comment on "Southern Ocean Cloud and Aerosol data: a compilation of measurements from the 2018 Southern Ocean Ross Sea Marine Ecosystems and Environment voyage" *by* Stefanie Kremser et al.

Gerald Mace (Referee)

jay.mace@utah.edu

Received and published: 19 February 2021

I have reviewed the manuscript describing the data set collected during the TAN1802 voyage. The data collected on this voyage to the Ross Sea in January and February 2018 and the manuscript describing the data are quite interesting and very well done. Data sets like this to remote areas are rare and extraordinarily valuable because they document unique regions and processes. This data set highlights interactions between the marine biogeochemistry and the atmosphere that are largely unobserved. It is to the authors' credit the they are willing to make this data available to the community.

Community access to this data will certainly maximize the value of the data.

Overall, the manuscript is well done and nicely describes the data set. I think that a bit more detail could be included for not a lot of work that could highlight how the data set fits into a larger context. I highlight those points below in my comments. Overall, I suggest no major revisions, and I think the manuscript should be published after minor revisions.

Specific Comments:

Abstract Line 5: Satellite measurements certainly see the low level clouds without much trouble. The satellite measurements just can't constrain the aerosol-cloud processes very well. Maybe a bit of clarification on this point.

Line 55. No argument from me about the need to know INP better, but doesn't the low concentrations of INP suggest that it is very important to understand secondary ice processes much better than we do in this region of low INP?

line 76: Do you mean to say that "process model predict that the highest open ocean OCS fluxes are in the Southern Ocean"? Your sentence is missing "that" after "predict"

Line 93 (first bullet): "low/medium" is a rather ambiguous term. Do you mean clouds based in the boundary layer or clouds that are not cirrus or...?

Table 2 and Science Objectives: It might be useful to readers to number your science objective listed in 2.1 and then in Table 2 include a column that connects science objectives with measurements - something like a science traceability matrix.

Line 104: The heading text ("Meteorological conditions") is not descriptive of what is in the subsection.

Line 112: Is 1-minute the highest rate at which motion and position are recorded?

Line 123: Is there a reference describing the gas exchange algorithm?

Line 154: Line 154: You don't say how often the data are recorded from the radiosondes. The temporal or vertical resolution would be useful.

Line 184: Oh No! Major Bummer!

Line 220: Do you mean the maximum detection range? Statement makes it sound like it does not record below the upper troposphere.

Line 232: How often did the instrument/software fail?

Line 252: would be good to note the temporal and vertical resolutions of these files. Do the files include the attenuated backscatter of the lidars?

Section 3.4: Was the MRR on a stabilized platform? If not the Doppler information will be difficult to interpret due to ship motions. Also, is the MRR calibrated against some independent radar measurement? These are both critical details.

Line 277: This is a fairly sophisticated camera. Any chance the RGB imagery could be calibrated?

Line 370: This seem like an important step. Should it be described in more detail? What does "corrected to ambient" mean?

Line 449: so the the archived data are temperature dependent number concentrations of INP one per filter? Perhaps clarify? Was additional chemistry done on these filters? Could it be if not?

Figure 4: It would be useful to plot these over an ocean color or chlorophyl-a retrieval map. I eyeballed the map that can be created at https://oceancolor.gsfc.nasa.gov/l3/ and the monthly plot for February 2018 shows some interesting structure in your region that seems to correspond to your data.

Line 591: If the MRR is not stabilized the Doppler information is likely not suitable for the Maahn and Kolias algorithm. To my eye, the Doppler velocity looks to include ship motions but it is very hard to discern at the plotting resolution.

Line 618: What fraction of the data are deemed contaminated from exhaust? A day by day graphic showing the contaminated fraction would be useful.

Line 647: Increases in total number (e) and ccn (d) are pretty obvious on Feb 17. However increases in number in panels a and b are not obvious. Does this air mass change correlate with the onset of strong southerlies in Figure 5? May be worth noting if so. Also, on NASA Worldview I think maybe I see your ship track in the MODIS Aqua imager approaching Cape Adare. https://worldview.earthdata.nasa.gov/?v=258225.19165830087,-2145493.8406539974,501157.02538037306,-1958367.8679662866&p=antarctic&t=2018-02-17-T15%3A23%3A20Z

Figure 14: Having titles or insets on these panels listing what each is would be very helpful.

With Compliments, Jay Mace