Specific comments:

Why authors of the Antarctic surface snow isotopic dataset available for download at https://doi.org/10.5281/zenodo.7294183 are different from the authors of the submitted ESSD article?

Response: We have updated the authors of the dataset to match the authors of this article (please see https://doi.org/10.5281/zenodo.7788716).

It is not clear why the title of ESSD paper is "The Ant-Iso dataset: a compilation of Antarctic surface snow isotopic observations" while there are 80 points of ice cores and 235 points of firn cores. You should either revise the title or exclude ice cores from the dataset.

Response: We have changed the title. The new title is *"The Ant-Iso dataset: a compilation of Antarctic surface snow and ice isotopic observations"*.

The dataset needs to be revised and polished. You should thoroughly check the dataset to be sure that it follows the common requirements of a dataset. At least 25 samples do not have coordinates, elevation and year of sampling. 117 samples do not have coordinates and year of sampling. I doubt that such values without any spatial and temporal references could be useful. If it is not possible to obtain the metadata, they should be excluded from the dataset. By the way column "Sample label" suggests location for some of the samples without coordinates. For example, 753 Molodezhnaya, 754 Amery-G1, 755 GM7, 756 GM10, 757 GM13, 758 Dome C, 759 Mirny, 760 Pioneerskaya, 761 Vostok 1, etc. Probably you can use it after careful check.

Response: We have deleted the points without latitude and longitude information and added the sampling time information as much as possible. Most of the missing information about sampling was in the original MD08 dataset. Through hard work, the sampling time is more complete in the new dataset. Based on your suggestion, we significantly revised and improved the dataset.

You need to define parameters in the dataset. It is not clear what the difference between published and calculated distance is and why did you need to calculate it? The same relates to elevation.

Response: There are quite a few points with latitude and longitude coordinates, but no information about elevation and distance to the nearest coast. For those data points, we extracted their elevation from the Global Earth Relief Grids data, and calculate distance to the nearest coast using the Generic Mapping Tools (GMT) software (Wessel et al., 2019). Therefore, some elevation and distance to coast data came from the same publications as the isotope data, but some came from our calculations. We added a supplementary explanation in the excel table.

It is also not clear how the quality flag was assessed.

Response: The quality control value ranges from 0 (minimum quality control) to 5 (maximum quality control), which is consistent with the practice of MD08. Data that meet any of the quality control index conditions can get 1 point: (1) analytical uncertainty of 0.1‰ or better for $\delta^{18}O$ measurements, (2) analytical uncertainty of 1.0‰ or better for $\delta^{2}H$ measurements, (3) sufficient number of measurements (10 or more), (4) age control on the sampling period or a core depth, (5) seasonal resolution of the measurements. Note: The purpose of the first two quality standards is to reflect

the quality of sample preservation and water isotope measurements; the latter three are based on the time scale and resolution of the samples in order to establish a climatic dataset on the isotopic composition of surface snow and ice (MD08).

"The quality control value ranges from 0 (minimum quality control) to 5 (maximum quality control). Data that meets any of the quality control index conditions (Table 2) can get 1 point."

"Note: The purpose of the first two quality standards is to reflect the quality of sample preservation and water isotope measurements; the latter three are based on the time scale and resolution of the samples in order to establish a climatic dataset on the isotopic composition of surface snow and ice (MD08)."

Does "Firn temperature or surface air temperature" relate to exact location and time of sampling or is it somehow averaged? How was it calculated or assessed? What is "Accumulation of snow/ice per year"and how was it estimated?

Response: "Firn temperature or surface air temperature" is related to the exact location and time of sampling. The air temperature data of some stations are calculated based on the weather stations. But for most sites, the multi-year average temperature data are not available. Samplers usually measure the firn temperature at 10 m of the ice core. According to the thermodynamics of glacier, the 10 m firn temperature can represent the annual average surface air temperature of the sampling site (MD08; Sun et al., 2021).

"Accumulation of snow/ice per year" is the net accumulation of annual precipitation, that is, surface mass balance. In Antarctica, there are five ways to get the accumulation rate (snow pit, ice core, stake observations, ground-penetrating radar

and automatic weather station). Snow pits and ice cores are first dated, and then the accumulation rates are calculated based on the annual layer thickness. The snow accumulation calculation of a site can also be directly measured by stakes, ground-penetrating radar and automatic weather station. The accumulation rate data are also available in the literature.

Data in columns should be formatted in a single style. For example, column "Averaging length (years or depth)" contains different data in very different style that prevent easy processing and analysis of the dataset. I suggest splitting the column into two different ones ("Averaging years" and "Averaging depths") and putting only numerical values in each of them. If needed additional explanation you could add another "Comments" column with text.

Response: Based on your suggestion, we divided this column of data into two columns (Averaging years or year period, Averaging depths).

Column "Sampling date" contains not dates but years in different formats (both numeric and text) that prevent processing and filtering. You may consider splitting the column into two different ones – "sampling year start" and "sampling year finish".

Response: As suggested, we revised all sampling times to make them consistent and easy to use. But it is not practical to have separate columns for start time and end time, because some data only contain a rough sampling range, without exact start and end time.

Column "Sample type" have errors in writing that prevent grouping samples by types. You should carefully check every type and provide exact number of points of every type in the article.

Response: We identified and corrected all the errors in the sample type column, and added their summary statistics in the article. Our dataset includes 885 snow pits, 358 snow cores, 77 ice cores, 359 surface snow samples, and 19 precipitation samples.

"Our dataset includes 885 snow pits, 358 snow cores, 77 ice cores, 359 surface snow samples, and 19 precipitation samples."

Lines 68-74. Are you talking about the dataset by Masson-Delmotte et al. (2008), mentioned earlier, or your dataset? Clarify it and if it relates to the dataset by Masson-Delmotte et al. (2008), provide more details about its actual content rather than "it provides an observational basis".

Response: We revised it to "MD08 dataset" to make it clear.

"MD08 database provides an observational basis for numeric simulations of the spatial distribution of snow and ice isotopes across Antarctica using pure mathematical methods combined with 1 km high-resolution digital elevation models (Wang et al., 2009a, 2009b, 2010)."

Lines 78-79 Provide sufficient references of "numerous new samples and measurements that have been acquired by different researchers"

Response: We added the references.

"numerous new samples and measurements have been acquired by different researchers (i.e. Ekaykin et al., 2020; Landais et al., 2017; Weinhart et al., 2021)."

Lines 79-81 Add quantitative estimation of the "additional observations" and described in numbers the difference between MD08 and your dataset.

Response: As suggested, we added a quantitative estimation: *"The original dataset has 1279 points, and we added 794 new data points."*

Lines 90-91 How many data points did you make publicly available for the first time? It is one of the most important things to show the value of your dataset.

Response: We added 794 new observation points in total. Among them, 226 data points were not available on public repository or supplementary material of papers. We obtained those data by directly contacting the authors (Table 1). We added the following descriptions and tables to the dataset.

"Among the new additions to the data, 226 data points were not available on public repository or supplementary material of papers. We obtained those data by directly contacting the authors (Table 1)".

Table 1. Data that were not available in public repositories or supplementary materials for literature

Sampling site	Data numbers	References	Comments
Zhongshan−Dome A	13 snow pits	Xiao et al. (2013)	Supplemented data via email
Vostok flow line	89 snow pits	Ekaykin et al. (2012)	Supplemented data via email
Syowa−Dome F	51 surface snow samples	Touzeau et al. (2016)	Supplemented data via email
SEAT	14 firn cores	Burgener et al. (2013) and Williams (2013)	Supplemented data via email

Zhongshan Station	1 precipitation sample	This study	In situ collection
Vostok	21 snow pits	Ekaykin et al. (2016)	Supplemented longitude and latitude information via email
South Pole	10 ice cores	Fudge et al. (2019)	Supplemented longitude and latitude information via email
Lambert Glacier	1 snow pit and 1 ice core	Du et al. (2020) and Liu et al. (2019)	Supplemented data via email
DML	10 firn cores	Schlosser et al. (2014) and Vega et al. (2016)	Supplemented data via email
WAIS	15 ice cores or firn cores	Criscitiello (2014), Tavares et al. (2020), Thomas et al. (2013), Tetzner et al. (2022), Schwanck et al. (2017), Thomas and Bracegirdle (2015)	Supplemented data via email

Lines 119-121 Add numbers of points to the figure caption

Response: We have changed this figure. Following is the re-drawn Fig. 1.

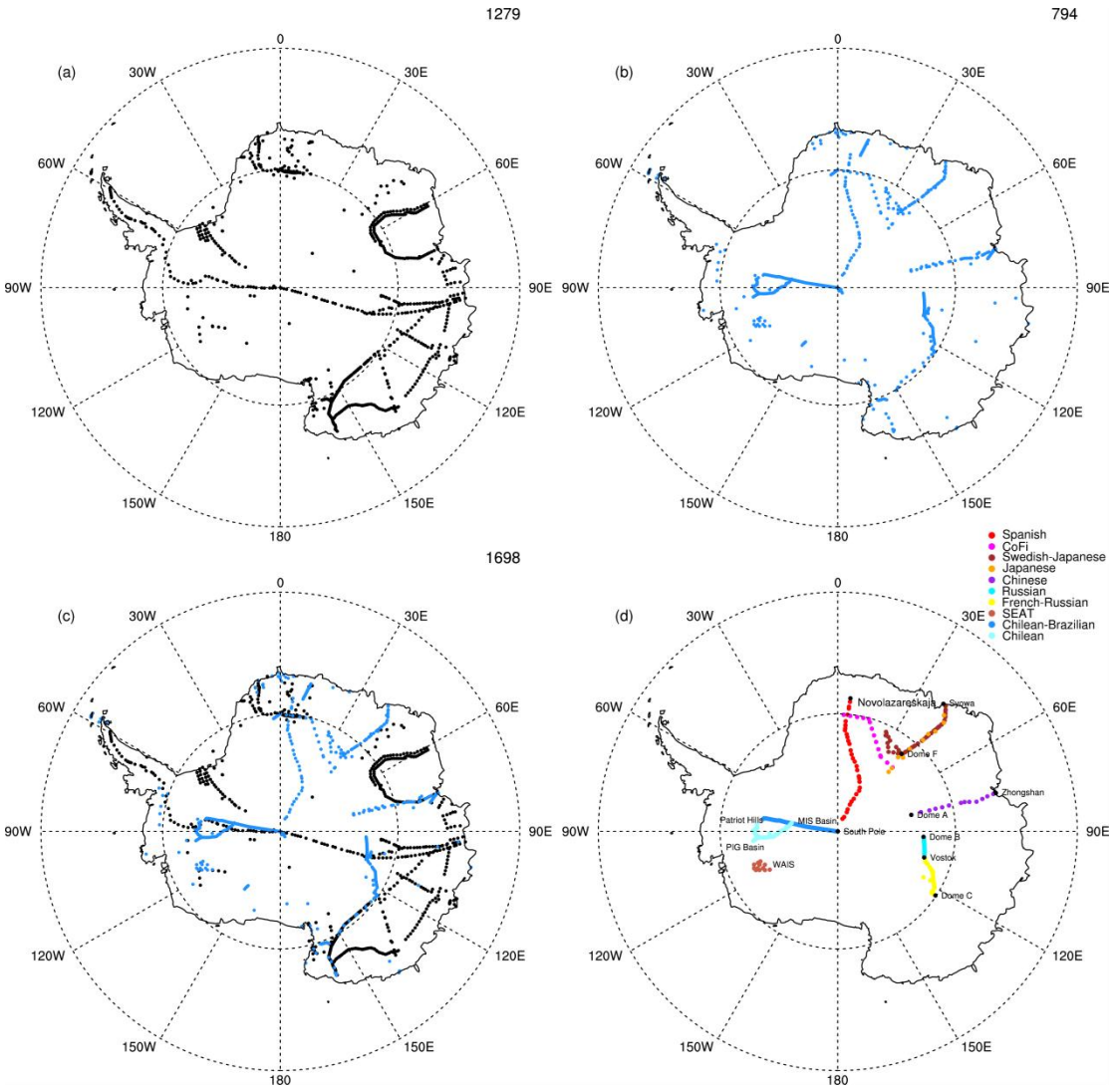

Figure 1. The comprehensive dataset of Antarctic surface snow and ice isotopic observations. The black points indicate the original dataset of MD08 (a), and the blue points represent our newly added points (b), and the black and blue points indicate all data locations (c). Major new sampling traverses of isotopic observations in Antarctica (d).

Lines 118-123 Consider merging figures 1 and 2. You can add information from Fig.2 to Fig.1 (b)

Response: We merged figure 1 and 2 as suggested. See figure 1 above.

Line 177-178 Include the same figure for δD, ‰

Response: We added a new figure for δD. Following is the revised figure.

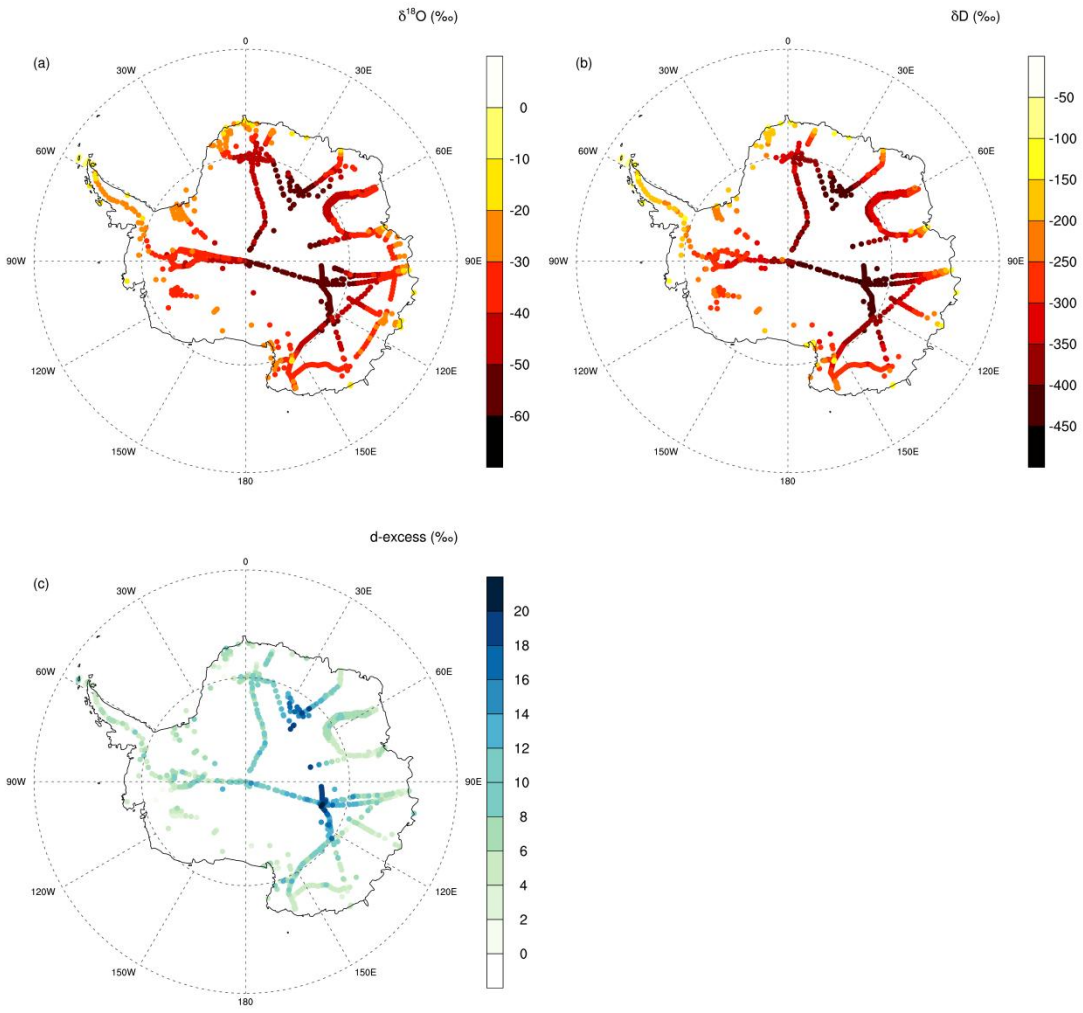

Figure 2. Spatial distribution of (a) $\delta^{18}O$, (b) δD, and (c) d-excess in Antarctic surface snow and ice.

Line 214 Since you have several files in Supplement you should reference more precisely.

Response: We deleted all but one Word file to avoid confusion.

"The supplement related to this manuscript can be found in the supplement.docx Word."

Line 252 Content of the Word file with Supplement differs from the supplement described here. You should provide detailed description of the supplement files.

Response: We deleted all but one Word file to avoid confusion.

"The supplement related to this manuscript can be found in the supplement.docx Word."

Technical corrections:

Affiliations and even country names have different formats

Response: They were revised in a consistent format.

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Line 174 Rewrite "…we do not quantitatively calculate the quantitative relationship…"

Response: This sentence was revised as "*It should be noted that we did not examine the linear correlation between isotope ratios and geographical and climatic factors here, as this is beyond the scope of this paper*."