Replies to Reviewer Comments (RC1)

General Comment: The manuscript entitled "HomogWS-se: A century-long homogenized dataset of near-surface wind speed observations since 1925 rescued in Sweden" submitted to ESSD created a century-long homogenized near-surface wind speed over Sweden. Generally, the manuscript is logical clarity, and the work is very meaningful for near-surface wind speed studies. I clearly recommend publication after some minor revisions.

Response: Thank you for high recommendation of our manuscript. Based on your constructive comments, we have made the corresponding revisions in a new version of the manuscript. Below are our point-by-point responses to your comments.

Specific Comments:

1) Comment: L45: remove "our".

Response: Corrected as suggested.

2) Comment: In Figure 4, I see a nice work in the homogenization of near surface wind speed, while in Figure 4b there is a distinct peak around 1990, were there extreme weather in this year?

Response: Yes, right. The peak is also reproduced by the CERA-20C reanalysis (Fig. 4b).

3) Comment: In Section 3.3, the authors show the results of raw and homogenized WS anomaly series averaged at the 13 stations, and also compared the stilling and recovery trends of different datasets. From Figure 5, I notice that there is a relatively serious lack of data in some stations since 1995, so the averaged weights in different periods is also different, the authors should add some discussions for this issue.

Response: This comment is valuable for climate change analysis, so we examined possible impact of short data duration by comparing the average series between all stations and those stations without short durations of data. We found a weak impact on the trends on longer than decadal timescale (Fig. R1), which does not change the results in the main text. This information has been added in Section 3.3: Noted that the average of the 9 stations excluding Väderöbod, Torslanda, Visby and Kalmar stations due to short data availability also yields similar results as shown below.

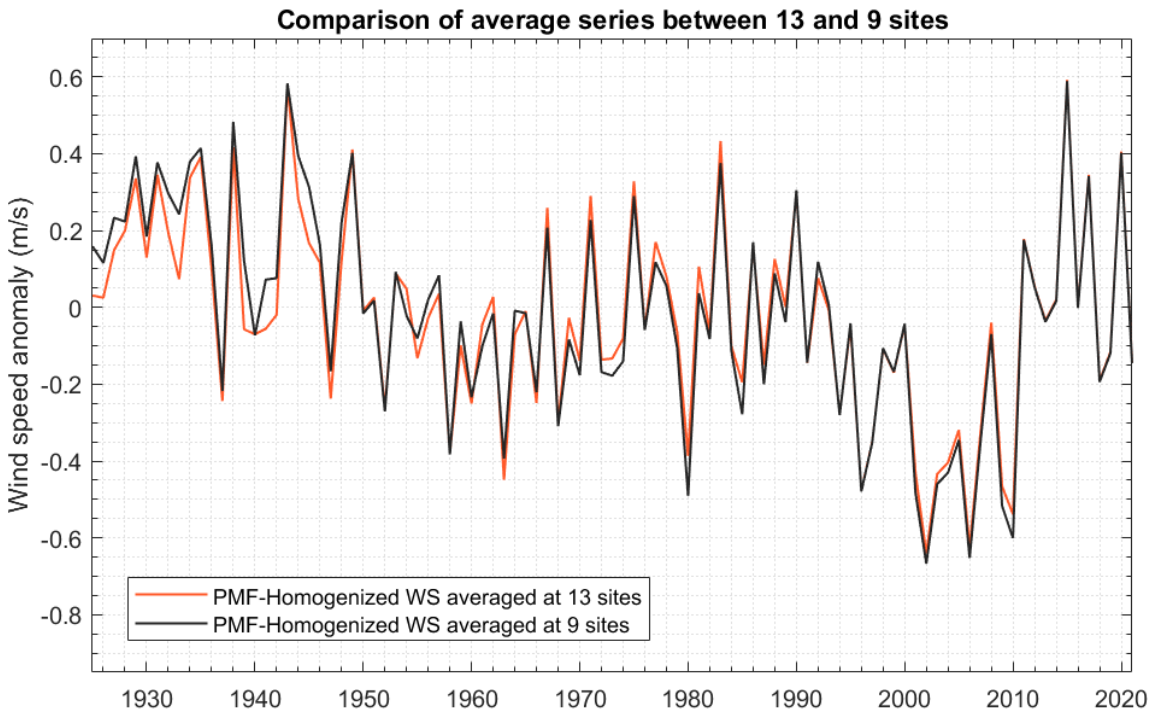

Fig. R1 Comparison of average wind speed anomaly series between two groups with the 13 and 9 stations shown in Figure 5. The four stations, i.e., Väderöbod, Torslanda, Visby and Kalmar, were excluded in the second group due to short data availability.

4) Comment: In Figure 6, the authors could also add the results of geowind, which could help the readers recognize the wind speed changes under the influence of internal variability.

Response: As suggested, we have added the geowind series in the new Figure 6 to show the signal of internal climate variability, along with the NAO index. An explanation has been added in Section 5 to help explain the role of internal climate variability: Geowind series mainly reflects the signal of internal climate variability and their average at these 13 stations presents basically consistent decadal variations with the NAO index (Fig. 6), implying that wind speed of these stations may be mainly affected by NAO on the decadal timescale.

Replies to Reviewer Comments (RC2)

General Comment: The paper entitled " HomogWS-se: A century-long homogenized dataset of near-surface wind speed observations since 1925 rescued in Sweden" deals with an interesting topic that can be certailny of interest for the audience of ESSD journal.

However, in my opinion, the current version of the manuscript is lacking in some details and analysis and should be reconsidered for publication after a major revision. As a general comment, the manuscript is well organized and the english language is fine, although minor spell check are required.

Response: Thank you for spending valuable time on reviewing our manuscript and providing constructive comments. Following your suggestions, we have shortened the abstract, added more details and made further language checks carefully, which greatly improves the readability of our manuscript. Below please find our point-by-point responses to your comments.

Specific Comments:

1) Comment: The abstract is a bit long. Please reduce its size and avoid the use of acronyms. Moreover, some methodological details can be removed or shortened.

Response: As suggested, we have reduced the use of acronyms and removed the methodological details. The abstract is about 250 words and look better now, thanks!

2) Comment: In the Section 2.1, the authors should provide more details about the raw data, as well as a more comprehensive description of the study area from geogrpahical and climatic points of view. As an example, they miss important details about the time resolution of the data and about the data availability of each station. Probabily, the latter information can be indirectly deduced from Figure 5, but specific details are required.

Response: As suggested, we have added more descriptions of the raw data and study region in Section 2.1 and added an elevation map in the new Figure 1.

Added details in Section 2.1: Sweden shows an overall topographic feature of being low in the southeast with hills and coastlines and high in the northwest with Scandinavian mountains (Fig.

1). Sweden consists of three main climatic zones: a mild oceanic climate in the south, a humid continental climate in the middle and a cold sub-Arctic climate in the north (Chen and Chen, 2013).

3) Comment: At line 125, please justify the choice of 10 days as threshold to exclude or retain a determined month from a time series. I think that this is a very low threshold.

Response: The choice of 10 days is widely adopted in many climate studies to include as much data as possible (e.g., Conway et al., 2022; Zhou et al., 2021; Waliser et al., 1999). Figure R2 shows that if this threshold increases to 25 days per month, it will remove only 1% of the months. This information has been added in Section 2.1: Noted that if this threshold increases to 25 days per month, it will remove only 1% of the months.

References:

Conway J P, Abermann J, Andreassen L M, et al. Cloud forcing of surface energy balance from in-situ measurements in diverse mountain glacier environments[J]. The Cryosphere Discussions, 2022: 1-35.

Zhou L, Tian Y, Wei N, et al. Rising Planetary Boundary Layer Height over the Sahara Desert and Arabian Peninsula in a Warming Climate[J]. Journal of Climate, 2021, 34(10): 4043-4068.

Waliser D E, Shi Z, Lanzante J R, et al. The Hadley circulation: Assessing NCEP/NCAR reanalysis and sparse in-situ estimates[J]. Climate Dynamics, 1999, 15(10): 719-735.

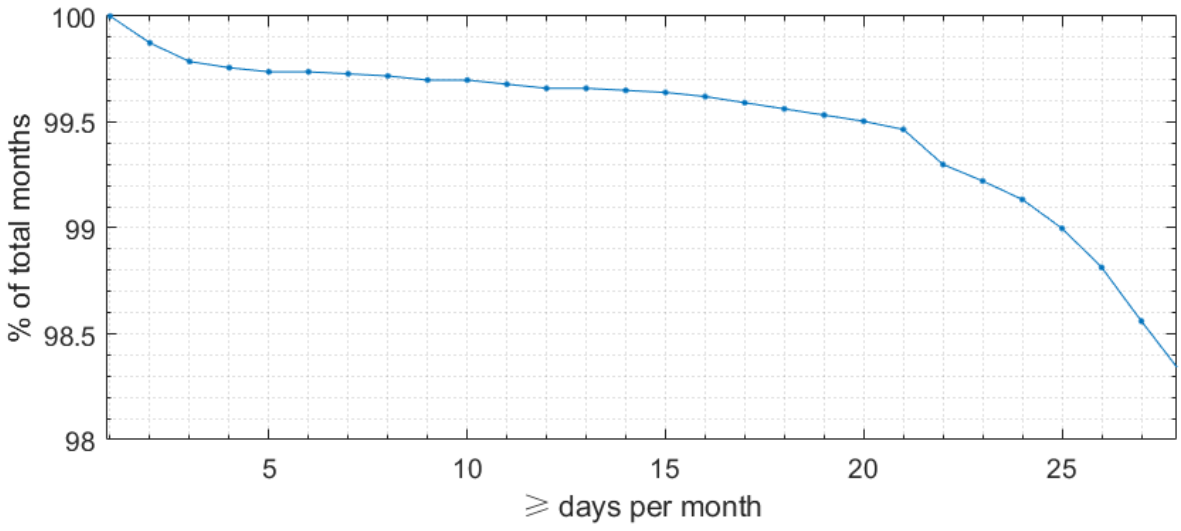

Fig. R2 Percentage of total months as a function of the number of days with data per month.

4) Comment: It is not clear if the considered anemometric data consist only of wind speed observations or also of wind direction measurements. Please clarify this point.

Response: The rescued data consist of wind speed and direction. This study is focused to only homogenize raw wind speed series to provide century-long data, so that one can examine if there was early wind speed stilling or reversal phenomena. This information has been clarified in Section 2.1.

5) Comment: In the Section 2.3, plase provide more details about the homogenization processes. Did you considered only one time series consisting of monthly anomalies? Did you evaluate the possible impact of seasonality?

Response: Yes, the monthly anomaly series is subject to the subsequent homogenization. First, we have removed the seasonal cycle of wind speed as calculating the monthly anomaly series. Because variability of wind speed anomaly in winter is usually a bit larger than that in summer, we have then tried the homogenization on individual monthly anomaly series, and obtained the same results. Third, the PMF and PMT tests both consider series autocorrelation as detecting a change-point. In all, the seasonality has no impact on the homogenization in this study. The above information has been added in Section 2.3:

Both tests consider the effect of series autocorrelation in the detection of change-points.

The above procedure was also conducted on individual months and yielded similar results.

6) Comment: About the monthly anomalies, what is reference climatological period? Did you consider the 1925-2021 period or a more standard benchmark, such as the 1981-2010 time interval?

Response: Monthly anomalies were calculated relative to the entire data period. This information is given in Section 2.1.

7) Comment: Another "dark point" concerns the reanalysis data used as a reference series. I suggest to describe the processing of these data in more detail. Did you extract from the reanalysis immediately the monthly wind speed anomalies or, for exmaple, the U and V data? Please provide more details.

Response: As suggested, additional information has been clarified in Section 2.2: The reanalysis data of 3-hourly zonal and meridional wind components were downloaded to calculate 3-hourly WS values and then integrate into monthly anomalies.

8) Comment: I suggest to spend more words about the causes of the inhomogeneity found in the investigated wind speed series. What is the impact of the change in instrument type? There many differences between the old mechanical anemometers and the more recent ultrasonic devices, just to introduce a possible discussion about this topic.

Response: As suggested, we have added one paragraph to discuss potential impacts of the instrument changes and aging in Section 5: Due to incomplete metadata and lack of parallel measurements, it's difficult to directly compare these artificial biases. Brázdil et al. (2017) compiled parallel WS measurements between universal anemographs and the Vaisala WAA251 sensor (cup anemometer) or the WS425 sensor (ultrasonic anemometer) during 2000-2016 at two Czech stations and found the universal anemographs on average underestimated WS. Azorin-Molina et al. (2018) designed a 3-year field experiment with paired WS measurements by old and new cup anemometers and found that the old anemometer significantly underestimated WS. These parallel comparisons revealed that the instrument changes and aging could generate change-points in the WS series, and our homogenization can remove these discontinuities to produce the homogenized WS series.

9) Comment: Finally, the authors mentioned a good correlation with NAO index, but they did not prove and document this interesting result with a figure or a table.

Response: The decadal covariance between the NAO and wind speed series is shown in Figure 6 and a discussion with previous studies is seen in Section 5: Overall, the homogenized WS series during 1925-2021 presented a stronger correlation with the North Atlantic Oscillation (NAO) than that of the raw WS series (0.54 vs 0.29). Geowind series mainly reflects the signal of internal climate variability and their average at these 13 stations presented basically consistent decadal variations with the NAO index (Fig. 6), implying that wind speed of these stations may be mainly affected by NAO on the decadal timescale. This improved relationship with NAO confirms and extends the result of Minola et al. (2016) and Minola et al. (2021) using the data after 1956 in Sweden.