Referee 1: The authors present their approach and results very clearly and, as far as this reviewer is aware, no one else has carried out similar research. However, in my opinion, the results are very meagre and of very limited use. While I could imagine some popular science journalist using these results to say, for example, "the aurora of (name your year) was so spectacular that it was seen as far south as Spain," but I cannot imagine a scientist making use of these sparse records.

Authors: Thank you very much for your comments. Indeed, no one has yet read the entire collection of the newspaper "Extremadura" looking for news of interest from the point of view of Earth Physics.

However, we do not share the referee's opinion that our results are "very meagre and of very limited use". While it is true that our data are "sparse records", the emphasis of our work lies in the enormous effort of working with a huge number of newspaper pages looking for news of interest to geophysicists. In our opinion, the results obtained from this effort, whatever they may be, deserve to be published so that no other research group wastes time again in reviewing this newspaper. Moreover, we can imagine a scientist using some of our data. Just imagine someone studying one of the geomagnetic storms that have occurred since 1923 wanting to verify if there is an observation in the newspaper "Extremadura". Likewise, a social scientist who wants to study the impact of geomagnetic storms on public opinion during the 20th century will surely find in our work a source of data of considerable value. We are therefore convinced that our work can be published in HGSS. In any case, we have made some improvements in our manuscript to emphasize these aspects.

In particular, we have included a new paragraph in the final part of the introduction section showing some of this point of view:

"Despite the scarcity and dispersion of data on auroras in a local newspaper such as "Extremadura", which provides information from a low-latitude region where these phenomena are unlikely to occur, this effort is both valuable and necessary. Research on major geomagnetic storms can utilize these records to confirm whether auroras were observed in a region as Extremadura. Furthermore, these data may be of particular interest to social scientists seeking to examine the impact of geomagnetic storms on public opinion throughout the 20th century".

Referee 1: One newspaper's accounts of the aurora might shed some light on the extent of that newspaper's science coverage but without extensive comparison with other newspapers, this reviewer is hard-pressed to know if the coverage in "Extremadura" is out of the ordinary. One cannot say if the attention given to the aurora by this newspaper is sporadic, but I doubt that the reports are based on regular nightly observations. In any case, there are only "12 news items including specific descriptions on direct aurora observations" and "the 19 news items of general reports" are selective and of no statistical use.

Author: Thank you very much for these comments. It was not our initial goal to make a comparison with other newspapers although we acknowledge the value of providing a broader context for our work. In any case, this is possible since Prof. Odenwald has performed similar research using other newspapers. In fact, our manuscript already includes notes referencing his work to highlight additional coverage made by other journals of the auroral events we discuss. In any case, we are willing to make this major change suggested by referee #1. Therefore, we have included in the conclusions section this sentence: "A simple comparison with the works by Odenwald (2007, 2021) allows us to conclude that the coverage in the "Extremadura" newspaper is not out of the ordinary".

Obviously, newspapers do not publish news items based on regular nighttime observations. However, we think that this is not a problem for drawing conclusions about the attention paid to the aurora by "Extremadura". In fact, it reflects the sporadic but significant interest in such rare phenomena. Therefore, we have included in Section 2.3 (data description) the following sentences to explain these facts: "General newspapers as "Extremadura" do not publish news items based on regular nighttime observations. However, this is not a disability for drawing conclusions about the attention paid to the aurora by "Extremadura". In fact, it reflects the sporadic but significant interest in such rare phenomena in this region".

We respectfully disagree with the comment by referee #1 (there are only "12 news items including specific descriptions on direct aurora observations" and "the 19 news items of general reports" are selective and of no statistical use "). We believe that it does not take into account either the enormous work done to locate these news

items or the geomagnetic latitude of the Extremadura region which is low enough for the aurora to be a very rare phenomenon. First, the identification and analysis of 31 auroral reports (12 specific observations and 19 general reports) required a lot of time and effort by several people, given the large archive of records that were reviewed. Secondly, the low frequency of the phenomenon in latitudes as Extremadura is compatible with the low number of news items, of course. Therefore, we have included a new sentence in the introduction section (third paragraph) to clearly stablish these aspects: "In any case, we note that aurora observations are quite rare from the Iberian Peninsula in general and from the Extremadura region in particular".

Respectfully, we also disagree with referee#1's comment about the impossibility of using these data from a statistical point of view. It is true that there are few direct observations, but they are consistent with what we expect for a region like Extremadura. These new localized records can be also used, for example, to complement other sets of auroral data to reconstruct the spatial extent of specific auroral events. We highlight that there is currently no series of northern lights observed from the Iberian Peninsula during the 20th century, except for the data presented in this manuscript. Maybe, this approach is not clear enough in our manuscript. Therefore, we have included a new sentence trying to clarify these aspects (Section 3, first paragraph): "We emphasize that there is currently no series or catalogue of aurorae observed from the Iberian Peninsula during the 20th century, except for the data presented in this manuscript".

Referee 1: The period of time covered, 1923-2017, is during a time of well documented observation by meteorological observers, especially those who set up all-sky cameras to record the aurora systematically and regularly. For the last 60 years, solar activity and the aurora have been monitored from space.

Authors: It is absolutely true that meteorological records have existed in Extremadura since the 19th century (Vaquero et al., 2022). But, to the best of our knowledge, (i) night-time meteorological observations are not common and (ii) there are no cameras covering the entire sky to record auroras systematically and regularly in Extremadura (and in early times such as 1923 this type of

instrumentation did not exist). Therefore, we have included some sentences in section 2.3 (Data description) to include these important notes: "There are meteorological records in Extremadura from the 19th century (Vaquero et al., 2022) that could potentially contain observations of auroras to compare with the data offered in the newspaper. However, as far as we know, (i) nocturnal meteorological observations are not common and (ii) there are no cameras that cover the entire sky to record auroras systematically and regularly in Extremadura (and in early times such as 1923 this type of instrumentation did not exist)". Obviously, we have added the reference (Vaquero et al., 2022) in the reference list.

On the other hand, it is evident that during the last decades solar activity and auroras have been monitored from space. But this monitoring does not cover 100 years and, ultimately, data redundancy is always welcome from a scientific point of view. Therefore, we think that these facts should not prevent the publication of our manuscript.

Referee 1: As far as the methodology is concerned, doing a word search on "aurora" could omit accounts using other words if, for instance, there is a Spanish equivalent of "northern lights."

Authors: Thank you for this comment. Maybe, it is not clear enough in our manuscript but, in fact, a systematic search was carried out with more than a dozen key words (of geophysical interest). In particular, there is also the expression "Luces del Norte" in Spanish, but its use is very limited compared to the common term "aurora". In journalistic language the word that is always used is "aurora". Other words that have been included in the systematic search are also useful to search for auroras as "phenomenon". Thanks to this systematic search for terms of geophysical interest, our team has located, for example, a super-bolide (Vaquero et al., 2023), the fall of a meteorite (Vaquero et al., 2024) or an exceptional month of electrical storms that caused considerable damage (Acero et al., 2024). Of course, we have modified our manuscript to better explain these aspects.

We have included in the Section 2.2 the following sentences to explain our systematic search: "… Once the documentary sources were collected in digital format (pdf

format), a search using character recognition with more than a dozen key words (of geophysical interest) for the "Extremadura" newspaper. Thanks to this systematic search for terms of geophysical interest, our team has located, for example, a super-bolide (Vaquero et al., 2023), the fall of a meteorite (Vaquero et al., 2024) or an exceptional month of electrical storms that caused considerable damage (Acero et al., 2024). Regarding aurora events, we found 31 news articles including information on them". Obviously, we have included these references (Vaquero et al., 2023; Vaquero et al., 2024; Acero et al., 2024) in the reference list.

Moreover, we have included two new sentences about the searched terms in our work in the section 2.2 (Location of news of interest): Note that there is also the expression "Luces del Norte" (Northern Lights in Spanish), but its use is very limited compared to the common term "aurora". Moreover, other words that have been included in our systematic search are also useful to detect news about auroras as "phenomenon".

References

Acero, F.J., M. Antón, A.J.P. Aparicio, N. Bravo, V.M.S. Carrasco, M.C. Gallego, J.A. García, I. Tovar, J. Vaquero-Martínez, J.M. Vaquero (2024) "The anomalous thundery month of June 1925 in SW Iberia: description and synoptic analysis" Natural Hazards and Earth System Sciences 25, 305–320, https://doi.org/10.5194/nhess-25-305-2025.

Vaquero, J.M., N. Bravo-Paredes, M.A. Obregón, V.M.S. Carrasco, M.A. Valente, R.M. Trigo, F. Domínguez-Castro, J. Montero-Martín, J. Vaquero-Martínez, M. Antón, J.A. García, M.C. Gallego (2022) "Recovery of early meteorological records from Extremadura region (SW Iberia): the "CliPastExtrem" (v1.0) database" Geoscience Data Journal 9, 207-220. https://doi.org/10.1002/gdj3.131.

Vaquero, J.M., I. Tovar, M.C. Gallego (2023) "A Possible Superbolide Over Don Benito (Spain) in 1926 December 27" Research Notes of the American Astronomical Society 7, 208. https://doi.org/10.3847/2515-5172/acfe77.

Vaquero, J.M., C. Sánchez Romero, L. Díaz-Condiño, M.C. Gallego (2024) "A Possible Meteoric Fall in Cabeza la Vaca (Spain) in 1970 January" Research Notes of the American Astronomical Society 8, 57. https://doi.org/10.3847/2515-5172/ad2dee.

Referee 2: This article examines records of auroras in the Spanish newspaper *Extremadura* from 1923 to 2017. By analyzing 31 news reports, the article reveals both direct observations and general reports of auroras, covering several major auroral events. The study makes full use of nearly a century of news records, providing a detailed historical perspective on auroral events and highlighting the value of historical newspapers as a source for reconstructing solar activity and its impact on Earth. By linking auroras to solar activity, it provides important supplementary data for solar activity research, especially concerning space weather studies in Spain and surrounding areas.

Authors: We appreciate the time and effort made by the referee as well as the comments and suggestions, which will help us to improve our manuscript. Below, we address the referee's comments in detail and describe the changes that will be made to the manuscript.

Referee 2: Major Comments：

1. Reanalysis of Auroral Data:

- The authors emphasize the importance of auroras for solar activity research but lack sufficient validation. It is recommended to compare several auroral records with solar activity indices (such as sunspot numbers, F10.7, etc.) or geomagnetic activity indices to observe whether they reflect extreme solar activity and discuss the indicative significance of auroras. Currently, it appears that the intervals between the first three auroral occurrences are 12 years, which could reflect the solar activity cycle.

Authors: Thank you for this comment. We have contextualized solar activity around aurora events providing data such as those from the official sunspot number index provided by SILSO and geomagnetic indices such as the Kp (provided by the GFZ Helmholtz Centre for Geosciences since 1932) and Dst index (provided by World Data Center for Geomagnetism from Kyoto or that estimated for those events before 1957 if possible). We have added new text in the manuscript on the Dst and Kp index of each storm (if available). Please, revise the new text in red. Moreover, we have included a new figure (Figure 7) to discuss the potential relationship between the timing of the auroral events and the solar activity cycle. These comparisons clarify

the importance of auroras as proxies for solar activity. We have incorporated the following text as well (Conclusions, second paragraph):

“"Extremadura" is a Spanish regional newspaper established in 1923, covering local to international news with a focus on Extremadura. In addition to print, it publishes digital content across various sections. For this study, all the issues since its inception were collected digitally. A search for news items on auroras yielded 31 results. These articles are categorized into direct observations (12) and general reports (19). The former includes historical aurora events from 1926 to 1991, while the latter covers scientific research, explanations of aurora formation, and reports on aurora-related scientific missions and expeditions. Figure 7 shows the relationship between the sunspot number evolution and the occurrence of the auroras reported by “Extremadura”. One can see that the auroras reported by “Extremadura”. The analysis reveals that the aurora observations occurred around the maximum of solar cycles, specifically during the peaks of Solar Cycle 16 to 19 and Solar Cycle 22. We highlight the importance of auroras as valuable historical proxies for solar activity”.

Referee 2: 2. Expand Research Data and Supplement Necessary Figures:

- In addition to auroral events, the locations where auroras occur are also important. Comparing or linking multiple locations can reflect the strength of auroras, further indicating the intensity of geomagnetic storms. The article mentions many locations of auroral reports in newspapers, but readers may be unfamiliar with these places. It is suggested that the authors search for reports of the mentioned auroral events worldwide. Finally, a map could be provided to visually display the distribution of these auroral events, thereby quantitatively assessing the strength and impact range of several auroral events.

Authors: We agree that location data can provide valuable information into the strength of auroral events. Therefore, we will include a map showing all the locations of the auroral observations mentioned in the newspaper records and add other locations from other sources. We will use different colors to identify each aurora event. Thus, we will quantitatively assess the strength and impact range of these auroras.

In addition to the map (new Figure 1), we have included the following text in the manuscript (Section 3):

“In this section, we describe and analyze the news articles containing specific information on aurorae published in “Extremadura”. A summary of the descriptions can be found in Table 1. Furthermore, Figure 1 shows a map including the location mentioned in “Extremadura” where auroras were observed…”.

Referee 2: 3. Detail of Research Methods:

- The description of data collection and analysis methods in the article is rather brief. It is recommended to add detailed steps on how keyword searches, data filtering, and classification were conducted, as well as the criteria for defining auroral events, to enhance the reproducibility and transparency of the research.

Authors: We understand this comment. We will expand the methodology section to include a more detailed description of our data collection process. It will improve the reproducibility of our study. Please, see the new text in Section 2.

Referee 2: - Considering that auroral phenomena might not be reported with the explicit term "aurora," it is suggested to check if there are possibilities of using other terms (such as "like fire," "red clouds," etc.) to describe auroral phenomena, which is common in many ancient records.

Authors: We agree with this observation and acknowledge that auroral phenomena might have been described using alternative terms. Thus, we will include more information on the different terms used to carry out this work such as was previously described in detail to a comment by referee 1. In any case, please, see the new text in Section 2.3.

Referee 2: Minor Comments：

1. Literature Citation:

- Some cited literature is relatively outdated. It is recommended to supplement with the latest relevant research to ensure the study remains at the forefront.

Authors: Thank you for this comment. We have included more references on recent studies on historical auroras, solar activity, and geomagnetic storms to improve the state of the art in our manuscript.

Referee 2: 2. Analysis of Event Impact:

- The analysis of the social impact of auroral events is rather superficial. It is suggested to explore in depth the specific impacts of these events on local society, economy, and scientific research.

Authors: This is an interesting comment. We have searched for more information on the impact of the events on the local context. Unfortunately, we did not find many new information from "Extremadura" on the impact of these events on Extremadura society. Some few information was found about the events of 1950, 1957, and 1991. We have included this new information in Table 1, as well as throughout the text. To provide more information on the social impact of these events, we have searched for information in Spanish newspapers. We have incorporated additional details on this point into the discussion section.

Referee 2: By addressing these issues, the article will be more convincing and scientifically valuable. I hope the authors will consider these suggestions to further improve the study.

Author: By addressing the referee's comments, the revision has improved the quality and impact of our manuscript. We thank the referee once again for the valuable feedback.