

Barcelona, 2025, January 23rd

Dear Editor,

Please find attached the corrected version of our paper entitled “SedDARE-IB: An open access repository of sediment data for Iberia and its continental margins”, following the insightful comments and suggestions provided by the reviewers.

We have addressed all the reviewers' comments thoroughly, as detailed below. For your convenience:

Minor Comments: All minor revisions have been clearly marked in the track-changes version of the manuscript. In the responses to reviewers, we have indicated the specific lines where each modification can be found.

Major Comments: For the major comments, we have rephrased and revised the corresponding paragraphs of the manuscript to ensure clarity and alignment with the reviewers' suggestions. These revisions are also highlighted in the track-changes version and referenced in the response letter for easy navigation.

We are confident that these revisions have strengthened the manuscript, and we appreciate the constructive feedback that has guided us through this process.

Please let us know if there are any additional steps required on our part.

Sincerely,

Montserrat TORNE

RESPONSE to REV 1

The manuscript titled "SedDARE-IB: An open access repository of sediment data for Iberia and its continental margins" by Torne and co-authors, presents the SedDARE-IB database, which includes available data of the depth to the Base Cenozoic and Top Paleozoic stratigraphic markers for the Iberian Peninsula and surrounding Western Atlantic and Mediterranean Neogene basins, or to the acoustic basement as interpreted for the Valencia Trough and Alboran Mediterranean basins. Very interesting, the authors also assess the effect of sediment thickness on the depth to the 150°C isotherm (commonly used in geothermal exploration) at specific basins, as an example of the broad applicability of the data included in SedDARE-IB. The manuscript is well-written, and the sections are well structured. I collectively categorize my review as "minor revisions" and look forward to seeing the paper published at Earth System Science Data (ESSD) after some small edits – see below.

We greatly appreciate the reviewer's valuable comments, which have significantly contributed to improving the manuscript. Minor edits have been incorporated into the revised version of the paper. Responses to other comments are provided below.

Minor Edits:

Probably an effect of the template. It would be useful for the reader to increase the size for all figures to 1.5 column or double column (full width), as well as its resolutions (see some comments below).

L80. Figure 1: Please change the label to "Tagus Basin" for clarity. **Done (Refer to the upgraded Fig. 1)**

L230 Figure 3: Caption. **Done (Lines 249-250).**

Please revise the sentence "Base Cenozoic marker." (See below) **Done**

L324. García-Lobón et al. (2010a). **Done (Line 345)**

L353. García-Lobón et al. (2010b). **Done (Line 355)**

L353. García-Lobón et al. (2010b). **Done (Line 375)**

L377. Change to "the reader is referred to García-Lobón et al. (2010d)." **Done (Line 399)**

L384. García-Lobón et al. (2010a). **Done (Line 407)**

L395. Carvalho et al. (2005, 2017). **Done (line 419)**

L399. (Carvalho et al., 2017). **Done (Line 422)**

L410. "Exceptions are the Valencia Trough and the Alboran Basin, where the basement marker corresponds to the Base Cenozoic marker or the so-called Oligocene unconformity." Add this paragraph in the caption of Figure 3? See my previous comment above. **Done (Lines 435-436)**

L499-504.

L501. "Considering surface heat flow values ranging from 40 to 120 mW/m²": from Fernández et al. (1998) and IHFC (Fuchs et al., 2023)? Please add some references for the different parameters for context. **Done (Lines 533-534)**

The authors assume a crustal thermal conductivity of 3.1 W/m K for the crust. However, I think this value is very high. The authors could consider a thermal conductivity of 2.5 W/m K. Or it would be supportive if the authors provided a statement about the relative importance of thermal conductivity of the crust; its control over the critical threshold? Probably the main control is the own sediment thickness.

We have completely rewritten the paragraph, as indicated in our response to the reviewer (Lines 539-553).

About Figure 7. Please see my comment above about the figures. The authors could consider to present these results as subplots 2x2. On the other hand, I think it would help the reader a great deal if the labelling on the panels were improved. **Done. We have reformatted the figure as subplots 2x2 (See updated Fig. 7).**

RESPONSE to REV 2

The main objective of this short and well-illustrated paper is to present the open access database for sedimentary basins of Iberia and also its offshore basins, SedDARE-IB. This important database appears to include only Mesozoic and Cenozoic sedimentary successions (i.e., no Paleozoic or older sediments). If so, it would be useful to explicitly state this. The paper also presents maps of depth to base Cenozoic and Top Paleozoic stratigraphic markers. These maps are rather small and could be presented to greater advantage by filling the full page. The paper briefly describes the geological characteristics of the major onshore and offshore Iberian basins. Some attention is needed to complete and harmonize the data provided for each basin. An illustrative modelling of depth to the 150°C isotherm is presented with intriguing results, which require a clearer explanation. But I think this has already been addressed.

We greatly appreciate the reviewer's valuable comments, which have significantly contributed to improving the manuscript. Minor edits have been incorporated into the revised version of the paper. Responses to other comments are provided below.

I recommend publication with minor revisions.

“This important database appears to include only Mesozoic and Cenozoic sedimentary successions (i.e. no Paleozoic or older sediments)”.

The referee is right, the presented database includes only Mesozoic and Cenozoic sedimentary successions because, to date, there is no globally available information on Paleozoic or older sediments at the scale of Spain, aside from a few localized studies. Additionally, there are no recognized Permian strata in Portugal, nor are such strata present in the conjugate margins of Newfoundland and Nova Scotia. Post-orogenic sedimentation appears to have commenced only in the Norian stage, well into the Triassic. Beneath this, there exists only the Variscan metamorphic basement.

More detailed comments.

Line 42: replace ‘rocks sourcing them’ with ‘rockes in source areas’ **Done (Line 43)**

Line 45: replace ‘whose detailed knowledge’ with ‘a detailed understanding of which’ **Done (Line 46)**

Line 52 replace ‘is instrumentale for’ with ‘contributes to’ **Done (Line 53)**

In the introduction it would be very useful to indicate the range of ages of the sedimentary succession in the database.

In response to the referee's suggestion, we agree that including age ranges would add significant value to this information. However, due to the substantial variability in ages, we have opted to

incorporate the reported ages directly within the corresponding chapter, as detailed below. Additionally, we have slightly modified the text regarding Table S1 to clarify that it includes the minimum, maximum, and average thickness ranges. The revised text reads as follows: “The data included in SedDARE-IB are summarized in Table S1, which details the primary sources of the data, the geological areas covered, and key attributes such as the minimum, maximum, and average thickness ranges, and key references associated with the datasets”. (Lines 80-83)

Line 68: replate ‘the applicability of’ with ‘the potential uses of’ Done (Line 69)

Line 104: replace ‘at c 156 Ma’ with ‘starting at c 156 Ma’ Done (Line 107)

Line 107: replace ‘at about 118 Ma’ with ‘starting at about 118 Ma’ Done (Line 111)

Line 114: replace ‘salt-related’ with ‘salt-rich’ Done (Line 118)

Line 130: replace ‘occurrence’ with ‘development’ Done (Line 134)

Section 2.2.1 Ebro Basin: Need to state clearly that this is a foreland basin.

In the title and first line of the section, we specify that the Ebro Basin is a foreland basin (Lines 150, 151, 154 and 162)

2.2.2 Duero and Basque-Cantabrian basin: give thickness range, age range of sedimentary fill. Is this a foreland basin?

We have added a sentence specifying ages and average sedimentary thickness (Lines 177 – 178)

Regarding the question about the type of the Duero Basin, we have slightly modified the text. Now it reads: “The intermontane Duero Basin” (Line 170).

2.2.3: give clear information on thickness range, age range of sedimentary fill.

Lines 195-196

2.2.5: This section is quite unlike the other basin descriptions. It describes the tectonic features and evolution of the Guadalquivir Basin but there is little information about the basins sedimentary fill. Would be good to give the same information for this basin as for the others.

The new text reads as follows “The Guadalquivir Foreland Basin, located in the southern part of the Iberian Peninsula and spanning c. 57,000 km², is a foreland basin bounded to the north by the Iberian Massif and to the south by the Betic Cordillera, which continues into the Rif Chain of northern Africa. Like the westernmost part of the Betics, it was influenced by post-Cretaceous tectonic movements between Africa and Eurasia. Studies suggest significant N-S convergence to have affected the Guadalquivir Basin from mid-Oligocene to the late Miocene, followed by WNW-directed oblique convergence until the present day (Macchiavelli et al., 2017). According to Barnolas et al. (2019) and references therein, the basin can be divided into two zones. The northern one is filled with autochthonous sediments, whereas the southern zone also contains chaotic masses of Mesozoic and Cenozoic allochthonous materials that slid from the Subbetic units during the late Miocene compression in the external Betics. The autochthonous sedimentary infill comprises six Miocene seismic-stratigraphic sequences, ranging in age from the middle Miocene (the late Langhian-early Serravallian) to the late Miocene (Messinian). Overlying these Miocene sequences are Pliocene-Quaternary strata that record

westward sediment progradation along the basin axis (Berástegui et al., 1998). The southern margin of the basin involves several salt diapirs, with Triassic evaporates in their cores, which were tectonically compressed during the Cenozoic. These diapirs form multiple frontal imbricate wedges. The frontal imbricates involve late Serravallian to late Tortonian sediments (sequences 3 to 5, as described by Berastegui et al. (1998). In particular, Sequence 6, which spans from the late Tortonian to the late Messinian, clearly postdates all the structural features. This indicates that significant shortening in the External Betics was concluded by approximately 6.3 Ma (Messinian). Tectonic activity, including normal faulting at basement level, occurred during early to middle Serravallian times. The basin primarily originated through orogenic wedge accretion along its active southern margin, with flexural subsidence propagating towards the foreland basin per se (García-Castellanos et al., 2002). The Guadalquivir Foreland Basin depocenter is 600 km thick in the east but is up to 100m thick in its western region. Readers are directed to the work of Civis et al. (2004) and Barnolas et al. (2019) for further detail on the basin's sedimentary infill and evolution” Lines 220-245.

Line 215: replace ‘Similarly to’ with ‘Like the’ or ‘With the’ Done (Line 222)

Line 221/ replace ‘comprises’ with ‘involves’ Done (Lines 230 and 234)

230: suggest completion of sentence ‘of the Acoustic Basement marker for most of the Western Mediterranean region, which is equivalent to the Base Cenozoic marker’. Reprased (Lines 247-250)

Line 251: Estremadura Spur – needs to be shown on a figure. Done (See upgraded Fig. 1)

Line 259: outer shelf should read inner shelf? Outer shelf is correct.

259-260: Present day? sediment composition on the shelf varies with water? Varies with depth. We have slightly modified the sentence “Sediment composition on the shelf varies with depth” (Lines 278-279)

Line 275: shallow marine and shelf break limestones ... what is the age of these sediments?

The shallow marine/shelf-break deposits are of multiple ages. The dredges have sampled Jurassic to Miocene shallow marine units in proximal parts of the Alentejo Basin, in multiple locations. Therefore, it is not possible to assign a specific age to these strata.

Line 279: Setubal and Sao Vicente – these localities need to be shown on a figure Done (See upgraded Fig. 1)

Line 288: Replace ‘Neo-Tethys’ by ‘Atlantic’??

We have slightly modified the text; it now reads "Neo-Tethys/Atlantic," as there is no consensus among authors. While some consider "Atlantic" acceptable, others advocate for the presence of the Neo-Tethys. Line 308.

Line 291: add: Carboniferous basement rocks of the SP2 zone (Fig.1b) We are uncertain about the reviewer’s comment, as it is not our intention to present the prevalent lithologies of the different Iberian Massif Zones. Such an analysis is out of the scope of this paper. Our aim is solely to assist the reader in locating the study area by listing and identifying the various zones that constitute the Variscan Iberian Massif.

Line 292: I would say the Guadalquivir basin lies to the SE of this basin? – Also I’m wondering if it makes sense to make this statement as the Guadalquivir basin did not exist when the rift forming?

In this context, we specifically refer to the Guadalquivir Bank rather than the Guadalquivir Basin. Within the framework of the Algarve Basin, the Guadalquivir Bank represents a key geological feature, serving both a structural boundary and a depositional element. The Algarve Basin contains a diverse and extensive stratigraphic record, encompassing sedimentary sequences ranging from the Jurassic to the Cenozoic. These sequences capture significant geological events, including major episodes of rifting, subsidence, and subsequent compressional deformation.

Between Lines 300 and 309 – clarify and harmonise the ages given for the development phases of the Algarve basin.

We have slightly revised the original text. The modified paragraph now reads as follows (Lines 319-330):

“Sedimentation continued through the Mesozoic and was characterized by the accumulation of alternating carbonate and siliciclastic units, indicating shallow marine to continental environments. It was interrupted in the Cretaceous by tectonic inversion resulting from oblique convergence between northwest Africa and Iberia, causing important depositional hiatuses and unconformities. The oldest offshore Cenozoic deposits in the Algarve Basin are dated as Paleocene to Oligocene, lying unconformably over folded Lower Cretaceous strata (Terrinha, 1998; Lopes et al., 2006; Roque, 2007, Matias, 2007).

In summary, Cenozoic strata overlay folded and thrust older units, suggesting that tectonic inversion occurred predominantly after the Cenomanian and lasted until the late Oligocene-Aquitainian. Nevertheless, present-day compression is still recorded in the Algarve Basin, being NW-SE oriented and, driven by oblique collision between northwest Africa and southwest Eurasia (Ribeiro et al., 1996).”

Line 358: replace ‘differing’ with ‘new’? Done (Line 380)

Line 385: replace ‘limitations in terms of’ with ‘limited’ Done (Line 411)

Line 397: replace ‘was’ with ‘were’ Done (Line 420)

Figure 5 locate Valentia trough and Alboran Sea on the map.

In the figure caption, we have added “See Fig. 1 for location” (Line 435)

Figure 5: Figure caption. I find the term ‘Paleozoic-cover sequence boundary’ unclear compared with ‘top of Paleozoic basement’. Im not sure I understand why you need to make this distinction?

Corrected: We have removed all references to “marker” and slightly rephrased the caption in accordance with Rev # 1 comments.

Figure 5: in caption replace ‘discordance’ with ‘unconformity’ Done (line 436)

420: correct positions of brackets **Done (Line 444)**

437: replace ‘comprise’ with ‘provide’ **Done (Line 462)**

479: replace ‘it serves’ by ‘it is identified’ **Done (Line 504).**

Section 4 – influence of sediment thickness and nature on geothermal potential – Your response to the first reviewer has answered my request here to provide a clearer explanation of the model results.

Text has been corrected. See paragraph - lines 521 to 534

Figure 7: You plot values for various basins but it is not clear how there data were gathered. A deeper discussion of their significance would be helpful to illustrate the relevance of your models.

We have now included the most relevant references for the sources of thermal data (lines 535-536). Additionally, the revised text clarifies that constant values were used for the thermal conductivity and heat production of the crust. The analysis incorporates the measured heat flow at each study point, with the thermal conductivity of the sediments being the only variable. This parameter was adjusted within a plausible range to illustrate how variations in conductivity can influence the depth of the 150°C isotherm

Line 503: ‘other parameters considered ‘... Are these input parameters that are held constant in all the models?’

We have slightly rephrased the text. Now it reads “Other parameters considered were a **constant** crustal thermal conductivity of 3.1 W/mK and a **constant** mean surface temperature of 15°C”. See lines 537-538.

Line 505 replace ‘concerning.....’ with ‘with varying sediment thickness and surface heat flow and for....’

We have revised the entire paragraph, incorporating the comments from both reviewers (Lines 539-553)

Line 506: four different thermal conductivity values for the sediment’.... It would be very useful for the reader to appreciate the relevance of these values for real sedimentary basins?

Both comments are already included in the new text.

Figure 7. Colour scale for depth to 150°C isotherm is I presume in km? add km to the scale or say in figure caption... **Done (refer to the upgraded Fig. 7)**

Line 541: replace ‘a rise’ with ‘an increase’ **Done (Line583).**

RESPONSE to REV 3

The manuscript entitles “SedDARE-IB: An open access repository of sediment data for Iberia and its continental margin” present a necessary compilation of the subsurface information available in Iberia. The authors have unified and merged different sources, which will be an unvaluable tool for improving the knowledge in a very complex tectonic area. The manuscript is properly written and organized. The quality of the figures is also adequate. However, some comments will be explained in detail. As a general comment for figures, the font size should be increased. I would suggest to the authors to include a map explaining the quality of the data in the different basins. Some additional explanation regarding the results of the modelling will be very illustrative.

I recommend publication with minor revisions.

We greatly appreciate the reviewer’s valuable comments, which have significantly contributed to improving the manuscript. Minor edits have been incorporated into the revised version of the paper. Responses to other comments are provided below.

Detailed comments:

L56: I would suggest Iberian geology rather than Iberia’s geology. **Done (Line 57)**

Figure 1: Tagus Basin to be aligned with the text. **Done. We refer to Tagus Basin throughout the text.**

Figure 1: I am not sure that figure a should be included. The reference appears also in the text, but I am not sure that this approximation enriched the manuscript.

The reason for providing a broad view of the study area is to assist readers who may not be familiar with Iberia in accurately locating it within the westernmost end of the Alpine-Himalayan orogenic belt. We suggest retaining the figure in its current form, as we believe it adds valuable context for the broader audience.

L180: I understand that is difficult to summarize the complete geological history of the region, but nothing is stated regarding the Iberian Range in the text. However, the area is covered by the database.

We appreciate the reviewer’s comment. However, this paper does not aim to provide a detailed summary of the geological history of Iberia. Instead, we refer readers to the comprehensive work of Quesada et al. (2019), which offers an exhaustive analysis of Iberian geology. Our focus is on basins and regions with significant sediment accumulations, and we provide specific references where further details on the geology of these areas can be found. To address the reviewer’s suggestion and avoid confusion, we have replaced 'Iberian System' with 'Iberian Range' throughout the text.

L182: Iberian Range. **Done (Line 187)**

L182: is bordered by the Central System to the north, the Iberian System to the east, and the western sector of the Montes de Toledo to the south. **Done (Line 187)**

L183: Toledo Mountains. **Done (Line 189)**

L185: reference to Muñoz-Martín (1997). **Done (Line 191)**

Figure 3: Please, explains why Galicia margin is not included in the manuscript.?

For the sake of consistency and to keep the manuscript within a reasonable length, we grouped the Galicia Bank and Galicia Basin together with the offshore basins of northwest Portugal under the West Atlantic Margin section. However, to avoid any potential misunderstanding, we have now retitled Section 2.3.1 as 'West Iberian Atlantic Margin', which include the Galicia and the basins of the western coast of Portugal.

L248. Continental slope tilts. **Done (Line 267)**

L370: why the authors do not use the seismic interpretation proposed by Muñoz-Martín and de Vicente (2013). **Reference has been added (Lines 399-400)**

Section 3.1.3: a quality map of the information would enrich the manuscript and clarify to the potential users how reliable is the information in the different areas.

L394: data constrained by gravity and or magnetic data has more uncertainty. This type of information might be included in a quality map.

L405: basement depth estimated via magnetic models. This type of information might be included in a quality map.

In response to the comments related to the “Quality Map” we appreciate the idea and recognize its potential value in enriching the manuscript, however, we would like to respectfully explain why such an inclusion is not feasible within the scope of this study. The database we present in our manuscript has been meticulously compiled from a diverse range of sources, each with its own quality control (QC) procedures. For transparency and to aid readers, we have ensured that references to the original datasets are clearly provided (e.g., along the ms and in Table 1). These references enable readers to access the specific methodologies and QC protocols applied to each dataset. Moreover, whenever possible, we have undertaken cross-checks by comparing data with other available sources to enhance reliability. While this effort has strengthened the dataset’s integrity, creating a precise and comprehensive map of data quality for all included basins would require an extensive and detailed additional analysis. Such an undertaking would involve not only significant time and effort but also the risk of introducing inaccuracies due to the inherent heterogeneity of the datasets and the QC procedures employed by their original creators. We firmly believe that providing a detailed map without the necessary rigor could inadvertently mislead readers, which is something we wish to avoid. Instead, by referencing the original sources and highlighting the cross-checking efforts we performed, we offer a transparent framework for understanding the quality and limitations of the data.

L414: García-Lobón et al., 2020 is not in the references list. **Done. The correct cite is García-Lobón et al., 2020a**

L420: TGS 2001 is not included in the reference list. Is this information publicly available?.

Relevant information on the TGS 2001 is included in Table 1. Since no specific reference exists for this dataset, we have included a reference to Alves (2024) to enhance accessibility for the

reader. This work presents the reprocessed data used to compile the sediment database featured in this study.

Figure 7: very small. Color scale units are missing.

Figure 7: font size extremely small

Figure 7: some of the basins do not appear in the plot and those basins that appear are only mentioned. I believe a more elaborate explanation should be included in the text.

Figure 7 has been reformatted into two-column panels to make the font sizes larger and clearer. It has also been updated based on comments from other reviewers, and the text has been modified according to reviewer's suggestions.

L524: S.I. units $\text{W/m}\cdot\text{K}$ L526: $3e^{(z/10)}$ L526: S.I. units $\mu\text{W/m}^3$. **Done**

$3e^{(z/10)}$: This means that z represents depth in kilometers and that heat production decreases exponentially with depth. Therefore, the expression is correct. We have revised the text to improve clarity (lines 541 and 542). However, we have corrected the mathematical notation to $3\cdot e^{(z/10)}$ to avoid any misunderstanding.