

# Reviewer 1: Comments

## General comments :

This paper presents a new Europe-wide database combining both coastal erosion and flooding information to enable identifying the interactions between these two hazards at large spatial scales. The database builds upon previously existing databases (e.g. EuroSION (2004); Corine Land Cover (2018), etc.), and improves, simplifies, and extends them, while also adding additional information about the presence of structures and other features that constrain coastal evolution. The overall structure of the paper may be clarified by stating clearly the different elements that are considered necessary in such a database. The manuscript describes the different elements and then summarizes the overall statistics. Several details about the different data sources could be added (succinctly!) to clarify the contributions of each data set and to clearly identify the work done here. The paper is well written overall and presents an interesting new data set that may be useful for coastal managers. The specific comments listed below highlight a few questions and a few details that could be added to clarify some points throughout the manuscript.

***Many thanks for your comprehensive feedback and constructive comments that have contributed to clarifying and improving the current manuscript. Taking into account a number of your comments, we have revised the background section to provide a clearer conceptual background to creating the database and its potential benefits. This also provides an improved introduction to Section 3. Similarly, we have restructured the discussion and conclusion to make these more distinct and rephrased text where the aim was considered unclear.***

## Specific comments:

This paper presents the new database, while also relying on a contributions from previously existing databases. This work is worthy of publication, and several points can be addressed to clarify and expand the applications of this work.

Firstly, the introduction suggests the importance of quantitative analyses of erosion and flooding, and the need to generate improved databases to support efforts (e.g. in the CoCliCo project) to map current and future coastal flooding. I would suggest extending the bibliography here by citing other potentially relevant European-wide databases/studies, such as Le Gal et al (2023), Souto-Ceccon et al. (2025), among others. Many additional data sets exist at local and regional scales, so perhaps it is worthwhile (L35) to emphasize the need to produce these datasets on European scales.

The end of the introduction presents the work completed here, and it would be worthwhile to describe more clearly the database that will be presented (e.g. the major components and how this improves upon existing databases). For example, only erosion from EuroSION (2004) and the shoreline position from EEA (2017) are mentioned in L44-48. Table 1 later presents a more complete summary of the different databases used, but it would be useful to present the essential elements in such a database earlier. One approach may be to identify the necessary elements here or to suggest that the necessary elements will be identified in the background section that follows. This may help to structure the following sections of the article and to

create a smooth transition to the background section. (The background section almost feels like it could integrate well in the introduction, but this is a choice to be made by the authors and/or journal concerning the overall format.) Perhaps even a diagram indicating the general elements in the database would be useful at the end of the background so that the overall themes of the database are described early on before additional details are provided. Finally, I would also suggest emphasizing the open source nature of the data (which is implicit, but it doesn't hurt to be explicit about this!)

***After considering your comments and those from RC2, we have revised the background section to better explain the thinking behind the database, including moving Table 1 from Section 3 and creating a conceptual flow diagram to provide a guide for Section 3. We have also highlighted that the data is open source in the text and Table 1.***

At the very end of the introduction, it would be worthwhile to be more specific in the statement "possible developments are also considered." (e.g. limitations are identified in the discussion and suggestions for future improvements are made regarding certain specific aspects?)

***We agree with this comment and the sentence has been revised.***

One of the contributions of this work is improvements to the shoreline position contour defined by EEA (2017). The "cleaning" is referenced in L94: can you provide more details about what kind of cleaning was completed? what percentage (or spatial distribution or type of elements (e.g. port contours, wetlands, etc.) were improved?) This coastline was then cut into "homogeneous sections" (L99): please list the criteria that were used to achieve this. The coastline characteristics were then assigned to a zone extending approximately 100m landward of the EEA shoreline (L101): how was this value of 100m chosen? I would recommend being more specific about these aspects since they are some of the contributions of your work!

***'Cleaning' of the database has been replaced with more descriptive terms. The text has also been rephased to emphasise that the coastal sections come directly from the EA shoreline and were not manipulated for the analysis. The reasoning behind the choice of 100 m for the coastal zone has been added.***

Section 3 could benefit from a more detailed presentation of the elements integrated in the database (in particular in 3.2). While the goal of this work is not to present thoroughly the previously existing databases, it would be useful to the reader to provide (succinctly) additional details (e.g brief description and estimated errors, which is an important point again in the discussion when identifying the limitations of the current shoreline data used (e.g. L323-324)) about the useful parameters that have been extracted from previous data sets. For example, by stating that the Corine Land Cover database includes 44 classifications that have been regrouped (Table A1/A2) and simplified down to XX classifications. In L115, is the visual interpretation completed using satellite images? (similar to what was indicated for structures in L141?)

***We note the request for additional information around the methodology and input data to the database and have provided basic information on accuracy/resolution for the data sources in Section 3. We have clarified why the three classes based on  $\pm 0.5m$  are used based on the accuracy of satellite derived data and noted that this may not be accurate for some applications. We look forward to the development of more accurate erosion data to satisfy this need but this is clearly beyond the scope of this paper.***

In section 3.2.4, it would be useful to the reader to define more explicitly the definition of the floodplain zones, including the 2 types of floodplain connections to the coastal segments. In L143-4, the coastal segments are connected to the 1 in 100 year coastal floodplain. Although it is mentioned in Table 1, it is worthwhile repeating here that these values come from the CoCliCo flood units (Lincke & Hinkel, 2023), and to describe in a few words the method used to obtain the 1 in 100 yr levels. Are the direct connections between coastal segments and floodplains made by evaluating all floodplains that are connected to coastal zones below 2m + the 1 in 100 yr extreme event elevation? Then, L152 refers to “non-local, more indirect implications”. Please clarify what is meant by this. Does this refer to zones that are not connected using the above-mentioned cutoff?

***Additional information on the floodplain definition has been added (e.g., source of the 1:100 year extreme water level, DEM used, hydrological connection to the coast). The explanation for ‘remote’ floodplains has also been amended to make the relationship to barrier features clearer.***

When describing the erosion data set that is used in this database, please clarify what is meant by the data limitations that led to using 0.5 m/yr as a cutoff. You state that (following Luijendijk et al., 2018) this cutoff is used, so is this the error threshold or a given significance level?

***The 0.5 m/yr threshold is an error-based detectability threshold, not a statistical significance level. Following Luijendijk et al. (2018), this value reflects the positional accuracy of satellite-derived shorelines. Satellite-derived shorelines were extracted from Landsat imagery at subpixel accuracy (~15 m; Hagenaars et al., 2018 <https://doi.org/10.1016/j.coastaleng.2017.12.011>). Over the ~35-year observation period, this translates to a resolvable long-term trend of roughly 0.5 m/yr. Rates of change smaller than this fall within the noise (uncertainty) of the measurement method and cannot be robustly distinguished from natural shoreline variability. Recent work with improved methods yields higher positional accuracy (~5–10 m; Vos et al., 2023 <https://doi.org/10.1038/s43247-023-01001-2>), but the 0.5 m/yr limit remains appropriate for this datasets as it integrates data from Luijendijk et al. (2018). A short explanation is included in the text.***

Section 4 presents the statistics of erosion and floodplain interactions around Europe. In L224: can you clarify what is meant “However, erosion ... has more impact on individual country shorelines.”? (Is the goal to emphasize the importance identifying of erosion zones? I’m not sure I understand the reference to “individual countries” here) Also, the term “natural” is used throughout this section, when referring to both wetlands (e.g. is the goal to distinguish between natural wetlands and wetlands that have been impacted by human interventions?) and evolution (e.g. is the goal to distinguish between natural evolution and climate change-induced evolution?). One general suggestion for this section is to refer consistently to the percentages in addition to the number of kilometers (e.g. L234, L244, L249+) since the percentages help to clarify a broader interpretation of the results. This may also be useful in Table 4 (not necessarily for each country, but perhaps for the totals?)

***The use of ‘natural’ refers to those shorelines without human intervention. This has been made clear on first use of the term. Shoreline percentage has been added to the text and totals row in Table 4 as suggested.***

In L237, how is the “total floodable shoreline” defined? It seems like all shorelines are floodable during extreme events, but this depends on the definition of the shoreline.

***We understand your point. Text has been added to Section 3.2.4 Coastal floodplains to explain that the shoreline is only considered floodable where associated with defined floodplains. Shorelines with no floodplain association are therefore considered non-floodable for the purposes of this analysis.***

In L268-269, the concept of commitment is introduced, stating that “Figure 7 shows that Italy has the highest commitment to maintaining open coast major port infrastructure in floodplains followed by France, Spain and the UK”. The use of the term “commitment” merits some discussion because this implies something about the political/management decisions that may not be well represented in the database if countries have existing defences but are not necessarily committed to continuing to upgrade them. This concept is addressed again in L314-315, but it seems difficult to discern commitment (implying the future) from presence (current state) with the data sets used here, but perhaps you can clarify this in the text.

When discussing the current erosion, stability, and accretion trends in L280-281, it is suggested that trends may change in the future, which merits a reference or a short explanation of how/why (even though it seems obvious!). In the following sentence, statistics are cited for the case “if erosion is universal along developed coasts”: Do you mean if a constant erosion trends is applied everywhere? I’m not sure to understand properly this sentence.

***We agree that reference to future changes/potential responses are unsuitable in the current paper and have been removed.***

The discussion summarizes the advantages and limitations of the database, highlighting the importance of the interactions between erosion and floodplains, which is often implicitly considered but not quantitatively addressed in independent studies of coastal erosion or flooding. One important detail to emphasize in the discussion may be to identify who is the primary beneficiary/user of this database and for what kind of applications? coastal managers? Is the goal that this data can be used to make policy or management decisions? or to allow a preliminary detection of sites needing observations/detailed modeling to explore further local hazards related to combined erosion and flooding? Perhaps the reference to French et al. (2016) in the conclusion could be moved here and elaborated upon (describe briefly their case study?).

***This point has been addressed in the revised background section (2) which now includes reference to EU scale policy development and funding allocation as well as identification of sites which may require further investigation.***

Finally, L365-377 bring up new points that are often placed more in the discussion than in the conclusions of an article, which usually focuses on summarizing what has been stated in the paper.

***The discussion and conclusion have been revised to take this comment into account.***

#### **Technical corrections:**

Several small suggestions are listed here :

L19: « European coastal floodplains »

**Amended**

L34: insert « spatial » with scales ?

Figure 1: explain where « Belle Henriette » is in the picture (e.g refer to the blue arrow ?) and perhaps also the additional impacts caused by the erosion in this location (increased flooding volume or speed or duration of flooding ?)

**Caption has been revised**

L71: « waves »

**Amended**

L76: remove « ; » (or replace with « : » ?)

**Amended**

L95: write out UK the first time it is cited?

**Amended**

L200: « ... »

**Amended**

L222: what areas do not have shoreline movement data ?

**Text has been added to Section 3.2.5 to clarify that full inlet/estuary extents and small islands are not covered.**

Figure 4: One suggestion is to make the total (last column) stand out better by making it wider or setting it apart, or making thin horizontal dashed lines across the plot to show when percentages are above or below each threshold (red/gray and gray/green transitions), simply to help guide the eye of the reader.

**Figure has been revised to change the formatting of the Total column and axis text**

L260: « are a ... » remove « a »

**Amended**

L271: remove « to » ?

**Amended**

L301: « . » remove extra spaces

**Amended**

L320: new paragraph ?

**Amended**

L321: add comma after « analysis, »

**Amended**

L322: « land claim » => « reclaimed land »

***Amended***

L336: « coastlines »

***Amended***

L351: « is a developing » => remove « a »

***Amended***

**Citation:** <https://doi.org/10.5194/egusphere-2025-2371-RC1>

## Reviewer 2: Comments

The manuscript deals with a very interesting topic.

Only minor revisions are needed before publication.

**Thank you for your time, we have taken your comments into consideration when revising the manuscript.**

In detail:

- In the Abstract, it would be helpful to include a brief description of the database, its elements, and what it offers compared to existing databases.

***A basic description of the database has been included in the abstract to describe the purpose of the database and its components.***

- In Section 2, "Background," it would be helpful to include a detailed analysis of existing European databases, highlighting what is new in CoasTER compared to them.

**As far as we are aware, the only specific European-wide erosion database are EuroErosion (2004) and its precursor CORINE Coastal Erosion (1998), which is included in the EuroErosion Database and were both published by the European Environmental Agency. We have added this to the text, together with other relevant national databases and global databases which include Europe, reflecting coastal erosion as an issue.**

- In Section 3, "The CoCliCo Coastal Typologies and Erosion for Risk (CoasTER) Database," it would be helpful to clarify the resolution of each key coastal characteristic considered in the database. This information should also be added to Table 1, along with information on the nature of the data (open source, subject to registration, licensed, etc.).

***The abstract has been updated and a diagram added to basic accuracy/resolution information for the data used has also been added within Section 3. Table 1 is no longer in the data section (moved to section2) so did not seem an appropriate place to report resolution. However, this is included in the individual sections where appropriate. All the data sets are open source and any user can explore them freely.***

- In Section 3, it would be useful to add a flow chart summarizing the database and its elements, and a paragraph on errors and uncertainties related to the estimation of each coastal characteristic.

***In response to your comment and those from RC1, the background has been revised and we have included the requested flow chart in this section (2). We also added comments/references on uncertainties in the section on erosion rates (Vos et al. , 2019, 2023) and later in the manuscript***

- In Section 5, "Discussion," it would be useful to add a comparison of the CoasTER database's performance with similar databases in other contexts around the world.

***As far as we are aware, the CoaSTER database is the first specifically designed for flood/erosion interactions; other erosion datasets focus on coastal erosion with no consideration of coastal flood implications and this is now stated in the Introduction.***

**Citation:** <https://doi.org/10.5194/egusphere-2025-2371-RC>