First of all, the authors thank the reviewer for its constructive and valuable feedbacks.

Please find the authors' replies to the comments of the reviewer (RC1) written in blue.

General comments (GC)

This manuscript reports on a how a modelling study was used to obtain a relation between the duration of seawater pollution events and rainfall volume. Two models were used: an urban drainage model to simulate combined sewer overflows (CSOs) and a hydrodynamic model to simulate the spread of pollution in the nearshore area. This work contributes to the existing body of literature on the impact of CSOs on the water quality. In my opinion, the scientific significance and scientific quality are good, while the presentation of the manuscript can be improved.

GC1

Consider restructuring the manuscript to improve clarity and flow – see the proposed outline below. The suggestion is to report the calibration and validation of each of the two models directly next to the description of the modelling set-up, to make it easier for the reader to follow.

Proposed outline:

1 Introduction

2 Methods

2.1 Study area

2.2 Hazard assessment (the hazard levels were defined; the coupled model was used to obtain the data for hazard assessment)

2.3 Urban drainage model

2.3.1 Model set-up of the urban drainage model (Model type and software; Input data: types of data and sources of these data, assumptions)

2.3.2 Calibration and validation of the urban drainage model (Data used for calibration and validation (what periods and why); Calibrated parameters (which and why, selected values); Calibration and validation results, e.g. graphs, RMSE, etc.)

2.4 Hydrodynamic model

2.4.1 Model set-up of the hydrodynamic model (Model type and software; Input data: types of data and sources of these data, assumptions)

2.4.2 Calibration and validation of the hydrodynamic model (Data used for calibration and validation (what periods and why); Calibrated parameters (which and why, selected values); Calibration and validation results, e.g. graphs, RMSE, etc.)

3 Results and Discussion

3.1 Hazard assessment

3.2 Validation of hazard assessment

3.3 Applicability of the suggested approach (here, the limitations and advantages of the modelling approaches and of the hazard assessment approach can be discussed, also in the context of existing literature)

4 Conclusions

Reviewer 1 proposes a restructuring of the manuscript in order to improve clarity and flow, whereas Reviewer 2 finds the paper "well organized and well structured".

In order to improve clarity and flow we have significantly improved Section 2.3 and changed the title of section 2.2 following the reviewer's suggestions relative also to the Specific Comments SC4, SC6 and SC8.

We prefer to keep the structure of the manuscript as it is. The main suggestion of Reviewer 1 is to report the calibration and validation of each of the two models directly next to the description of the modelling set-up. However, we prefer to keep the calibration and validation as part of the results section because we consider them as case specific. In this way, the methodology section keeps a more general focus and a broader application. The second suggestion of Reviewer 1 is to remove the data section 2.3 (a section dedicated to all the data used in the whole study) and describe the data separately in each section ('urban drainage model calibration and validation', 'sea water quality model calibration and validation' and 'Validation of the hazard assessment'). We believe it is better to keep the data section separately in order to avoid many repetitions that would occur. This is because the same data are often used in different sections: for instance some of the data used in the section 'sea water quality model calibration and validation' are the same data used in the section 'Validation of the hazard assessment'. The data section was improved by adding several lines guiding the reader to improve readability.

GC2

Consider revising which tables and figures are necessary to include in the manuscript, which can be placed as supplementary material, and which can be omitted. The quality of the figures can be improved to make them clearer and more informative.

Figures 7 and 8 were merged into one figure and 3 more graphs were added. Figure 10 was modified in order to make it clearer. Figure 3 was corrected. 2 out of 4 graphs were removed from Figure 11. We did not consider adding supplementary material as all the additional figure can be found in the deliverables of the BINGO project.

GC3

Consider more clearly stating which data and which periods/events were used for calibration and validation of the different models and methods, with motivation why. Consider showing more (all?) graphs for visual comparison of the modelled and observed data, either in the main text (if appropriate) or as supplementary material.

We have added some sentences stating which data and which periods/events were used for calibration and validation of the different models and methods. Also, we have added more graphs for visual comparison of the modelled and observed data.

GC4

Consider including a (more detailed) discussion of the applicability and limitations of the used modelling approaches and of the developed hazard assessment approach, also in the context of other studies.

We consider that the applicability and limitations of the used modeling approaches were already sufficiently discussed throughout the paper also with comparison to other studies. We have not added more details as suggested by the reviewer.

Specific comments (SC)

SC1

Title: I would suggest mentioning in the title that the modelling approach was used. Also, I would recommend against using the word "health" in the title, because health or infection risks are beyond the scope of the paper, the paper is about E. coli levels representing the fecal pollution of the water.

We agree with the reviewer and we have modified the title.

SC2

Line 52-53: "None of the studies presented above provided a methodology to evaluate health hazard of bathing waters affected by CSOs that is the main aim of this study" I would suggest reformulating this statement. There are examples in the literature combining bathing water quality modelling with quantitative microbial risk assessment, i.e. to evaluate health hazards.

We have improved this sentence and part of the following ones.

SC3

Consider explaining what BINGO is (very briefly).

We have added a line at the end of the abstract.

SC4

Line 90 and onward: Automatic samplers – how often/how many times/when were they used? Why is it relevant to this study? See also my suggestion to restructure the presentation of the data used in the study (GC1).

We added some lines in order to clarify these points in section 2.3.

SC5

Line 97: Consider specifying how long the pedestrian bridge is – here or where appropriate.

Ok.

SC6

Section 2.3: The data – It could be better to mention the different types or data where relevant instead, for example, in the sections about the urban drainage model, in the section on hydrodynamic model, in the section of hazard assessment. See also GC1.

We believe that a unique section including all the data would be clearer. Nevertheless, we have improved the readability of the data section also following the suggestions of SC4.

SC7

Line 105-110: The description of what is shown in Figure 3 is unclear, consider revising. For example, it is written that there are 4 measurements in Figure 3a while there are 2 measurements in Figure 3b – unclear how this is meant, there are many points in these figures. Also, Figure 3b indicates two locations (R.C. M.A.). Consider improving the text and Figure 3.

We clarified the text and corrected Figure 3.

SC8

Section 2.4.1: Consider clearly stating which model was used to simulate the urban drainage processes. It is mentioned that the original model (using which software?) was integrated into InfoWorks (consider explaining what InfoWorks is – it is not very clear from the provided website). Then it is stated that runoff-rainfall was simulated using SWMM. What model was used for simulating the flow in the sewers? Also, see comment GC1.

We clarified these points.

SC9

Line 185: Figure 1 indicated that there are several rain gauges in the city of Badalona. On line 185 it is mentioned that the rain data were used from the city of Barcelona – why? Consider motivating why local data were not used. The same is relevant for the wind data.

We explained this.

SC10

Table 1 is unnecessary, since this hazard classification is explained in the text.

We prefer to keep this table as part of the manuscript as it shows the hazard criteria that are a main input for the methodology.

SC11

Table 2: specify the unit for the return period.

Ok.

SC12

Section 3.1: How were the calibration and validation events selected? Were data from other overflow events available? Why were the SCOs in 2017 not included in the calibration/validation procedure? See also GC3.

We clarified this and improved the description of section 3.1.

SC13

Section 3.1: Which parameters were calibrated?

We clarified this.

SC14

Line 220: Why were these periods selected for calibration/validation? Were there data available for more events? Could it be more relevant to look at more periods during the bathing season? See also GC3.

We clarified this and added a line at the end of Section 3.2.

SC15

Figure 6 can be placed in supporting information.

We prefer to keep this figure as part of the manuscript as it shows the temporal variation of one of the most influential and calibrated model parameters.

SC16

Figures 7 and 8: Consider showing the graphs for all three calibration/validation events. The results for E. coli (three graphs) and salinity (three graphs) could be combined into one figure with six graphs in total. This would provide more information on how the E. coli concentrations and salinity change during overflow events.

Figures 7 and 8 were merged into one figure of six graphs as recommended by the reviewer.

SC17

Table 4 is unnecessary since it presents only four values – it would be better to present these values in the text.

We prefer to keep the table in the manuscript as we consider that it helps readability.

SC18

Consider improving Figure 10 to make it more easily readable.

We modified Figure 10.

SC19

Figure 12 can be placed in supporting information instead.

We prefer to keep this figure as part of the manuscript as it is a visual example that helps the reader understanding the procedure adopted.

SC20

Line 317 “The validation of the mean duration of high hazard per bathing season was not done due to lack of observed data.” Are not data available on how many days the beaches were closed during each bathing season?

We clarified this.

SC21

Line 330 It is not very clear what is meant here about the percentiles – consider rephrasing.

We clarified this.

SC22

In general, I think it would be good to include a table that summarises which events (periods of time) and types of data were used for calibration and validation of the models and approaches: sewer model, hydrodynamic model, hazard assessment. I think this should be explained where relevant in the text (in separate sections where the models are described), but a summarising table can be provided as supporting material.

A summary table was not introduced as it is was not considered to be relevant since the text was improved and all the suggested details related to the calibration and validation processes are now present in the text.

SC23

In general, in the figures, make sure that it is clear whether the figure shows observed (measured data) or modelling results (see e.g. Figure 11).

The caption of Figure 11 was modified.

SC24

Section 3.3.1 and conclusions: Was the purpose of developing this approach to predict the duration of water pollution events based on the rainfall volume? What are the practical implications of this work? Can this method be used by water managers? Any other reflections about the significance of the findings?

These questions were already addressed in the text. Further reflections about the significance of the findings were not added.

SC25

Figure 13: How were the events for validation of this approach selected? Were there more data available? Currently, measurements/estimations for three years are presented, with some of the measurements being outside of the bathing season. See also GC3.

We added some lines in the data section 2.3 in order to clarify this.

SC26

Conclusions – first line: I think it is better not to call this "health" hazard, because the health and health risks (measured in e.g. probability of infection or DALYs) were not calculated – beyond the scope of this study. See also SC1.

We like to keep "health hazard" as also the Bathing Water DIRECTIVE 2006/7/EC treats the bathing water quality as a hazard for human health.

SC27

Conclusions: "A novel correlation between the duration of sea water contamination and the event rainfall volume was presented." Consider discussing (in the appropriate section of the text) whether there are other studies attempting to do something similar – correlate precipitation, impact of CSOs with bathing water quality.

To our knowledge there were no other studies attempting something similar.

Technical corrections

E. coli and Enterococcus intestinalis: small letter for the species name, Italics for Latin. The way E. coli is written needs to be corrected everywhere in the manuscript, including figures.

Text and figures were corrected.

My impression is that "wastewater" is most often written as one word.

Wastewater was modified throughout the manuscript.

"Pollution" and "contamination" seem to be used interchangeably in the manuscript. Consider if it would be better to use one term only, if no difference is meant.

Ok. We used pollution which seems more appropriate for our case according to the following definitions:
http://www.fao.org/3/x5624e/x5624e04.htm#1.1%20contamination%20or%20pollution.