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Interactive comment on "Recurrence intervals for the closure of the Dutch Maeslant surge barrier" *by* Henk W. van den Brink and Sacha de Goederen

Anonymous Referee #1

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General comments

The authors, van den Brink and de Goederen, address an issue of high importance regarding coastal risk in Rotterdam, namely the estimate of the chance that a storm occurs during the maintenance/repair of the movable surge barrier New Waterway, which protects Rotterdam city. The authors propose to estimate the frequency of succeeding closures within a given interval (e.g., one day, one month), i.e. the inter-arrival times. Due to the short instrumental water level time series, the authors propose to rely on a numericcaly calculated water level series derived from the combination of ECMWF forecasts with the WAQUA/DCSMv5 surge model. An evaluation of the effect related to sea level rise is also performed.

The manuscript is well written; the presentation of the problematic, the methods and

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results are clear as well as the figures. However, my main concern is regarding the assumptions made by the auhors. There are several aspects that need either to be clarified or better presented or discussed with respect to alternative methods in the litterature. That is why, I recommend revisions before publication.

Specific comments

Instrumental observations The authors underline from the introduction (from line 26), with reasons, that the use of ECMWF derived time series is a real plus regarding the use of instrumental observations alone. Yet, it would beneficial regarding the readability of the paper to have from the start a clear vision of what the instrumental time series is (duration, quality, what would be the estimate of inter-arrival time using it alone, etc.). Furthermore, adding more details regarding the way the correcction due to land subsidence / long term trend (Figure 1) has been derived would also be appreciated (Sect. 4.1).

Presentation of the methodology In section 3, the authors present the methods used but it would be beneficial to have a section recalling the different stages of their whole strategy, because the link between the methods is not clear. As far as I understand, the authors only perform Extreme Value Analysis to correct the bias of ECMWF derived time series and to be used to fit the exponential model for the inter-arrival times. Besides in the section 5, which is dedicated to result analysis, the authors present an another method, which is confusing.

Alternative approaches - The statistics of inter-event spacing can also be analysed using the tools of extreme value analysis as it has been done regarding extreme beach erosion; for instance Callaghan et al. (2008): Coastal Engineering. Could the authors discuss/ comments on how their approach differ / complement? - The extreme value analysis is performed using a GEV distribution. Could the authors justify their choices, especially regarding the use of a more complete approach with GPD distribution. - As stated by the authors in Section 2.3 with references to van den Brinck et al. 2005A,

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Kew et al. 2013), the joint occurrence of extreme discharge and extreme water levels is independent. Could the authors comment on the manner to address the problem when this situation does not exist.

Results - The authors seem to base their approach on the independence assumption. In section 3 and in the introduction, the authors underline the use of the Poisson process model, but in section 5, they underline the violation of the assumption, and propose an alternative. What is confusing is that this alternative is not highlighted in the abstract neither in the conclusion (reading line 13 'assuming independence...' leads to wonder what can be done to overcome the independence problem). - Regarding the presentation of the results (figure 7 and 8 in particular), could the authors discuss / comment on the uncertainty related to the use of an empirical probability distribution. More specifically, there is some slight scattering of the dots in Figure 7, which makes wonder about the uncertainty in the results described in Sect. 5.1. - The question of uncertainty is also raised regarding the GEV fit (Fig. 4) and the derived bias correction.

Technical corrections Figure 6: in the legend, the blue line for observations appears twice.

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