

Interactive comment on “Combining operational models and data into a dynamic vessel risk assessment tool for coastal regions” by R. Fernandes et al.

Anonymous Referee #3

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General Comment:

The manuscripts describes the methodology of development of a new model tool evaluating risk of individual vessels as well as coastal pollution based on an oil spill model, vessel tracking automatic identification systems (AIS) data as well as atmospheric, waves and oceanic modeled data. The risk model is able to run real-time as well as past or hypothetical scenarios by setting independently the AIS, meteorological and oceanographic data. The model was applicated to the Portuguese coastal area, the results section present the graphical interface and examples of responses of the risk model to metocean conditions and vessel positions, as well as a few exercises chosen to illustrate the influence of various components of the risk model. The authors

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mentioned that the evaluation or calibration of absolute risk values was out of scope at this stage and that this study would be pursued in the future with upcoming new developments of the model.

In general, the title, structure and contents of the article are pertinent and the paper address relevant scientific questions within the scope of OS. Some deeper testing and model response evaluation would have been appreciated. In facts the results present an illustration of the model capacities looking at global tendencies without quantifying the amplitudes of variation of neither the input conditions, nor the risk value response, due to the lack of calibration of the absolute risk value. The perspectives should highlight in a more clear way the need and intention to proceed shortly to the calibration to allow deeper analysis of the results. The model structure (Comment A.1) should be mentionned in the abstract and detailed more clearly in the first sections of the paper. Apart from this point, the description of the implementation of the modelling tool is clearly exposed although few explanations are missing and there are several expression or nomenclatures aspects that need to be clarified in the final manuscript. There are many tables, some of them may be grouped together to allow easier reading. Dimensions and ratio aspects of some of the figures should be harmonized.

A. Details of the principal comments:

A.1) It could be written more clearly and earlier in the manuscript (per example in introduction or in the section 2.2 Approach, and adding a few words in the abstract) that the model includes the computation of different types of risk assessments and that each of them is governed by an expression $\text{Risk} = \text{Probability} \times \text{Severity}$:

- the individual risk of oil spill accident for each vessel, depending on the vessel itself and on the metocean conditions, which is not dependent on the coastal consequences ;
- the risk of shoreline contamination taking in account coastal vulnerability indexes

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CSI, SESI and ECSI with the integration of the above risks of oil spill accidents of all the vessels present in the vicinity of a given coastal stretch. To account for the influence of the proximity from the coastal stretch of each vessel, two strategies are implemented and evaluated:

- a modeled one based on oil spill modeling for each vessel
- a non-modeled one based on a correction factor function of the distance between the vessel and the coast stretch.

A.2) Page 1333 line 5: the multiplication operator should be replaced by the sum operator : $I_R = I_P \times I_S$ should be replaced by $I_R = I_P + I_S$

A.3) page 1337: lines 14-15: expression redundancy: "has been was"

A.4) Equation 9 page 1343 : $I_{SSC} = 0.5I_{SSI} + 0.5I_V$ Clarification of the nomenclature is requested: I guess that I_{SSI} is the sum of the severity indexes of the risk of oil spill incident of all the vessels present in the surroundings area, so that $I_{SSI} = \sum(I_S)$ where I_S is the one of equation 4? To avoid confusion with the precedent general expression $I_R = I_P + I_S$ equation 3, I would suggest to change nomenclature of I_S to I_{SSI} (and as well I_P to I_{PSI}) in Equation 4 as well as appendix B, C, D and associated tables. If Equation 4 is expressed for each vessel, it might be more clear to specify it: $I_{IRSI}^{vessel} = I_{PSI}^{vessel} + I_{SSI}^{vessel}$ and specify in equation 9 that $I_{SSC} = 0.5I_{SSI} + 0.5I_V$ with $I_{SSI} = \sum_{vessels} (I_{SSI}^{vessel})$.

A.5) More detailed explanation or eventual modifications are required concerning the variable Lunit Page 1344 line 24 and 1345 line 1: reference is made to Lunit as a shoreline distance unit by default 100m. By "shoreline distance unit" is it intended "shoreline extension unit" as written line 3? The concept of "distance" relies to a length unit in the direction perpendicular to the coastline and creates confusion.

A.6) Page 1343 line 4: the meaning or writing of this sentence is not clear or words

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are missing. Page 1343 Line 5 missing word: "This initial implementation was [?] to facilitate" Page 1348 line 28: the meaning or writing of this sentence is not clear or words are missing. Page 1354 line 16-17: words are missing probably between the words "can considered".

A.7) Mistakes in the lines 12-18 of page 1356: P_{Fo} refers to collision to port facilities while it should refer to foundering and structural failures, P_{GDN} refers to grounding while it should refer to grounding during navigation, P_{DG} refers to fire and explosion while it should refer to drift grounding and P_{IOD} refers to fire and explosion while it should refer to illegal/operational discharge.

A.8) Table D3: there are 3 nomenclature errors in the sub-captions : twice $I_{S_{restricted}}$ is written in the place of $I_{S_{unrestricted}}$ in the left column ; one time $I_{S_{unrestricted}}$ is written in the place of $I_{S_{restricted}}$ in the right column. In the title of table 3 it should be specified: severity index "of oil spill incident"

A.9) It should be specified in the caption of fig.6 that the computation is made using the same ship informations as those of fig 5.

B. Other minor suggestions of improvements:

B.1) No mention is made of the availability to public access of neither the oil spill model nor the risk model itself.

B.2) Page 1333 line 12: justification of the choice to exclude from the study "Vessels with less than 100 DWT, passenger vessels and fishing vessels navigating outside restricted waters" (quantifying the percentage of vessels excluded by this choice) and clarification on the fact that they are excluded from the applicative test cases presented in the results section although the model could include them.

B.3) It would be interesting to include average, min and max values of the CSI, SESI and ECSI indexes for the study area.

B.4) Tables 2 and 3 could eventually be grouped together. A vertical line could be added

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tab2 to separate the column of I_P values from the I_R values, alternatively, an idea to allow easier visualization could be to color I_R values of tab2 by the corresponding colors described table 3.

B.5) Tables B1 and C2 could eventually be grouped together

B.6) The title of table 4 may specify the signification of D_{SS}

B.7) Fig 3 and 4 could eventually be grouped together.

B.8) The aspect ratio of the figures 8, 9 and 10 should be harmonized and Fig 8 and 9 could eventually be grouped together.

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