Response to editor and reviewer

Editor: Heidi Kreibich

- Comment 1:

(a) NOVELTY OF YOUR STUDY. Your research on sea ice disasters is interesting and very relevant from a practical point of few. Please try to strengthen the description of its scientific novelty. This needs to be done both at the beginning so we understand, but also in discussion, telling us 'why should someone outside of your study area be interested in the results'. If you were to explain the results of your case study to someone in another country, what would they gain from your study? What is novel and what might they learn?

Answer:

The following words are added in the INTROUDCTION.

"The optimization selection and safety assessment of engineering structures generally involve the long-term simulation calculation and require a certain calculation basis. If an assessment index system is established based on the risk assessment theory, the safety level of various structures and the risk level of structural operation can be quickly assessed. Therefore, a structural risk assessment index system can be used as a basis for the more efficient and accurate structural safety analysis."

- Comment 2:

(b) BROADER CONTEXT OF YOUR STUDY. You do not relate your work to the broader international literature of what others have done. We need to understand this broader context and what others have done.

Answer: Four literatures were added in the first paragraph of introduction.

Mangalathu, S., Jong-Su, J., Padgett J. E., Reginald, D.: Performance-based grouping methods of bridge classes for regional seismic risk assessment: Application of ANOVA, ANCOVA, and non-parametric approaches. Earthquake Engineering & Structural Dynamics, 2017, 46(1).

Wu Q.Y., Zhu H. P., Fan J.: Performance-based seismic financial risk assessment of, reinforced concrete frame structures[J]. Journal of Central South University, 2012, 19(5):1425-1436.

Tromans, P. S., Van d G. J. W.: Substantiated Risk Assessment of Jacket Structure. Journal of Waterway, Port, Coastal, and Ocean Engineering, 1994, 120(6):535-556.

Melani, A., Khare R., Dhakal R.P., Mander, J.B.:Seismic risk assessment of low rise RC frame structur. Structures, 5:13-22.

- Comment 3:

(e) ENGLISH. Although your manuscript will undergo a copy editing at the final stage, there are sentences in your manuscript which one cannot follow well due to the issues of English. I suggest an improvement of the English language.

A: The English of this paper has been revised.

- Comment 4:

(f) GENERAL TECHNICAL FORMATTING. I encourage you to examine carefully the NHESS author guidelines for formatting available online at: https://www.natural-hazards-and-

earth-system-sciences.net/for_authors/manuscript_preparation.html.
A: Format modification including title, author, graph and table.

#Revewer 3

- Comment 1:

Grammar needs to be corrected throughout the paper.
Answer: The English of this paper has been revised.

- Comment 2:

Technical discussion needs to be worded in state-of-the-art terms. For example: "When the overall deformation of a structure exceeds its allowable deformation under extreme ice force, structural stiffness failure occurs." While I follow the meaning of the sentence, it is worded awkwardly and is not consistent with the current state of practice in structural engineering. Another example would be "ice pile climbing." What is meant by this?
Answer:
(1)" When the overall deformation of a structure exceeds its allowable deformation under extreme ice force, structural stiffness failure occurs" was revised to" When the structural deformation under extreme ice force exceeds allowable deformation, it leads to a structural stiffness failure.".
(2)"ice pile climbing" was revised to " ice pile climbing".

- Comment 3:

The authors should explain how the index will be used in practice. It appears to result in a relative description of risk and not an absolute measure. How will that description be used?
A: "The assessment system is a qualitative description of risk and can be applied in structural optimization during the design phase and real-time risk level assessment during the operation phase. In the future, we will make the detailed analysis based on the preliminary results obtained with the risk assessment method in order to provide more efficient and accurate assessment result."
The above words were added in the conclusion.

- Comment 4:

the discussion of dynamics is probably more detailed than is need for this paper. Explanation of when higher modes are considered is probably all that is required.
A:"4.1.1.2 Dynamic ice force" was trimmed. Figure 4 was deleted.

- Comment 5:

The 0.5 exponent on V4 appears to be arbitrary. Why was that value chosen? Does it have significance?
Answer: the structural function also directly affects the risk level. For example, there are many devices on oil production platforms. The design of manned platforms should pay attention to personnel comfort and their risk is relatively high. Unmanned platforms have a low risk. Kb is the structural function coefficient and its values for manned central platforms, unmanned central platforms, and auxiliary function platforms such as the bollard are

respectively set to be 1.5, 1.2, and 1.0.

The ice-induced vibration value M3 is expressed as:$M3=V1*V2*V3*V4^{0.5}$.

By compare contribution of four parameters, which are overturning index V1, dynamic indexV2, ice-induced vibration indexV3, and function indexV4= Kb), The value of V4 made smaller contribution to risk results, so the 0.5 exponent of proposed. This conclusion has been validated by experts, and the conclusion was published in postdoctoral research report" Xu, N. Research on Critical Issues of Sea-ice Disaster Risk Assessment and Prevention Strategy. 2014".

The above literature was added

- Comment 6:

Line 12: It was stated that a 100-year return interval was chosen because the structure has a 100-year design life. These two design criterion do not correlate.

This literature was added in this paper.

A: "Since the designed life of the oil platform in Bohai Sea was 100 years, a return period of 100 years was selected in the subsequent analysis." was revised to "A return period of 100 years was selected in the subsequent analysis"

- Comment 7:

For Table 3, the division between the rows needs to be better defined. It is not clear where one row start and stops, vertically.

Answer: Black lines were added between various rows.

- Comment 8:

It is stated in the text that Table 4 summarizes relative structural deformation for buildings. How do we know these drift limits are applicable to offshore jacketed structures?

Answer: one literature was added. This conclusion was published in " Ji,S.Y. and Yue, Q.J.: Numerical model on engineering sea ice and its application. Science Press. 327-328. 2011"