

## **Response to Referee Review by Dr. Jose Salas**

**The authors would like to thank the reviewer for his effort in providing a constructive and positive review of this paper.**

Page 6884, line 21: Do you mean "...hazard random variable  $X$ , with ..."

**Yes, we have made this change.**

Page 6885, lines 22-24: Consider rephrasing the sentence "Our primary goal is to apply HFA to characterize the likelihood of nonstationary natural hazards and to better understand the expected time until the next natural hazard event occurrence for design and planning purposes."

**The authors agree this sentence needs rephrasing. It now reads:**

**"Our primary goal is to apply HFA to characterize the probability distribution of the waiting times for the next exceedance of a natural hazard event for nonstationary systems."**

Page 6886, lines 22-23: The citation to Davison and Smith, 2003 is not included in the reference list.

**The reference has been added.**

Page 6888, line 15: Consider using the word "Furthermore" instead of "Importantly"?

**We have made this change.**

Page 6888, lines 23-24: Consider rewording as "...natural hazard event and the waiting time or failure time until a hazardous event in excess of some design value occurs."

**We have taken the reviewers suggestion.**

Page 6891, lines 13-14: Consider rewording as "...in which case simple analytical expressions for..."

**We have taken the reviewers suggestion.**

Page 6891, lines 26-27 (and top of next page): In the sentence "For the stationary case .... (or the geometric distribution for a discrete random variable;..." do you really mean discrete random variable? or rather the time is assumed at discrete steps such as a year?

**The authors are referring to the case where the expected waiting time  $T$  is discrete. We have reworded this sentence to clarify:**

**"For the stationary case, the time to failure,  $T$ , always follows a 1- parameter exponential distribution (or if discrete, the geometric distribution);"**

Page 6892, line 2: I would suggest using the word "variable" rather than the word "series".

**We have taken the reviewers suggestion.**

Page 6893, line 19: It may be useful defining the symbol  $C_x$

**The authors have moved the definition of  $C_x$  from pg. 6894 L4 to just before L19 on p. 6893.**

Page 6896, line 21: Should it be  $\tau$  instead of  $T$  ?

**According to recommendations from other reviewer comments, we have modified our notation, removing the symbol  $\tau$  to improve clarity.**

Page 6896, Eq.(11), 2<sup>nd</sup> term, denominator: Should it be  $\beta \tau$  instead of  $\beta t$ ?

**The reviewer is correct, however we have now modified our notation such that this is now  $t$ .**

Page 6898, term  $b$  below Eq.(15): Consider using  $b$  to simplify Eqs.(13) and (14).

**The authors have taken this suggestion as well.**

Page 6900, line 17: Should it be at  $t=50$  ? Note that Fig. 2 relates  $S(t)$  vs.  $t$ .

**The reviewer is correct, however we have now modified our notation such that this is now  $t$ .**

Page 6900, lines 25-29: Here the text refers to  $H(\tau)$  vs.  $\tau$  while Fig. 3 refers to  $H(t)$  vs.  $t$ .

**The reviewer is correct, however we have now modified our notation such that this is now  $t$ .**

Page 6902, line 19: Should the end of the sentence refer to say “other events and distributions” rather than “specific events”?

**The reviewer is correct and we have made this change.**

Page 6903, lines 3-4: In the context of the sentence and previous definitions, I am not sure the words “...a natural hazard with design event  $X$ , and the...” are clear. Consider using either “...a natural hazard with probability distribution  $f_X(x)$  and the...” or “... a natural hazard represented by the random variable  $X$  and the...”

**The authors agree. We have made corrections throughout the paper to reword our description of the problem as:**

**“Natural hazard event,  $X$  with a cumulative distribution function (CDF),  $F_X(x; \theta)$ , where  $\theta$  is a generic parameter vector set.”**

Page 6903, line 27: Does it mean “...the distribution of the time of failure is no...”?

**The authors agree and have reworded as the reviewer suggests.**

Page 6903, lines 28-29: I would suggest rewording as “...on a distribution with different shapes, depending...”.

**The authors agree and have reworded as the reviewer suggests.**

Page 6904, line 2: I would suggest dropping the words “in shape”.

**We concur and have removed this phrase.**

Page 6904, lines 7-9: In this sentence and perhaps in other sections above you may consider citing the paper “Frequency of Recurrent Extremes under Nonstationarity” by J. Obeysekera and J.D. Salas, ASCE J. Hydrol. Engr., approved Nov.2015, which deals with estimating the frequency of the number of exceedances during the planning horizon where the magnitudes of natural hazards increases with time.

**The authors appreciate the reference and agree that it should be referred to in this section. We have added it.**