Interactive Comment on "**Hazard function theory for nonstationary natural hazards"** by L.K. Read and R.M. Vogel

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The referred paper reviews the hazard function theory that has been applied in several fields, and provides a convincing argument for further developing the theory based on POT data and the GP distribution for nonstationary natural hazards. In particular, the aim of the paper is relating the distribution of the natural hazard random variable X with the distribution of the time of failure T for a specified design event, and related hazard function properties such as survival and cumulative hazard functions. For this purpose the paper shows in some detail results of the various forms of probability density functions of the variable T that are obtained for assumed degrees of nonstationarity of the 2-parameter GP distribution. Likewise, results are shown of hazard, cumulative hazard, and survival functions for assumed cases of variability and nonstationarity. Given the increasing concern of the effects of human interventions, global warming, and climate variability on the hydrological cycle, which may intensify the magnitude and frequency of hazardous events, developing new techniques that may help in designing structures subjected to nonstationary events are always welcome.

The paper is very well written, however, some corrections and clarifications are needed as suggested below.

Page 6884, line 21: Do you mean "…hazard random variable *X*, with …"

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."

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

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

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."

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

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?

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

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

Page 6896, line 21: Should it be τ instead of T ?

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

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

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

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

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

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…"

Page 6903, line 27: Does it mean "…the distribution of the time of failure is no…"?

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

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

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.