TSUNAMIGENIC PROBABILISTIC FAULT DISPLACEMENT
HAZARD ANALYSIS FOR SUBDUCTION ZONES

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ABSTRACT

The recent Sumatra earthquake and subsequent tsunami has provoked greater awareness of the hazard posed by coseismic fault displacement associated with sea-floor subduction zones. Generally, the mechanism that causes this type of tsunami, coseismic fault displacement of a sea-floor subduction zone, is still treated deterministically. Presented here is a methodology for probabilistic fault displacement hazard analysis (PFDHA) for a sea-floor subduction zone. As an example, displacement hazard curves for the Cascadia Subduction Zone are shown. The goal of this probabilistic methodology is to quantify the uncertainty and associated hazard of coseismic fault displacement of sea-floor subduction zones. This will provide tsunami modelers with a probabilistic measure of the occurrence of fault displacement, and decision makers with a rational basis for tsunami hazard mitigation measures.

The annual rate at which surface displacement, D, will exceed some value, d, can be computed as,

$$v(d) = N_{M\min} \int_M P(D > d|m) \cdot f_M(m) \cdot dm$$

The term $P(D>d|m)$ is the empirical relationship for estimating fault displacement, and $f_M(m)$ is the characteristic probability density function describing the relative distribution of magnitude.

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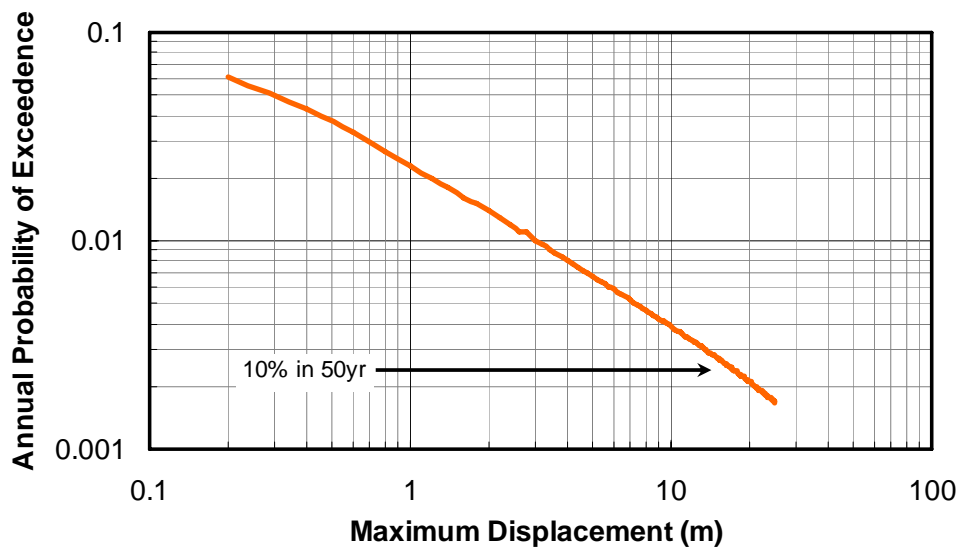
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