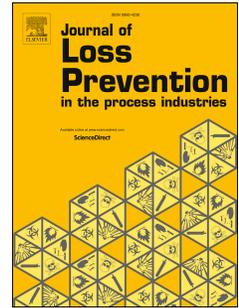


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Probabilistic risk analysis of process plants under seismic loading based on Monte Carlo simulations

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1 **PROBABILISTIC RISK ANALYSIS OF PROCESS PLANTS UNDER SEISMIC**
2 **LOADING BASED ON MONTE CARLO SIMULATIONS**

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12 **ABSTRACT:** The vulnerability of process plants to natural hazards has been demonstrated in the
13 last decades by a number of catastrophic events. Unfortunately, despite the continuous evolution
14 of the knowledge on this matter, there is a lack of widely accepted and standardized procedures to
15 perform a risk assessment of process plants subjected to Na-Tech hazards. In this paper, a new
16 tool for the probabilistic seismic risk assessment of process plants is thus proposed, based on
17 Monte Carlo simulations. Starting from the seismic hazard curve of the site in which the plant is
18 placed, a multi-level approach is proposed. In this approach, the first level is represented by the
19 components seismically damaged, whereas the following levels are treated through a classical
20 consequence analysis, including propagation of multiple simultaneous and interacting chains of
21 accidents. This latter is applied through the definition, for all relevant equipment, of proper
22 correspondences between structural damage (i.e., damage states) and loss of containment events.
23 The procedure has been implemented in the software “PRIAMUS” (**P**robabilistic **R**isk
24 **A**ssessment with **M**onte Carlo simulations of **P**rocess **P**lants **U**nder **S**eismic **L**oading). By
25 automatically generating samples of damage propagation chains, the risk of the plant can be
26 easily quantified in terms of economic losses, content losses, damage propagations or final
27 damage scenarios. The application to a petrochemical plant shows the potentiality of the method
28 and envisages possible further evolutions.

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