

# Site effects on industrial plants in the Simeto river basin, Eastern Sicily (Italy)

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This paper deals with the assessment of seismic site effects carried out along the Ionian coast of the Simeto river basin (Eastern Sicily) where are located some major industrial activities, mainly constituted by chemical plants, flammable and toxic substances deposits. The studied area is characterized by a high vulnerability, being located near the south-eastern side of the Etna volcano and on the alluvial plain of the Simeto river; furthermore, on a regional scale, most of Sicily is subject to an active crustal dynamic that determined, during the last millennium, several major earthquakes.

The rupture of the Hybleo-Maltese fault, a seismogenetic structure placed few kilometers offshore the Ionian sea, was chosen as source for simulating an earthquake similar to the  $M=7.2$  seismic event that in A.D. 1693 shattered the region. The ground shaking assessment is computed solving the bi-dimensional full-wave equation by the Chebyshev spectral element method, which solves the variational formulation of the differential equation. The wavefield model is characterized considering at the same time different features as type of fault motion, crustal heterogeneity and local geological detail, obtained from the geological and geotechnical data available. Peak ground acceleration (PGA) values range between 0.1 and 0.3 gal, although particular site conditions strongly affect these values locally.

A geotechnical zonation of the terrenes was performed carrying out SPT and CPT investigations and using data from existing soundings. The results obtained and the ground shaking assessment were reported in terms potential liquefaction index ( $P_L$ ). The analyses indicates that for earthquakes with  $M > 6.5$  terrenes may loose their bearing capacity, in particular along the littoral zone.

Input data were processed in a dedicated GIS and the output informative layers were obtained in form of risk maps. Results allowed to outline that the industrial district of Catania is exposed to a high seismic risk, both for seismic loading and terrain liquefaction susceptibility, in particular near the coastal area. Furthermore the methodology allowed to evaluate, through the analysis of site effects, the overall industrial hazard of the area, related to the possible maximum damage scenario and the domino-effect phenomenon between contiguous industrial settlements.