

## **Contributes from a posteriori studies on the damage of buildings affected by the 1976 Friuli earthquake (NE of Italy)**

Stefano Grimaz and Petra Malisan

SPRINT-Lab, Dipartimento Politecnico d'Ingegneria e Architettura, Università degli Studi di Udine, Italia

After the 6.46 Mw, May 6, 1976 earthquake in Friuli (NE of Italy), about 85,000 buildings were investigated in the affected area, in order to assess the damage and estimate the reparation needs. For this purpose, a damage-assessment form was defined and compiled by teams of technicians deployed in the whole affected area. After a decade, a research team of the University of Udine recovered, collected and re-organized the data of the damage-assessment forms, and created the Fr.E.D. (Friuli Earthquake Damage) database. The database permitted statistical studies concerning the seismic vulnerability, mainly for masonry structures. Six masonry typologies were recognized having significantly different seismic behaviors. Furthermore, the Probit analysis carried out Probit equations correlating ground motion parameters and damage distribution for the different building typologies. Further investigations using the Fr.E.D. data, were aimed at investigating and quantifying the effects on the seismic action of different geo-morphological scenarios. By geo-referencing the data of the buildings (vulnerability class and sustained damage) over the geo-morphotype map, it was possible to use the Probit analysis to identify and estimate the effect of each geo-morphological scenario on seismic ground motion variations. The analysis of the data showed that the scenarios of “crest”, “foothill zone”, “deep valley”, “alluvial fan” and “flat plain in stiff soil” revealed a meaningful amplification of the seismic ground motion. The outcomes are coherent with in-situ geophysical measures and with instrumental records of recent earthquakes. The obtained results allow a quick definition of seismic consequence scenarios at territorial scale, in areas presenting masonry building typologies similar to those involved in the Friuli earthquake and they provide a valid support for the definition and design of the investigations for in-depth studies of the seismic local site effects.