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GEOMORPHOLOGICAL CONTRIBUTIONS TO SEISMIC RISK ASSESSMENT (**)

Abstract: PANIZZA M., *Geomorphological contributions to Seismic Risk assessment.*

The author analyses the contributions provided by *Geomorphology* in studies of the assessment of *Seismic Risk*: this is defined as a function of the *seismic hazard*, of the *seismic susceptibility*, and of the *vulnerability*.

The geomorphological studies applicable to seismic risk assessment can be divided into two sectors:

a) *morpho-neotectonic* investigations conducted to identify *active tectonic structures*;

b) *geomorphological* and *morphometric analyses* aimed at identifying the particular situations that amplify or reduce *seismic susceptibility*.

The morpho-neotectonic studies lead to the identification, selection and classification of the lineaments that can be linked with active tectonic structures. The most important geomorphological factors that can condition seismic susceptibility are: slope angle, debris, morphology, degradational slopes, palaeo-landslides and underground cavities.

KEY WORDS: Geomorphology, Seismic Hazard and Risk.

Riassunto: PANIZZA M., *Contributi della Geomorfologia alla valutazione della pericolosità sismica.*

L'Autore analizza i contributi che la Geomorfologia fornisce negli studi tesi alla valutazione del *rischio sismico*, definito come funzione della pericolosità sismica, della *suscettibilità sismica* e della *vulnerabilità*. Gli studi geomorfologici applicabili alla valutazione del rischio sismico possono essere suddivisi in due categorie:

a) ricerche di *morfoneotettonica*, finalizzate all'identificazione di *strutture tettoniche attive*;

b) *analisi geomorfologiche e morfometriche*, volte all'individuazione di particolari situazioni che amplificano o riducono la *suscettibilità sismica*. Gli studi di morfoneotettonica permettono la caratterizzazione, la selezione e la classificazione dei lineamenti che possono essere connessi con strutture tettoniche attive. I principali fattori che influenzano la *suscettibilità sismica* sono l'acclività, la presenza di copertura detritica, la morfologia, i versanti in degradazione, le paleofrane e le cavità sotterranee.

TERMINI CHIAVE: Geomorfologia, Rischio e pericolosità sismici.

INTRODUCTION

Using the definitions provided in PANIZZA (1988), *seismic risk* will be defined as the probability of an earthquake occurring, of a pre-established Magnitude, within a given

number or years, with specific consequences on the environment. Thus, seismic risk is specified not only by the expected seismic event itself, but rather, by the setting of this event in the geological and physical geographical conditions of the area affected, including the density of the population, the conditions of the existing buildings and construction, the type of economy, the level of preparation for and knowledge about seismic events on the part of the population, the presence of aid facilities, and the efficiency of the civil defence network (IACCARINO & *alii*, 1979). In fact, the factors converging into the definition of seismic risk may be summarised according to the outline shown in fig. 1.

A *seismic hazard* in a strict sense, connected with the earthquake and the seismotectonic characteristics in an area, is distinguished from *seismic susceptibility*, that represents a hazard induced by the physical geographical situation of the area considered. The *seismic hazard* should refer to the types, features, mechanism, and phenomena of earthquakes, that is, to the energy propagated by them, to the depth at which they occur, to their recurrence according to sequences of time that may even be relative brief, to the dimensions of the focus area, etc. As far as *seismic susceptibility* are concerned, the term refers to local geological, morphological, and hydrological factors, of both the surface and substratum, which may amplify or reduce seismic vibrations or constitute situations of precarious geomorphological equilibrium.

The *geomorphological studies* applicable to seismic risk assessment can be divided into two sectors:

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These two sectors will be summarized in the following.

MORPHO-NEOTECTONICS

Morpho-neotectonic research is based on the concept that tectonic movements have brought about changes in the

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