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Abstract title

INTERPRETATION OF PALEOSEISMIC DATA USING AN INNOVATIVE MACROSEISMICITY SCALE

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Abstract

It is now a recognized fact among earthquake engineers that no realistic approach to seismic hazard issues can be made without interrogating the Earth's distant past-for which no instrumental, historical, or archeological record exists.

This explains the growing preoccupation among seismologists, working hand in hand with geologists, with detecting traces of very ancient seismic events, or paleo-earthquakes, and with developing reliable techniques for estimating their characteristics and recurrence rate. Essential among such techniques are those involved in trenching, which exposes the strata marked by ancient earthquakes of significant size-the determination of size being a key issue here.A wide variety of methods have been evolved over the past century to meet this perceived need, proposing measurements, more or less direct, purported to inform scientists on strength of seismic events. Those first elaborated, predating the emergence of earthquake recordings of acceptable quality, looked at and analyzed the effects of earthquakes in different localities, as felt by the population or in the form of damage to manmade structures. They are known as scales of macroseismic intensity, as the effects concerned are tangible, or visible. Later methods sought to ascribe earthquakes a size, or magnitude, at their source using quantifiable instrumental record as opposed to more or less subjective interpretation. But neither of these approaches has fully succeeded in ridding itself of the "filters" inherent to the type of information analyzed, qualitative or quantitative. Since no detection means can be placed physically at the earthquake's source to directly quantify significant source parameters, every effort must be made to minimize filter effects.The study of paleo-earthquakes compounds the difficulties present for more recent events: the only recording medium was the earth itself. This is why the newly developed innovative intensity scale (a multi-author undertaking within the INQUA Subcommission on Paleoseismicity), relying solely on modifications to the geological medium, has the potential to become a tool of prime importance, as it has for earthquakes of the historical and pre-historical periods and for those of today, affording greater objectivity through independence from the variable nature of man and his works. The intensity thus identified must then be connected, as for historical earthquakes, with a chosen source parameter-magnitude or seismic moment.

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Abstract title

THE INQUA SCALE: AN INNOVATIVE APPROACH FOR ASSESSING EARTHQUAKE INTENSITIES BASED ON SEISMICALLY-INDUCED GROUND EFFECTS IN NATURAL ENVIRONMENTS

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Abstract

The debate originated within the Workshop of the Subcommission on Paleoseismicity held during the 1999 XV INQUA Congress in Durban, emphasized the importance of developing a multi-proxy empirical database on earthquake ground effects that can be used by, and incorporated into, seismic-hazard assessment practices. An interdisciplinary Working Group was established, including geologists, seismologists and engineers, in order to formalize the collected data into a new scale of macroseismic intensity based only on ground effects. This poster illustrates the results of the research conducted by the Working Group (including F. Audemard, V. Comerci, A. Gürpinar, E. Esposito, S. Marco, J. McCalpin, A.M. Michetti, B. Mohammadioun, J. Mohammadioun, N.A. Mörner, S. Porfido, E. Rogozhin, L. Serva, R. Tatevossian, E. Vittori), introduces the new INQUA scale, and discusses major issues related to this innovative approach to the intensity assessment.
The INQUA scale allows defining the epicentral intensity starting from the VI - VII level, with increasing accuracy going towards the highest levels. The INQUA scale should not be used alone, but in combination with the existing scales. In the intensity range up to IX - X, the scale allows a comparison between environmental effects and damage indicators, emphasizing the role of primary tectonic effects, which are independent from the local economy and cultural setting. In the intensity range X to XII, the INQUA scale is arguably the only suitable tool for assessing the epicentral intensity. In summary, we regard the INQUA scale as an irreplaceable addition to all the existing scales up to the IX - X level, while it represent the substance of the epicentral intensity assessment for the highest degrees. After the recent events in Greece and Iran, it is increasingly clear, if needed, that for strong events a macroseismic assessment that does not include earthquake ground effects can give a misleading picture of the earthquake intensity.
The INQUA scale has been presented at the 2003 XVI INQUA Congress in Reno, and adopted for a trial period of 4 years. During this period an INQUA Project will promote the use of the scale in different regions of the world, through the revision of intensity assessments from historical and instrumental earthquakes, and the study of upcoming events. As a result of this project, we anticipate that an update version of the scale will be presented at the 2007 XVII INQUA Congress in Cairn.