



## **A site specific approach to the incremental dynamic analysis**

**C. Saccà, A. Marullo, A. Teramo, M. S. Teramo**

Osservatorio Sismologico - Università di Messina, Italy

A new approach for seismic vulnerability evaluation of structures is proposed, through the definition of structural performance levels related to increasing intensity seismic actions. The followed methodology is similar to the incremental dynamic analysis (IDA), but with an original approach. Through the IDA, increasing intensity seismic inputs are applied to the analyzed structure, by means of numerical simulations; the goal is to obtain a curve that, through the state of structural strain, correlates the level of seismic action to the level of structural damage, from the elastic range till the plastic collapse. In the traditional approach, the increment of intensity of seismic input is carried out scaling generic accelerograms, with characteristics not coherent with the expected seismicity in the site of interest and the magnitude increment, because only the scale factor varies, being unchanged the characteristics of the accelerogram. The proposed approach, instead, uses synthetic accelerograms obtained, in correspondence to the site of interest, for increasing magnitude values, on the basis of a model of the fault mechanism of the seismogenic zone which the given earthquake falls within, and a simulation of the seismic wave propagation through the layers of the geologic model. The accelerograms used in the proposed approach are coherent with both the characteristics of the expected seismicity in the site, and the considered magnitude level. The described procedure is applied to the structures of a hospital in Messina carrying out a series of non linear dynamic analyses by varying the seismic events of increasing magnitude values coherent with the Messina Straits seismogenic zone. This procedure allows the structural damage evolution to be checked for increasing magnitude values. As a consequence, it is possible, e. g., to determine the building response for a given magnitude, the magnitude value corresponding to different damage levels or collapse

and the level of damage for the maximum expected magnitude.