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The influence of earthquake source uncertainties and occurrence properties on NDSHA maps

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The procedure for the Neo-Deterministic Seismic Hazard Assessment, NDSHA, is based on the calculation of realistic synthetic seismograms. As a rule, NDSHA defines the hazard as the envelope ground shaking at the site, computed from all of the relevant seismic sources; accordingly, the simplest outcome of this method is a seismic zoning map, where the maximum of a given seismic parameter (e.g. PGV) is associated to each site.
Use is made of the available information about the space distribution of large size earthquakes (M$\geq$5 or I_{MCS} >VII), as defined from seismic history, seismotectonics and a wide set of geological and geophysical data (e.g. morphostructural features and present day deformation processes identified by Earth Observations). In this way, the standard NDSHA maps permit to account for the largest observed or credible earthquake (MCE) sources identified in the region in a quite straightforward manner. If needed, NDSHA allows using robust estimates of earthquake occurrence rates (e.g. those provided by the multi-scale approach), in order to provide information about the long-term average rate of expected ground shaking.
In Italy, most of the existing catalogues are based on macroseismic intensities (magnitude has been introduced in 1935 and the available catalogues are suitable for use with NDSHA since 1000), therefore reliable estimates of ground motion computations must be binned according to a factor of two, intrinsic in MCS and other intensity scales. The analysis of uncertainty in ground motion maps, due to the catalogue random errors in magnitude (which are mostly derived from intensities) and localization, shows a spatial pattern in the distribution of ground shaking uncertainty. Limits on the available information from past events, that may well not be fully representative of future earthquakes, can be overcome using independent indicators of the seismogenic potential of a given area, such as active faulting data and seismogenic nodes.