MACROSEISMIC INTENSITY ASSESSMENT OF THE 2008-2010 WALLOON BRABANT SEISMIC SWARM (BELGIUM) BY A GRID CELL PROCEDURE

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RESUMO: Macroseismic intensity assessment of felt earthquakes is important because it provides valuable information on earthquake ground motion, especially in poorly-instrumented regions. In this work *"Did You Feel It?"* (DYFI) macroseismic data collected through standardized online questionnaires of the Royal Observatory of Belgium (ROB, www.seismology.be) are analysed to investigate the intensity variation of 60 felt events of the 2008-2010 Walloon Brabant low-magnitude (-0.7 < M_L < 3.2) seismic swarm (Belgium). Macroseismic analysis of earthquakes that repeatedly occur in the same area allows to investigate the impact of magnitude and focal depth on the intensity distribution as local site effects are nearly similar for all events.

Instead of producing classical Community Internet Intensity Maps (CIIM), in which earthquake intensity is assigned to each municipality, we apply a different methodology: first, all individual responses are geolocated by address geocoding and, second, a Grid Cell procedure is applied in a GIS environment (QGIS) in which the model area is structured in regularly-sized grid cells. Based on individual intensity data, an intensity is assigned to each cell if at least 3 responses are located within a cell. This procedure ensures a homogeneous spread of the intensity data and permits a more reliable mapping of the earthquake impact that is easier to interpret than in a CIIM. The grid cell size can be adapted depending on the quantity of data and to the users' needs. Together with grid cell mapping, the intensity data are also analysed in attenuation graphs in which intensity decay is evaluated with epicentral distance.

The intensity grids and attenuation graphs of the seismic swarm show a consistent intensity decrease with epicentral distance in all directions. Analysing and comparing the intensity grids of all felt earthquakes indicate that deeper and higher-magnitude tremors are more widely felt but have a lower epicentral intensity than shallower, lower-magnitude earthquakes (up to intensity IV). In the attenuation graphs, the steepness of the attenuation decay is related to the earthquake depth: for earthquakes with a similar magnitude, shallower events have a steeper decay. The attenuation graphs for all felt events within the seismic swarm are also compared to the Central and Eastern United States (CEUS) Attenuation model of Atkinson and Wald (2007), an intensity prediction model typically used for intraplate earthquakes. The CEUS Attenuation model, however, proved to be inadequate in modelling the earthquake impact of the seismic swarm. Our data has always a lower intensity than the CEUS prediction. The development of a specific attenuation model for central Belgium is therefore advised to improve the assessment of the seismic risk. Apart from the intensity assessment, also the sound perception of earthquakes was analysed in grid cells. The sound results are however enigmatic as no distribution pattern could be clearly defined. This can be due to the fact that reporting a sound perception is too subjective for people.

PALAVRAS-CHAVE: MACROSEISMOLOGY, INTENSITY ASSESSMENT, GRID CELL

Código de campo alterado