



The Historical and InstruMental SEismic cataLogue for France (HIMSELF)

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In regions that undergo low deformation rates, as it is the case for metropolitan France, the use of historical seismicity, in addition to instrumental one, is necessary when dealing with seismic hazard assessment. The goal is to extend the observation time window to better assess the seismogenic behavior of the crust and of specific geological structures. This paper presents the strategy adopted to develop a parametric earthquake catalogue using M_w as the reference magnitude scale that covers the Metropolitan France for both instrumental and historical times. Works performed in the frame of the SiHex (Cara et al., 2015) and SIGMA projects (EDF-CEA-AREVA-ENEL), respectively on instrumental and historical earthquakes, are combined to produce the Historical and InstruMental SEismic cataLogue for France (HIMSELF). The SiHex catalogue is composed of $\sim 40\,000$ natural earthquakes, for which hypocentral location (inferred from 1D homogeneous location process and observatories regional estimates) and M_w magnitude (from specific analysis on crustal waves coda – $ML-LDG > 4.0$ – and magnitudes conversions laws) are given. In the frame of the SIGMA research program, an integrated study is realized on historical seismicity from Empirical Macroseismic Prediction Equations (EMPEs) calibration in M_w (Baumont et al., submitted) to their application to earthquakes of the SISFRANCE macroseismic database (BRGM, EDF, IRSN), through a dedicated strategy developed by Traversa et al. (submitted) to compute their M_w magnitude and depth. This inversion process allows taking into account the main macroseismic field specificities reported by SISFRANCE with a Logic Tree (LT) approach. It also permits to capture epistemic uncertainties associated to macroseismic data and to EMPEs selection. For events that exhibit a poorly constrained macroseismic field (mainly old, cross border or at sea earthquakes) joint inversion of M_w and depth is not possible and a priori depth needs to be set to calculate M_w . Regional a priori depths are defined here based on analysis of the distribution of depths computed for earthquakes with a well constrained macroseismic field and for which joint inversion of M_w and depth is possible. At the end, 27% of SISFRANCE earthquake seismological parameters are jointly inverted and for the other 73% M_w are calculated assuming a priori depths. The HIMSELF catalogue is composed of the SIGMA historical parametric catalogue from 463 to 1965 and of the SiHex instrumental one from 1965 to 2009. All magnitudes are expressed in M_w which makes this catalogue directly usable as an input for seismic hazard studies, carried out both through a probabilistic or deterministic way. Uncertainties on magnitudes and depths are provided in this study for historical earthquakes following calculation scheme presented in Traversa et al. (submitted). Uncertainties on magnitudes for instrumental events are from Cara et al. (2016).