The ISC-GEM Earthquake Catalogue for Global and Regional Seismic Hazard Assessment

*Dmitry Storchak[1], Domenico Di Giacomo[1], James Harris[1]

1. International Seismological Centre

The original ISC-GEM Global Instrumental Earthquake Catalogue (1900-2009) was released in 2013 (www.isc.ac.uk/iscgem/index.php). The catalogue was especially prepared for use in global and regional seismic hazard assessment. The main advantage of this catalogue is an improved homogeneity and accuracy of the earthquake parameters over the entire period of global instrumental seismological observations. The uncertainties and quality assessments of the main earthquake parameters are the other important features of this product.

The original ISC-GEM catalogue included only earthquakes greater than or equal to the following cut-off magnitudes: MS 7.5 for earthquakes occurring before 1918, MS 6.25 between 1918 and 1963 and MS 5.5 from 1964 onwards. With further funding from several commercial and public organizations, we are adding both recent earthquakes as well as those in the early instrumental period that fell below the original cut-off magnitudes. Here we present the Ver. 4.0 of the extended ISC-GEM catalogue, released in January 2017, that includes many thousands of additional earthquakes that occurred during 1920-1959 period.

The ISC-GEM catalogue (1900-2013) is freely available from the ISC website and is widely used by researchers working in both public and commercial organizations worldwide.

Keywords: hazard, global, catalogue, earthquake

Full-Waveform Ground-Motion Simulation and Its Application to Seismic Hazard Analysis

*Ming-Che Hsieh[1], Yin-Tung Yen[1], Po-Shen Lin[1]

1. Disaster Prevention Technology Research Center, Sinotech Engineering Consultants, Inc.

Nowadays full-waveform ground-motion simulations from physical aspects are necessary for earthquake-induced ground-motion prediction and seismic hazard assessment. Damages to engineering structures by an earthquake depend on the entire time history of the ground motion, which is affected by a number of factors including source-rupture process, subsurface velocity structure, topographic relief, and local site condition. Among these four factors, the source process may be most important because it leads to directivity effect, a major factor in determining the spatial pattern of the ground motion. Furthermore, effective modeling of the effects of structural heterogeneity, surface topography, and site amplification is necessary in order to achieve more realistic synthetic seismograms. In this study, we present a physics-based full-waveform ground-motion simulation scheme and its application to seismic hazard analysis. We carried out simulations to capture overall ground-motion characteristics at important sites with accounting for effects of (1) multiple source-rupture scenarios, (2) seismic wave propagation, (3) surface topography and (4) site amplification in modeling realistic synthetics. This ground-motion simulation scheme has been compared with probabilistic seismic hazard analysis (PSHA) results for the Science Park in southern Taiwan. Thus, the full-waveform ground-motion simulation technique has the potential to provide additional constrains for seismic hazard assessment and mitigation.

Keywords: ground motion simulation, seismic hazard analysis, PSHA

Systematic search for b-value anomalies in Japan

*John M. Aiken[1], Fabrice Cotton[1], Danijel Schorlemmer[1], Takahiko Uchide[2]

1. Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, 2. Geological Survey of Japan, AIST

Gutenberg-Richter b-values have been shown in case studies to be low prior to large earthquakes. However, a systematic study of b-values prior to large (>M6.5) earthquakes for a entire region has never been conducted. We systematically investigate the spatio-temporal evolution of b-values using a data-driven approach. Using the Japan Meteorological Agency (JMA) earthquake catalog, we explore b-values prior to major crustal earthquakes with M>6.5 in Japan that occurred during a 15 year period (late 2001 to late 2016). We calculated b-values in three dimensionally distributed grids using a parameter search (selection radius, time periods, etc.). We search for the appearance of b-value anomalies associated with large-magnitude earthquakes to develop a data-driven anomaly definition. These results will be used in designing a final model submitted to the Collaboratory for the Study of Earthquake Predictability (CSEP), Japan for testing.

Keywords: seismology, b-value, statistics

