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Seismic Hazard Assessment in Stable Continental Regions of Northen Eurasia

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Assessment of the seismic potential and related risk level of stable continental regions (SCR) is a highly complex problem, as the applicability of techniques developed for seismically active areas to the areas that have no or limited seismic records is still under discussion. The seismotectonic data of the SCR are very poor because of low seismic activity and an insufficient seismological monitoring system. On the other hand, the geological knowledge is rather good owing to extensive geological and geophysical surveys held during the past decades. Digital data base is compiled from all collected data. Procedure of its interpretation use current internationally recognized methods and criteria and include several stages. 1) Microearthquake detection on the base of seismograms which used polarization analysis, artificial intellect method, wavelet analysis. 2) Paleoearthquakes, prehistorical, historical and instrumentally recorded earthquakes are investigated. 3) The faults capability are analyzed and appropriate seismotectonic model is created. 4) Amplitudes of neotectonic vertical movements, basement and Moho boundaries are interpreted numerically in terms of deformation of earth crust in the investigated region through curvatures calculations. 5) Seismotectonic deformation rate (seismic strain release) are estimated analytically and thus it dependence from maximum earthquake magnitude (Mmax) and the seismic activity parameters are derived. 6) Maximum earthquake potential Mmax of capable faults is evaluated on the base of comparison of geological and seismic deformation. Magnitude of design basis earthquake is estimated using recurrence plot. 7) Engineering Seismology Studies included estimation of peak ground acceleration (PGA) and duration of strong shaking. The PGA is derived from the regional attenuation lows for ground motion versus distance. We apply the above approach to the several critical facilities which have been investigated during last years. The critical infrastructures of Novovoronezh, Kursk, Smolensk, Kalinin and Leningrad regions are located on the East European craton. Bilibino critical infrastructure is located in the Mesozoic Verkhoyansk-Chukotka fold belt. For capable faults within the investigated territories microearthquake registration is carried out. Automatic phase pickers are designed for seismogram processing based on STA/LTA ratios jointly with polarization analysis. Neotectonic bending strain rate and the seismotectonic strain rate, which depend on the Mmax, and seismicity parameters are determined. Maximum magnitudes for all the above mentioned sites are found to be in the range 4-4.5 The intensity I of strong shaking is less than 5 balls. Three different approaches were applied in estimating target response spectrum. Generalized response spectrum was calculated based on West Europe seismic records. Parametrisation of Eurocode 8 (1998) as well as standart spectrum spectra from Russian Guideline NP-031-01 (2002) were used. Ground time history acceleration was synthesized on a basis of standard generalized ground spectra. Acknowledgments. This work was partly supported by RFBR, № 07-05-00436.