Geophysical Research Abstracts
Vol. 19, EGU2017-7350, 2017
EGU General Assembly 2017

Seismic zoning (first approximation) using data of the main geomagnetic field

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Seismic zoning is among the most complicated and extremely important problems of modern seismology. In solving this problem, a very important parameter is maximal possible earthquake magnitude (Mmax) which is believed at present depends on horizontal size of geoblocks. At the same time, it was found by Khachikyan et al. [2012, IJG, doi: 10.4236/ijg.2012.35109] that Mmax value in any seismic region may be determined using Z_GSM value that is geomagnetic Z-component in this region estimated in geocentric solar-magnetosphere coordinate system (GSM). On the base of the global seismological catalog NEIC with M≥4.5 for 1973-2010 years, and the International Geomagnetic Reference Field (IGRF) model, an empirical relation was obtained as follows: Mmax= a + b {log[abs(Z_GSM)]}. For the case of the whole planet, obtained empirical coefficients are as follows: a = (5,22 ± 0,17), and b = (0,78 ± 0,06) with correlation coefficient R=0.91, standard deviation SD=0.56, and probability 95%. Further investigations showed that the coefficients of the regression equation are different for different seismically active regions of the planet. For example, to the territory of the San Andreas Fault, defined by the coordinates 30-45N, 105-135W obtained values are as follows: a = (4,04 ± 0.38) and b = (0.7 ± 0.13) with correlation coefficient R = 0.91, standard deviation SD = 0.34, and probability of 95%. For territory of inland seismicity in Eurasia defined by the coordinates 30-45N, 0-110E, a = (12.44 ± 0.48) and b = (1,15 ± 0.2) with correlation coefficient R = 0.87, standard deviation SD = 0.98, and probability of 95%, and for the territory of the strongest seismicity in the world defined by the coordinates 20S-20N, 90-150E, obtained values of a = (- 17.5 ± 1,5) and b = (5,7 ± 0.4) with correlation coefficient R = 0.97, standard deviation SD = 0.4, and probability of 95%. The relationship between the intensity of the main geomagnetic field and released seismic energy is expectable, because both the main geomagnetic field and the tectonic activity of the planet originate from the same source - the convection in the Earth's liquid core. The relationship between earthquake magnitude and geomagnetic Z - component expressed namely in geocentric solar magnetosphere coordinate system (GSM), in which the interaction of the solar wind magnetic field with the geomagnetic field is better ordered, indicates at the external (triggering) earthquake occurrence in the extremely stressed tectonic area. Above empirical relationships may be used (in first approximation) for global seismic zoning and for prediction of possible Mmax, when a place and time of earthquake occurrence are predicted. In report we present global maps of Z_GSM and Mmax estimated for different seasons and different times.