Geophysical Research Abstracts
Vol. 16, EGU2014-1449, 2014
EGU General Assembly 2014

Comparative analysis of the tsunami and large earthquake occurrence in the Pacific.

Boris Levin (1,2) and Elena Sasorova (2)

(1) Institute of Marine Geology and Geophysics FEB of RAS, Yuzhno-Sakhalinsk, Russian Federation (levinbw@mail.ru), (2) Shirshov Institute of Oceanology RAS, Tsunami Laboratory, Moscow, Russian Federation

The data about tsunami events from 1900 to 2012 with M>=7.5, tsunami intensity I>=1, which have tectonic nature and the validity level V=4 were extracted from two tsunami databases: the Expert Tsunami Data Base for the Pacific (ETDB/PAC), Novosibirsk, Russia (http://tsun.sscc.ru/htdbpac), and Tsunami Event and Runup Database at NOAA www.tsunami.noaa.gov/observations_data. Total number of chosen events was equal to 108.
The temporal distributions of the tsunamigenic earthquakes (TEQ) epicenters and the distributions of the energy released by the TEQ were calculated separately for the entire Pacific region, and for the Southern hemisphere (SH), and for the Northern hemisphere (NH) as well as for a number of sub-regions of the Pacific: Japan, Central America, South America, Alaska, the Aleutian arc and the Kuril-Kamchatka arc.
Next, we use two subsets of the worldwide NEIC earthquake (EQ) catalog (USGS/NEIC from 1973 up to 2012 and Significant Worldwide Earthquakes (2150 B.C. - 1994 A.D.)). Total number of chosen events was equal to 615. The preliminary standardization of magnitudes was performed. The temporal EQ distributions were calculated separately for the entire Pacific region, and for the SH, and for the NH and for eighteen latitudinal belts: 90°-80°N, 80°-70°N, 70°-60°N, 60°-50°N and so on (the size of each belt is equal to 10°).
In both cases (for the seismic events and for the TEQ), the entire observation period was divided into several five-year intervals. We calculated also two-dimensional spatio-temporal distributions of the EQ (TEQ) density and the released energy density. The comparative analysis of the obtained distributions (for the large EQ and for the TEQ) was carried out. It was found that the latitudinal distributions of the energy density for the grate EQ and for the TEQ are completely different. The analysis showed the periodic changing of the seismic activity in different time intervals. According to our estimations the periodic component of the seismic events determined approximately 30-40 years. The manifestation of this periodic component is inhomogeneous for different latitudinal intervals. The intensification of tsunami activity (number of the TEQ) also has different periodicity in different latitudinal belts. We found that the sources of the TEQ were mainly concentrated in the three latitude intervals: 40°N – 60°N, 15°N – 10°S, and 25°S-35°S. The periodicity of tsunami activity was varying from 10 to 35 years.
It is shown also that tsunamigenic earthquakes were only about 16% of earthquakes with M> = 7.5. The same relationship was observed for events with M >= 8, but all events with M >= 8.5 were tsunamigenic. Before in the work [Gusiakov, 2011] was shown the weak correlation between the intensity of the tsunamis and the magnitude of the earthquakes. According to our calculations, the correlation coefficient varies between 0.1-0.2. Apparently TEQ have special characteristic properties that arise in their sources. The search of such features requires setting up special studies that were discussed in this paper.