A nonrandom component in the earthquake distribution between the northern and southern part of the Pacific: observation data analysis and modeling.

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The equator plane can be considered as a natural symmetry plane for various geophysical processes. It has been taken into account that any fragment of the lithosphere may be considered as a set (system) of nonlinear oscillators that is capable of responding chaotically or regularly to external forcing. The objective of our work is to perform a specific procedure of electronic earthquake (EQ) catalog analysis, using methods of nonparametric statistics, in order to distinguish the conditions of appearance and the significance of nonrandom component in the process of temporal earthquake distribution between the Northern (NP) and the Southern (SP) parts of the Pacific region. The worldwide catalogs ISC and NEIC were used. The events with 4<=Mb (1964-2003 year) were chosen (a total number of events more than 200000). The aftershocks were canceled from the list. All events from the list were subdivided into following magnitude ranges (MR): 4<=Mb<4.5; 4.5<=Mb<5; 5<=Mb<5.5; 5.5<=Mb<6.0; 6<=Mb<6.5; 6.5<=Mb. The distribution-free test (run test with significant level 1%) was used for existence proof of nonrandom component into time sequences. The time sequences of the EQ switching between the Northern and Southern parts of the Pacific region contain statistically significant nonrandom component for the events with 4.0<=Mb<6.0. Then data in each magnitude range was subdivided in two groups: the deep earthquakes (H>70 km) and the shallow earthquakes (H<=70 km), where 70 km is threshold value (Htr). It was found that nonrandom component does not exist for deep earthquakes. On the contrary it is clearly manifested in time distribution of the shallow events. It was shown also that if we try to vary H_{tr} from 15 up to 200 km we could find the best Htr value (Hopt) for each magnitude level. The digital model (superposition of random and periodic processes) was proposed. The set of calculating experiments with model was carried out and the existence conditions of statistically validity of the periodic component in compound process were defined. It was found that statistical validity of the periodic component according to run test depends on ratio frequency of periodic component and the size of the sample sequence. The calculating experiments enable to comprehend some particular feature of the observation data: absence of the non-random component for the magnitude range Mb>6.5; disappearance of the non-random component after subdividing the original time series into the set of short subintervals (with duration 4 and 2 years). The obtained results indicate

that external periodical factors can affect, on the process of earthquake triggering, if the depth of the earthquake focus is less than Hopt. It was carried out additional analysis of observation data while the boundary of regions and location symmetry plane were scientifically modified.