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The global regularities in the earthquake latitudinal distributions and influence of the external forces on the Earth's lithosphere.

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The objective of this work is the attempt to analyze the modern point of view on interaction between global seismicity and influence of the external forces on the lithosphere of the Earth. The analysis of the statistically valid regularity of the EQ distribution over latitudinal belts was carried out for the Pacific region, for the eastern and western parts of the Pacific and for the spreading zones. The worldwide catalog ISC and NEIC were used (total amount of events is more than 200000). It was extracted all EQ in the Pacific with Mb>=4.0. The latitude distributions of the EQ number and energy released by EQ were calculated. The number of events in each latitudinal interval was normalized by the length of lithosphere plate boundaries in the given latitudinal zone. Thus we obtain relative seismic event number generated per one kilometer of the plate boundary. The normalized latitudinal distributions of the EQ number and energy released by EQ have clearly expressed bimodal character with two peaks located in Northern Hemisphere (40°–50°N) and in Southern Hemisphere (20°–30°S), local minimum near the equator (10°–20° N) and almost zero values in the regions of the polar caps. It was proved the stability of the obtained results in time and to various sizes of the latitudinal belts (10º, 5º and 2º).
Then the analysis of 2D EQ distributions (in depth and in latitudinal belts) was fulfilled. It was shown, that for the high latitudes up to 90% of the EQ sources are located on the depth H<=20 km. The part of EQ with 20<H<=60 km increases step-by-step for middle latitudes. And the essential part of EQ sources in latitudinal belts near equator (30 S - 30 N) are located on the depths 100<H<=240 km and H>=500 km (deep EQ). Maximal amount of deep EQ belongs on latitudinal belt 30 - 20 S. The analysis of EQ energy distributions over depth and over latitudinal depth shows, that full interval of depth in each latitudinal belt divides into three parts (clusters) with close-cut separation boundaries ((K1 - with 0<H<=80 km, K2 - with 120<H<=240 km and K3 - with H>=500 km).
The analysis of the obtained EQ latitudinal distributions shows, that the difference in the EQ number between some latitudinal belts is more than several tens times and for energy distributions this difference is more than 100 times. At the same time the maximum difference in the plate traveling velocities in subduction zones is no more than 10% (for example the Pacific part of the South America from 5ºN to 45ºS). It seems that it difficult to explain these peculiarities of the latitudinal distributions only from point of view the theory of plate tectonics.
Let us to consider the possible linkage between the seismic process and tidal forces. According to the tide theory [Melchior, 1983] the maximum of tidal energy is observed in Southern and Northern Hemispheres at the latitude 45° and zero values are marked at the poles and at the equator. But the real latitudinal distributions show the clearly expressed skewness. The direct relationship between the EQ origination and tidal forces is not adequately validated now. Moreover it was shown that influences of weak but long-period tidal forces (monthly, semiannual and annual) are more effective than influence of several times more powerful short-period tidal forces (diurnal and semi-diurnal). It was noted also, that total influence of tidal forces may have distinct nonlinear effect. It is evidently, that composite geological medium which is characterized by non-linear parameters and nonuniform structure, does not give simple and prompt response to an external forcing. In the last few years, concepts about the important role of the water fluid in seismicity process are gaining more and more support. The strongly pronounced irregularity of EQ latitudinal distributions can find the explanation in future only as a complex problem by joint analysis of the geological effects, influence of tectonic forces, tidal forces and the Earth rotation peculiarity.