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Factors of global fluid transportation and catastrophic earthquakes

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On the base of previously reserved a scheme of the geodeformation pulsation centers global displacements was their connection to the catastrophic earthquakes of the last years shown.

Key words: fluid dynamics, monitoring, geodeformation waves, geodeformation pulsation centers, earthquakes

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Investigating geodeformation processes that appear in the variations of fluiddynamic (primarily emanation) fields of the earth's crust fault geostructural formations of the geosinclinal (seismic) and platform regions of the former USSR, we have identified several patterns of spatial and temporal distribution of geodynamic events, showing their connection with processes of the lithosphere's self-organization, accompanying changes in rotational regimes of the Planet [*Rudakov, 2004; Rudakov, 2009*]. According to the analysis of dynamics of these patterns manifestation across the globe a map diagram (Fig. 1) was made of the global distribution centers of the geodeformation pulsation (GDPC) of the lithosphere. These centers represent a field of "interference" (combination of extremes) latitudinal and longitudinal wave components of geodeformation wave of seasonal (annual) periodicity. In this case, for graphic constructions have been used empirically received data on the rate of migration of seasonal geodeformation wave fronts in the latitude (7 km/day) and longitude (28 km/day) directions with reference of the extrema points of this wave movement to specific coordinates, i.e. to those in which a long-term monitoring of the geodeformation processes was made.

A characteristic feature of the seasonal geodeformation wave is exposure its amplitude (at average values of the order of $0.\ 3x10^{-6}$ [*Nersesov et al, 1985*] by the modulating influence of the long-geodeformation waves, as result of which the amplitude can reach critical levels (about 10^{-4}). Exceeding these values is accompanied, as a rule, by emission of seismic or volcanic (in respective regions) energy and other geodynamic phenomena [*Rudakov, 2004; Rudakov, 2009; Zhdanova, Rudakov, 1993; Rudakov, 1993*].

At the same time, the seasonal geodeformation wave affecting the amplitude and phase parameters of wave geodeformation processes of intra year periodicity, determines the dynamics of the more higher-frequency interval of the spectrum of the geodeformation "vibro" affect on the fluid system of the underground hydrosphere. This allows us to consider GDPS depicted on the scheme as local sources of rhythmic geodeformation impact on the formation fluids. The range of this influence extends from the vibrations of intra year periodicity to diurnal frequency components that contribute to directed transport ("pumping") of fluids of the fault structures in the latitudinal and longitudinal directions.

As follows from the received scheme GDPC are located (mostly) over the geodynamically active points of the Planet, superimposed on the overall configuration of the major continental and intercontinental paleorifts, continental paleooutskirts and marginal basins of the crust. Moreover, they (the centers) coincide or are close to many well-known hydrocarbon accumulations provinces both in Russia and abroad. The latter suggests that in the formation of oil and gas accumulations of the sedimentary cover and in the regularities of distribution in the crust oil and gas accumulations geodeformation factor determined by the rhythmic action centers on the lithosphere geodeformation pulsation, is no less important than factors of geological and geochemical origin. It is also clear that due to geodeformation factor affecting the change of the fluidtransportation regimes in the crust, are

created conditions conducive to the development of relevant geological and geochemical conditions and thermal regime of the formation of hydrocarbon deposits.

Analysis of the space-time location on the world map of the geodeformation pulsation centers of the earth's crust in the precondition of their connection with the provinces of hydrocarbon accumulations, shows not only the affinity of both to the active geodynamic structures of the Earth's crust, but also direct participation of GDPC in the processes of the hydrocarbon accumulations formation. This participation is determined, above all, by the formation of excess pressure in the fluid-saturated layers, contributing to directed transport ("pumping") in them oil and gas components in systems of meridional faults in the northern direction for northern hemisphere and in the south direction for the south hemisphere.

The last circumstance is a prerequisite for the formation of huge accumulations of hydrocarbons in the polar systems of rifting. The assumption, apparently, is also valid for faults trending east-west, but in this system of lineaments crustal fluid migration is carried out exclusively in a western direction, in accordance with the direction of movement of the fronts of longitudinal component of the seasonal geodeformation wave.

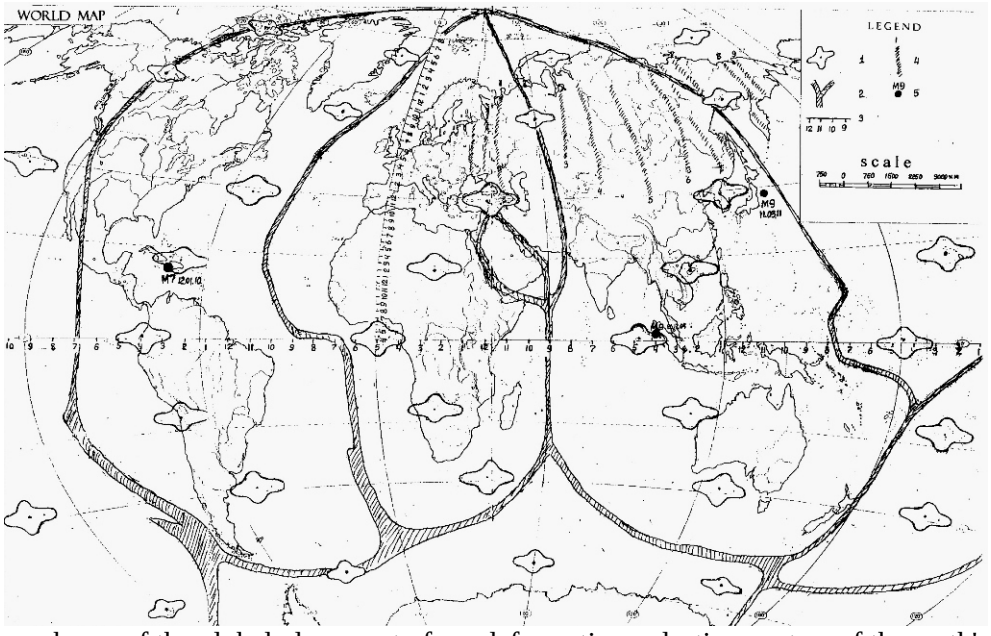

Fig. 1. The scheme of the global placement of geodeformation pulsation centers of the earth's crust. In the scheme are also plotted: 2 - main trunks of the world rift system, 3 - time scales of migration fronts of seasonal geodeformation wave in the latitudinal and longitudinal directions, 4 - the main faults of meridional system of the former USSR [according to *Sivorotkin, 2002*]. The numbering corresponds to the meridional lineaments shown in [*Sivorotkin, 2002*]. Button (5) corresponds to the location of the catastrophic earthquake in Sumatra, Haiti, and in Japan.

All this creates conditions for the strategy planning of exploration studies based on tracing the known and anticipated zones over rift geostructural formations, superposed in space with the location of the geodeformation pulsation centers of the earth's crust, and the search within the zones of their dynamic influence of the structural "traps" that provide long-term (at geological standards) preservation of hydrocarbon accumulations.

At the same time, ability to recover on the basis of a retrospective analysis of the velocity regimes of the planet at various epochs of its geological history, the system allows you to recreate over rift paleostructural formations that are favorable for the formation of petroleum accumulations. Thus, for the modern earth's rotational regimen, which determines the position of the continental rift controlling structures and placement of the geodeformation pulsation centers of the earth's crust in the territory of the Russia the perspective of not studied areas are the Verkhoyansk mountain range and the shelf of the East Siberian Sea. Moreover, the dimensions of hydrocarbon accumulations in these areas, probably comparable to the size of oil and gas potential of the West Siberian petroleum province and the Kara Sea shelf, which is consistent with the forecasts of Petroleum Geologists, classifying the named territory as a potentially oil and gas basins [Kleshchev and Shein, 2004].

Besides that the selected "nodes" of geodeformation pulsation of the earth crust coincide with the centers of modern geodynamic activity of the Earth, are repeated in the general configuration the contours of the main trunks of the planet meridianal rift system [*Sivorotkin, 2002*], and superimposed on the area of the formed oil and gas provinces. Their involvement in the formation of hydrocarbon accumulations in the areas of active tectonic destruction of the earth's crust causes provocation of the most catastrophic seismic events. Among the most famous in the last century examples of this symbiosis are Gazly earthquake in 1984, and Neftegorsk earthquake in 1995, and from classical occurred recently are earthquakes near Sumatra December 26, 2004 and March 28, 2005, reached the level of seismic energy is almost nine ball mark on the Richter scale, as well as in Haiti January 12, 2010 and in Japan March 11, 2011.

As can be seen from the figure, the catastrophic earthquakes in Sumatra realized within our dedicated center of geodeformation pulsations, which not only is in the zone of active subduction processes that are formed the morphology of the mountain massif of Sumatra and its vicinity, but also "mark" it (mountain massif), oil and gas capacity (Oil and gas capacity, 1978). So, for the formation of gigantic hydrocarbon accumulations on Sumatra and its vicinity existed geostructural, geochemical, and geodynamic conditions typical for oil and gas basins.

Thus, the analysis results of the study of the geodeformation wave processes dynamics in the geosynclinal and platform regions for determine their involvement in the development of catastrophic geodynamic phenomena allowed to draw a picture of the global distribution of points of the geodeformation pulsation of the earth's crust, formed by processes of rhythmic changes in Earth's rotational speed. It is shown the involvement of these points at the fluid transportation regimes formation and rhythms degassing the Earth's crust degassing, at the formation of structural-tectonic elements and at the formation of minerals of hydrocarbon origin. Confirmed so, that the basis of the nature of catastrophic seismic events is the relationship of areas of formation of hydrocarbon accumulations with areas of contemporary geodynamic activity.

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