不同层序岩相中的不稳定带和岩石的特征变化

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盆地形成的原因包括：构造圈深部地带物质的不稳定状态、软流圈厚度的增加和继而地壳厚度的减小。大多数沉积盆地均有一些高能不稳定层，反映了岩石特征的非线性交换。

在不同岩石类型的不同深度，密度、孔隙度、水饱和度等的异常均不相同。决定异常存在的主要作用是岩石的构造-组分特征和导热性、导电性。

采用与深度和 PT 因子一致的温度计算法来建立不同岩石类型和不同地球动力条件和热力条件下岩石特征变化的计算机模型或许是重要的。密度、孔隙度等的非线性变化决定了不同流体循环的环型流动的存在，不稳定层的预测是矿产预测之关键。

THE INSTABLE ZONES IN DIFFERENT LITHOFACIES OF SEQUENCE AND PROPERTY CHANGES OF THE ROCKS

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ABSTRACT

The reasons of basin's formation are: unsteady states of substance in deep zones of tectonosphere, increasing of asthenosphere thickness and decreasing of the crust thickness consequently. There are some levels of energetic instability in most of sedimentary basins. It reflects in nonlinear exchanging of properties of the rocks.

The anomalies of density, porosity, water saturation and others are distiguished in different depths in different types of rocks. The main processes that determine the existence of anomalies are structure-compositional features of rocks and thermo- and electroconductivity.

Probably it's import to construct computer model of changing of rock's properties in dif-

ferent types of rocks and in different geodynamical and thermal conditions, using method of temperature calculation according with depth and PT-factor. The nonlinear exchanging of density, porosity and others determine the existence of circulating cells in which different fluids circulate. The prediction of instable levels is the key for prospecting of mineral resources.

The deep drilling shows that properties of the rocks chance nonlinear with depth. There are some levels of energetic instability in most of sedimentary basins. The anomalies of density, porosity, water saturation and drops of temperature gradient were marked on these levels.

The reason of these anomalies is interaction of different lithofacies of sedimentary rocks and the position of rocks in sequence. The most reaction ability is characteristic for many mudstones and coal-bearing formations. The alteration of sedimentary rocks have waving nature expressed in macrocyclic structure of sequences in according of tectonic phases and alteration of transgressions and regressions. The compositions and structures of rocks, their thermoconductivity determine the changing of the secondary properties.

Our collected data show that packing of clastic sediments increases from upper strata to lowers. Density increase and porosity decrease with depth. On the first stage porosity reduction in upper strata is resulted by displacement and conformation of grains. A more intensive primary porosity reduction at interval 2000—3500 m is related to mechanical compaction and beginning of pressure solution. A sharp decrease at porosity gradient about 3500 m is to be explained by increase of contact area between grains and consequently by reduction of stress on grains contacts. Fig. 1 shows curve of density and absolute porosity for feldspar-quartz Tertiary sandstones as function of burial depth in North Sakhalin. This curve are schematics but it is established on data statistical processing. At the upper part of the section we can observe a relatively rapid increasing of density and rapid decrease of porosity. More lower the secondary porosity and the undercompaction (decompaction) develope. Such change of porosity and density with depth is to be explained by their compaction-decompaction equilibrium. We named it the waves of compaction-decompaction and distinguish 2 or 3 waves in stratisphere.

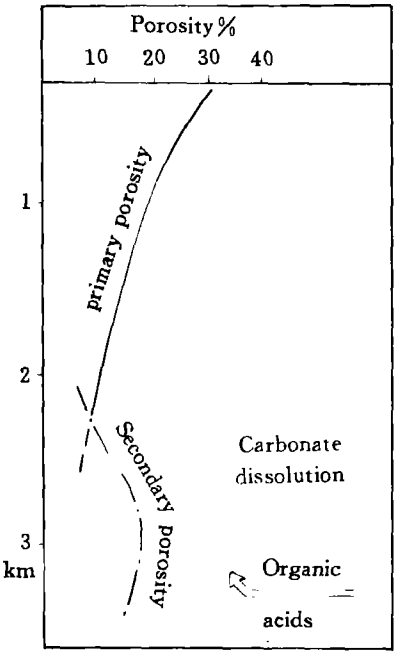

Fig. 1 Changes in porosity with depth in Tertiary deposits of North Sakhalin

The correlation between compaction and depth was influenced by secondary porosity.

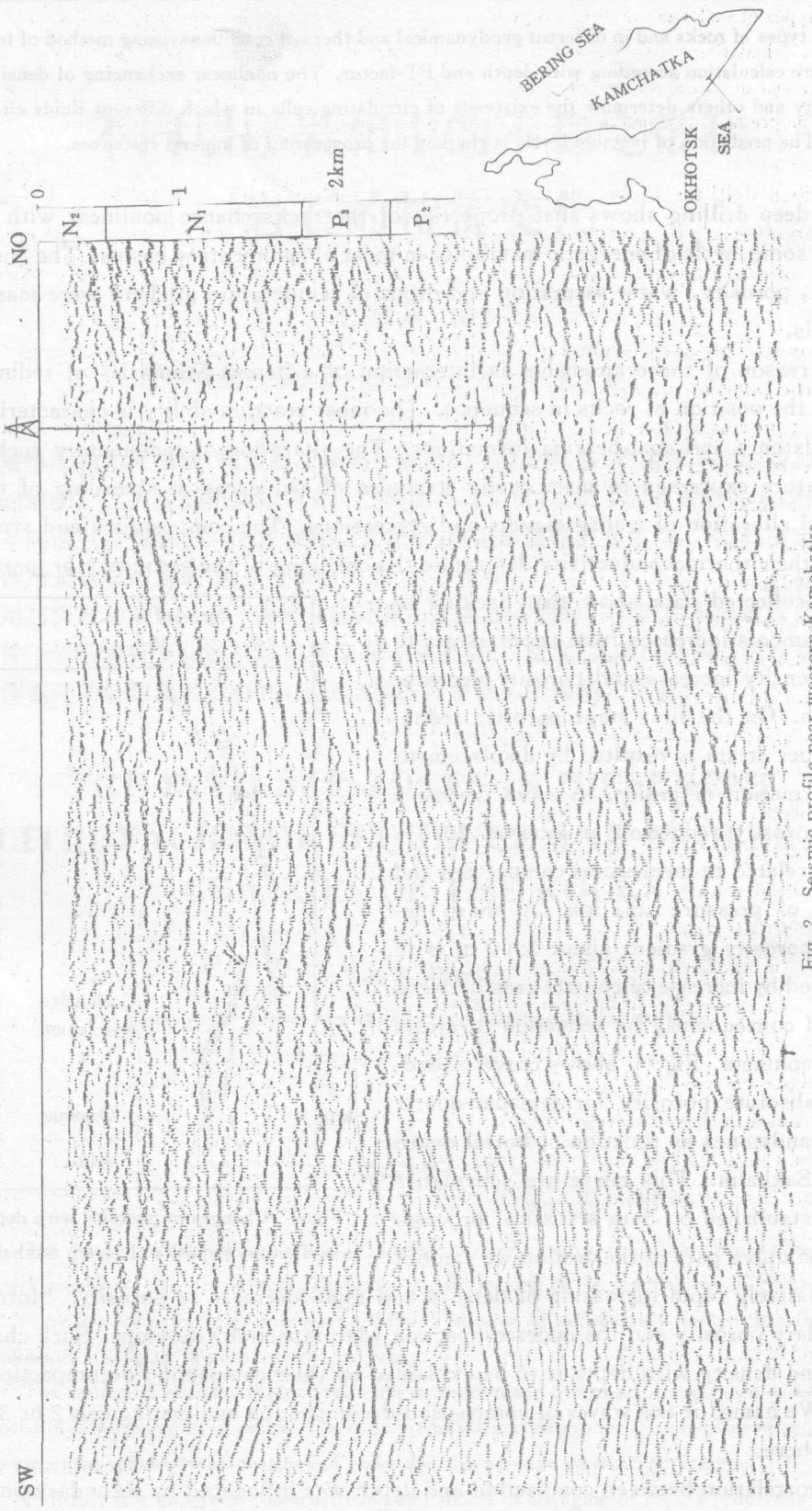

Fig. 2 Seismic profile near western Kamchatka

It was formed by partial to complete dissolution of grains and cement. An important role play new pores creation, they were created by dissolution of carbonates and then other minerals. The common and usual reason of carbonate dissolution is carbone dioxide which are generated by the thermal maturation of organic matter. The other agent for carbonate dissolution is organic acids as product of organic transformation. Secondary porosity is not strictly related to depth. Usually it make up the greater percentage of total porosity between depths 2500—3500 m in terrigenouos section. In silicites and carbonate rocks may be another depths. The depth depends upon temperature regime also.

The good reservoirs properties at big depth seem to be related to abnormal pressure zones. This abnormal pressure acts as buffer, reducing the effective stress loaded on sediments. Into some basins on moderate depths shales contain sufficient percentage of interlayered smectite-illite composition between other clay minerals. A 20—25% of interlayered mineral of this type in shales is enough common in many regions. We consider that the main reason of abnormal pressure in pores of muds and associated sands is compaction of mud and transformation of clay minerals accompanying by pressing out of junction (linked) water.

In case of strong interaction the processes of decompaction and increasing of high fluid saturation of rocks develope very much. The high temperature gradient appears under levels of instability state. These levels are the boundaries of blocks or geological "cells" in which irregular distribution of pressure and temperature take place. The generation of circular convection is result of this situation. Different fluids are involved in convective circulation, it's good factor for beginning of hydrocarbon migration. Moreover these levels are favourable for development of displacement along the beds and generation of subhorizontal shear zones. We see examples of such movements in Bering and Okhotsk seas (Fig. 2). In the low parts of sedimentary basins the vertical upflows are more effective, in upper parts the lateral flows are more strong. It's important structure-forming factor in basins especially for oil-gas migration. The formation of traps and redistribution of fluids take place simultaneously.

The application of sedimentary basin data base to different specific problems has academic and practical aspects. Probably it's possible to constract computer model of changes of rock properties in different types of rocks and in different geodynamic and geothermal conditions, using the method of temperature calculation according to depth and pressure-temperature factor.