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Study of anthropogeneous changing of underground geohydrosphere for estimation and prediction of geoecological danger

S. Kh. Maghidov
Institute of geology DSC RAS

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In the forties of the last century V.I. Vernadsky have written about origin of a new geological phenomenon, where "the Man had become the largest geological force" [*Vernadsky*, 1988]. From that time the scales of human activity have grown many times that creates conditions for ecological catastrophes both regional and global level.

Electrical and magnet background of the planet increased by orders, geochemical background of the atmosphere on some components and substances changed several times; unfavorable changes take place in hydrosphere too. At modern temps of technogeneous influence the Earth can become unfit for living of high animals including a man already in the nearest future.

Not less danger the man-made changes in the geosphere represent. Owing to wide scale recovery of underground fluids the forced evolution of underground hydrosphere takes place in global scale with essential change of thermo-baric conditions and physical and chemical properties of geofluids and rocks. Such development of events can threaten to cause non-predictable consequences because the modern level of knowledge doesn't allow to give exact forecasts of the global system behaviour for intensive technogeneous loading. More over it's impossible to guarantee that increasing man-made influences won't result in global cataclysms.

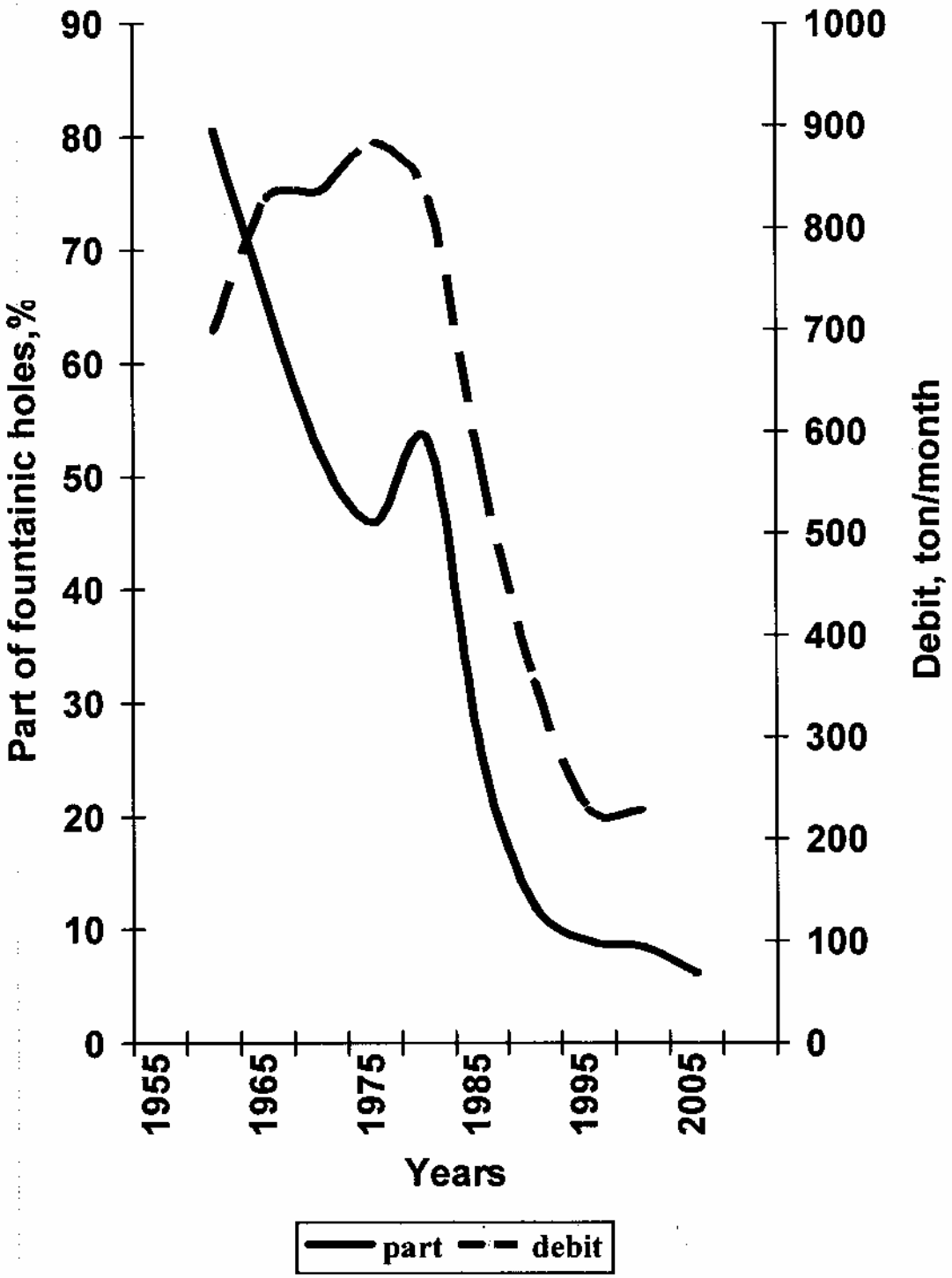
Close state of the Earth's bowels changes by their opening that may lead to cardinal alteration of geodynamics of the upper layers of the Earth's crust with breaking of natural fluidodynamic and tectonic processes because of change of geological and hydrogeological conditions of the bowels. In the work [*Maghidov*, 2009] it has been shown that the density of producing in the world oil wells nowadays is sufficiently big and can seriously influence geotectonic activity of the bowels and behaviour of geohydrodynamic systems that demands of reliable methods creation for hydrogeological prediction [*Konikov*, 1988]. If earlier influence of wells because of their little number was limited only by surrounding territory, when significant increasing of their number the force is spreading to the next wells, creating united sphere of influence. This field can cause global influence on properties of the upper layers of the Earth's crust, breaking the natural course of cyclic geodynamic processes going on with transference of great masses and energies.

Natural elastic and plastic system owing to defluidization turns into *hard and brittle* system, which hindering the natural course of geodynamic processes promote accumulation of strong strains that can cause super power tectonic earthquakes (STE) [*Maghidov*, 2009; *Maghidov*, 1994; *Maghidov*, 2002]. In the work [*Maghidov*, 2002] a possibility had been proved of super strong earthquake origin with magnitude 9 and more in the nearest future. The forecast came true during 10 years and at the beginning of XXI century two STE took place. Increasing scales of influence on geosystem will result in global change of upper strata properties of the Earth's crust that potentially can result in origin of hyperstrong earthquake with magnitude 10 and more, which will bring irreplaceable losses [*Maghidov*, 2002].

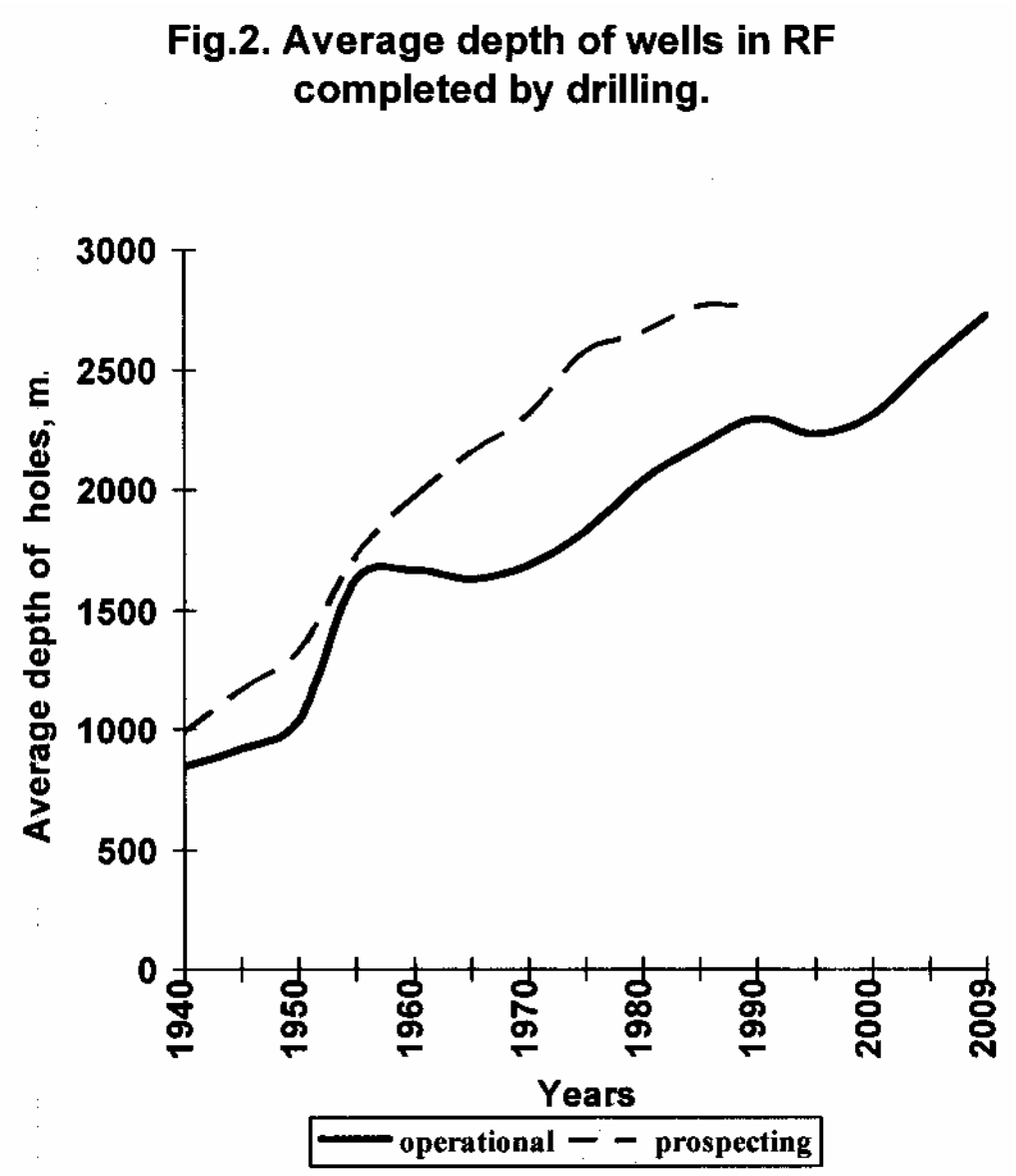
Because of heat losses and intensive defluidization, reduction of geothermal gradient takes place and also parameters of baric field in the upper crust, undergone to technogeneous force. Some data, illustrating scales of technogeneous influence on natural geohydrosystem, are given in Fig. 1 and 2. As parameters for illustration of stratal pressure changes in the bowels the discharge of oil wells and a quote of flowing oil wells from the total their number have been used. In Fig. 1 we can see that for a half of the century the both parameters have been decreased significantly that testifies to essential alterations in underground geohydrosphere. This, in its turn, leads to alteration of thermodynamic and physico-chemical properties (strength, elastic and plastic ones, filtration and so on).

In Fig.2 data of average depths of oil wells are given, which testify to scales of thechnogeneous influence on geosphere in the largest region of the world – Russian Federation -, the depth of development wells here exceeds already 2500 m.

Fig.1. Discharge of oil wells of RF and compressibility potential of formation.



In some areas of the RF this parameter is significantly higher. So, in Daghestan the middle depth of development oil wells two decades ago was more than 4 km. Nowadays in the world a lot of deep and super deep wells are drilled and every year a quote of them increased. Maximum depth of wells exceeds already 12 km.



For prediction the further man-made alterations of geological environment and prevention of ecological catastrophes of global nature it will demand to carry out investigations of several types: in vitro, in situ, as well analog and computer modeling.

List of geological objects and their properties requiring in urgent laboratory investigation (in vitro)

Compounds: fluids (HC, H_2O, CO_2, N_2, H_2 , He and so on), silicates, oxides, combinations of Al , Fe .
Measurement ranges: t = 20-600 ^oC; p = 1-3500 bar.

Thermodynamic properties

Molar volume (V), entropy (S), heat of formation (ΔH), free energy (ΔE).

Physical and chemical properties

Temperature of melting t_m, temperature of boiling t_b, permeability, solubility in liquid fluids.
Chemical interactions of fluids and rocks, decomposing and synthesis of fluids, depolymerization of non-organic polymers.

Physical and mechanical properties

Elastic and plastic properties of rocks under strain and stress in different time scales.

Nature investigations, hydrogeological and geothermal monitoring (in situ).

Hydrogeological monitoring

Regimen observations for natural fluido-dynamic processes and influence of anthropogeneous component on them.

Thermo-baric monitoring

Continuous observation for thermal conditions and study of geothermal gradient dynamics in time.

Systematic monitoring of baric field and investigation of exhaustion of elastic energy because of artificial exposing the Earth's bowels.

Geochemical investigations by express-methods

Determination pH, content of hydrocarbon dioxide, ions of Fe, Mg ets.

Analog and computer modeling

Analog formation

Processes modeling with using of alternate physical ground.

Mathematical simulation

Modeling with using of mathematical apparatus and computer technic.

All these data will need in further time for normalization of limiting loading on geological environment and producing of necessary recommendations for risk reduction of ecological cataclysms of man-made nature.

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