parameters (within experimental constraints) and hence on the vigour of small scale convection and the heat transfer. At the base of the long term stable lithosphere, a thermal boundary layer is formed in which the heat exchange between the convecting sub-lithospheric mantle and the lithosphere takes place. Small ascending diapers of warmer material slow down and spread out laterally at the base of the lithosphere, pealing off colder material that descends back into the upper mantle. The buoyancy effects of this partly chaotic mass movements cause low-amplitude and relatively rapid vertical movements of the surface of the lithosphere, which show only limited horizontal correlation. The faster vertical movements occur with periods from 2—20 Myr and have amplitudes up to 20—40 m. Long term surface movements have higher amplitudes and are caused by quasi-static organisation of the convective pattern in the sub-lithospheric mantle, which last long enough to influence the thermal state of the lithosphere. Because of the visco-elastic nature of the lithosphere, the more rapid buoyancy changes are filtered by a stiffer lithosphere than long term buoyancy changes. The shorter periods therefore correlate for slightly larger distances.

Extension of the convecting equilibrium model causes fault-controlled continental rifting and subsidence, followed by protracted thermal subsidence, much like the well-known plate model. However, in contrast to the plate model, the elevated asthenosphere is not instantaneously decoupled from the convecting upper mantle below, and cooling is thus not entirely conductive above the former base of the lithosphere. This causes significantly protracted cooling and slower and more linear post-rift subsidence. This model exhibits improved consistency with subsidence data from several rifted margins and intra-continental basins. Because of the small scale convection the long-term subsidence pattern in the presence of small-scale convection is superimposed by the aforementioned low-amplitude vertical movements due to convection dynamics at the base of the lithosphere. These movements are a recurrent and a potential cause for the development of stratigraphic sequences at similar time scale. Such sequences are commonly assumed to be caused by eustatic variations. The results therefore have important implications for inferences on global eustatic variations inferred form sedimentary sequences by e.g. back stripping analyses and assumptions about the thermal subsidence history based on the plate model of lithospheric cooling. Our results are furthermore important for the assessment of hydrocarbon potential of sedimentary basins in terms of stratigraphic correlation and thermal maturation.

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# Nature of sources of the magnetic anomalies in the Central Depression of the Dnieper-Donets Aulacogen

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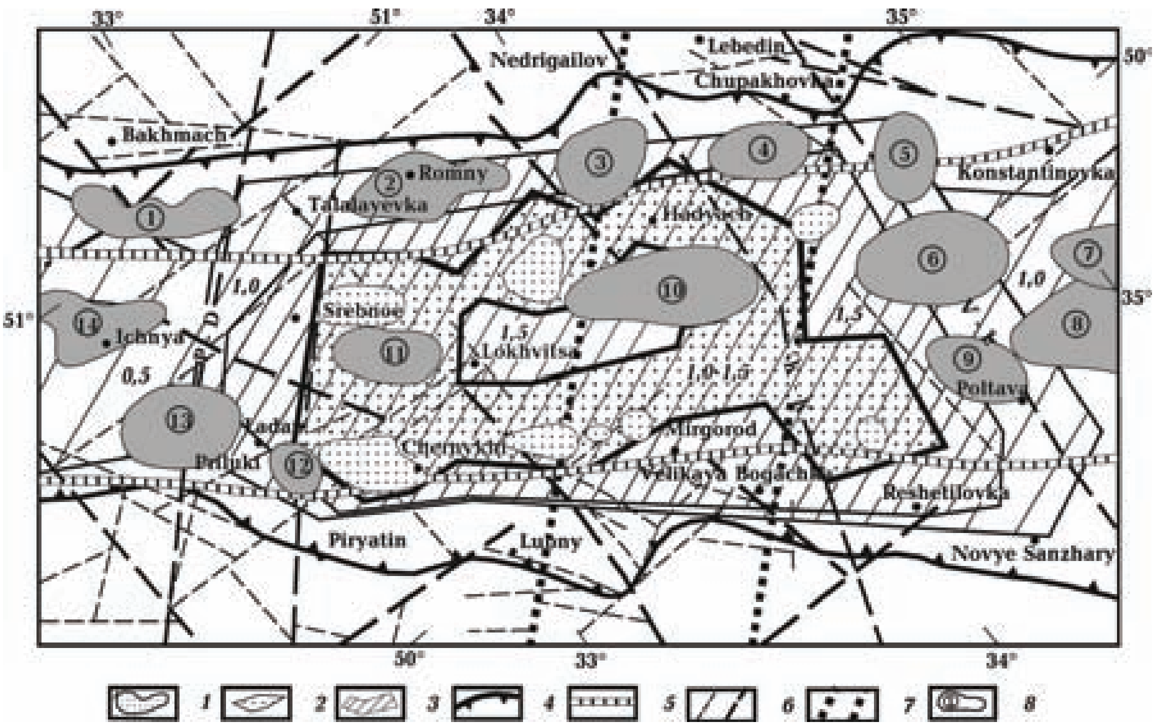
The nature of sources of the local and regional magnetic anomalies is an important element of the fundamental and applied studies aimed at elucidating the deep structure, composition and evolution of the Earth's crust. The present paper investigates the nature of the magnetization of different crustal layers of the Central Depression (CD) of the Dnieper-Donets Aulacogen (DDA) with special emphasis on elaboration of regional and local geomagnetic criteria for prognosing the oil and gas potential of the Earth's crust of the study area [Orliuk, 1994; Orliuk, Pashkevich, 1996; Orliuk et al.,1998; 2000]. The CD is situated between the cities Ichnya and Poltava [Chirvinskaya, Sollogub, 1980]. The crystalline basement surface is situated at depths from 2 km in the Aulacogen boundary areas and at 5—12 km in the central part. A regular basement depth increases from N to SE is observed [Ilchenko, 1997;




Sources of the magnetic anomalies in the consolidated crust of the Central Depression: *1* — local magnetic bodies with magnetization of 1.5—2.5 A/m; *2* — contours of the magnetic inhomogeneities of the upper crust, magnetization in A/m; *3* — contours of the magnetic inhomogeneities of the lower crust; *4* — marginal fault of the aulacogen; *5* — boundary of the Central Graben of the DDA (compacted part of the aulacogen) and faults of the rank; *6* — fault of the second and third rank by gravimagnetic data; *7* — projection of the exposure of the litospheric lineament G at the day surface the former separating the lithosphere with different thickness; *8* — contours of local depression.

Kozlenko, 1982]. Against the background of the regional change of the crystalline basement surface depth some local basins are distinguished. The Dimitrovskaya (1), Romenskaya (2), Sinevskaya (3), Kachanovskaya (4) and Sidoriachskaya (5) basins are located in the northern edge of the Aulacogen. The Solokhovskaya (6), Chutovskaya (7), Landoriskaya (8) and the Reshetilovskaya (9) basins are placed in the Aulacogen centre (at the Poltava and Akhtyrka longitude) (Figure). The Lutenskaya (10), Srebnenskaya (11) and Ichnianskaya (14) basins are situated in the central part of the Aulacogen, while the Ladanskaya (12) and Prylukskaya (13) basins are close to the southern boundary. The basins situated near the northern aulocogen (with the 6.0—7.5 km basement depths) are separated from the Aulacogen centre basins (7.0—12.0 km depth) by a peculiar swell with depths of 4.5—6.0 km to the crystalline basement surface. According to seismic data, the basement surface is disturbed by numerous faults of different strike.

The M uplift to 35 km is observed in the central part of the DDA [Sollogub, 1986]. The maximal gradient is recognized in the northern and southern aulocogen. The marginal aulocogen is featured by M depths >40 km, the gradient of the M for the northern boundary being steeper than that for the southern one. The magnetic model of the CD of DDA reflects the three-stage distribution of the magnetic sources in the Earth's crust. The upper stage consists of effusive-pyroclastic rocks of the Frasnian and the Famennian stages and lies in the lowermost sedimentary cover. Its mean weighted magnetization is 1.0—3.0 A/m. An analysis of the MS of a sedimentary cover enabled us to establish some regularities. 1) The increase in the magnetic susceptibility (MS) values of rocks from north to south is expected. Such a MS distribution corresponds to the consolidated crust magnetization, which kind of "contamination" with magnetic minerals of the whole crust in the area of the Lokhvytsya regional magnetic anomaly. 2) The increase of MS of the same type rocks with depth. This regularity is often masked by a certain periodicity in the distribution of the $\chi$ values associated with the structure of the sedimentary cover and perhaps with the character of the oxidation-reduction regime. 3) A clear differentiation of the MS values for the rocks of the boreholes with oil and gas fields. The magnetic sources in the upper consolidated crust (the upper edges at 3.0—15.0 km and the lower ones at 10.0—18.0 km depths respectively) have the magnetization of 1.0—2.5 A/m. The magnetic bodies of the lower crust are characterized by the magnetization of 1.0—1.5 A/m. The magnetic sources of the consolidated Earth's crust of the Central Depression have been formed at the stage of the Earth's crust extension during the aulacogen formation. This regime was favourable for the deposition of thick sedimentary masses and the accumulation of the organic substance from which the oil and gas accumulations were generated later. The MS values of different lithologic types of rocks obtained by studying the core samples show that the hydrocarbon formation and migration were accompanied by the change in the magnetization of the sediments.

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# Spacial-temporal structure of the magnetic field in territory of Ukraine

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The Earth's magnetic field (EMF) is one of the principal geophysical factors concerning the processes in a different planet covers and the planet in whole. Numerous phenomena in magnetosphere, ionosphere, atmosphere and biosphere are due to the magnetic field state as well as to the geomagnetic activity. Space-temporal structure of the Earth's magnetic field $B$ is defined by field total from different sources:

$$B = B_n + B_a + B_e + \delta B_v$$

where $B_V$ is the Earth's normal main field that is generated by the processes in the liquid core and at the border with the mantle and that is defining global space and temporal structure of the planet field; $B_a$ is the anomalous magnetic field (one of the lithosphere) that is due generally to the rocks mag-