DISSIPATIVE STRUCTURES OF THE EARTH

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Application of quantitative methods to study relief and shape of the Earth as well as data of seismic tomography shows conform relationships between surface morphological structures and deep levels of the density instability. G-hexagon, I-hexagon and roll-like density instability structures from a few tens to million km^2 in size have been established. Two super-large density megastructures are identified with the first one being located in the east and south parts of Pacific Ocean, and the second one — in the Indian Ocean, east Africa, north and south Atlantic Ocean.

Distribution of density instabilities of g-hexagon and I-hexagon types as well as paleogeodynamic restorations shows that these megastructures were formed as a result of different processes and therefore are of different age. The first one was formed due to activity of the internal sources of energy and material on the earliest stage of the Earth evolution during its differentiation and separation of the liquid outer core. The second megastructure was formed in Mesozoic – Cenozoic due to activity of the external sources of energy and material. Formation of the second megastructure was a result of avalanche-like (with reference to geological time scale) spreading of density instability that involved deeper levels and led to formation of larger structures.

Upward current of the first global convection cell is located in the Pacific segment of the Earth, whereas downward current is on the opposite side in the Indo-Atlantic segment. The second megastructure is characterized by opposite relationship with upward current of convection cell in the Indo-Atlantic segment and downward current of convection cell in the Pacific segment. This discovery gives key to correct interpretation of seismic tomography data and to develop a new model of the Earth evolution based on non-equilibrium thermodynamics.