The problem of the Earth's core evolution: Evidence from geological-petrological and paleomagnetic data

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For the first time the problem of the evolution of the Earth's core throughout of its geological history is discussed using both petrological and paleomagnetic data. It is known that the material of modern thermochemical mantle plumes, generated at the interface of the liquid iron core and a silicate mantle, contains fluid components of the core that are present in the products of their adiabatic melting - intraplate basalts. Thereafter, the mantle plumes are the only carriers of the core material reaching the Earth's surface, and the study of the evolution of mantle magmas throughout its geological history is a unique source of objective information about the core matter and its development over several billion years, inaccessible to other methods.

Because mantle plumes constantly carry out heat and fluid components from the core, it cannot survived in primeval state. Judging by the composition of mantle-derived magmas, the matter of mantle plumes has not been constant. Plumes of the first generation, formed by depleted ultramafic material, were irreversible changed in the range of ~ 2.35-2.0 Ga by plumes of the second generation (thermochemical), composed geochemical-enriched matter with isotopic evidence for the presence of the core material in the magmas. It was accompanied by cardinal reorganization of the planet's geodynamics, and, above, magnetic field strength peaked then. We suggest that material of the primordial core was molten at that time due to centripetal heating of newly formed planet and began generate thermochemical plumes which are the major movers of the modern tectonomagmatic processes.

So, according to data available, evolution of the Earth, consistent with the model of heterogeneous accretion of material that existed in the early Solar system, and the primordial iron core was its embryo. Geological, petrological and geochemical data suggest that the composition of this iron core was differed from the iron of chondrite origin. Modern Earth's core, very likely, was formed by mixing of the both types of iron: matter of primordial core and chondrite origin, and it was occurred in the Middle Paleoproterozoc..

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