Distribution of elastic parameters in the Earth's core

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The travel-time curves of refracted and reflected short-longitudinal seismic waves propagating in the Earth's core were constructed by record-sections of seismic vibrations from deep earthquakes recorded by the global network. These travel-time obtained velocity section core, in good agreement with observed data. The velocity curve for the Earth's core is well explain the nature of the so-called «precursors» — vibrations that go in the first arrival in the Earth's surface at epicentral distances of 134—142°. Features velocity section of the outer core is the presence of his bottom of the layer thickness of about 500 km from the high positive velocity gradient and immediately beneath a low-velocity layer thickness of about 200 km (zone F). In the inner core velocity first increases rather strongly to a depth of approximately 5500 km, and then to the center of the Earth varies almost linearly, with a slightly higher gradient than is usual in the standard model.

Density, elastic parameters and viscosity of the Earth's core were obtained on the basis of velocity curve for the longitudinal seismic waves. The density distribution for the new model differs from the distribution obtained in the standard model PREM only in the inner core. Distributions of modulus and shear modulus, depending on the physical processes occurring inside the Earth, may have a different character. In particular, the bulk modulus can have a negative jump at the boundary of the outer and inner core of the Earth, and the shear modulus may be different from zero at the bottom of the outer core. It is concluded that the shear modulus in the bottom of the outer core to fluctuations in the order of 1 Hz should be different from zero, and reach values of ~2×10^{12} Pa. This conclusion is based on the fact that the gradient of the velocity of longitudinal waves in the lower outer core increases and the assumption that the bulk modulus in the core is a monotonic function. Estimates of the coefficient of shear viscosity for the outer and inner core have been made. These estimates imply that in the outer core directly adjacent to the upper boundary of the outer core viscosity is low, which corresponds to the liquid state of matter in the Earth's core. As we move to the lower boundary of the outer core viscosity increases, and the substance goes into the vitreous state. Low viscosity, apparently, takes place at the bottom of the outer core in zone F.