

The Core of the Earth

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Abstract

The Earth consists of the core with its radius ca 3450 km, the mantle with the layer thickness ca 2890 km, and the crust with its thickness about 30 km. The core can be divided into the inner core and the outer core. The inner core is a solid sphere with radius 1220 km (exactly saying the figure of the inner core has an ellipsoidal shape), composed mostly by pure iron; and the outer core is a liquid layer, discovered by seismologist Lehmann, composed mostly by iron with few impurities. It was found that the rotation axis of the inner core is tilted about 10 degrees with respect to the rotation axis of the Earth.

The explorations about the core especially about the inner core of the Earth are extensive and in quick progress in recent decades. In 1980 Lembeck pointed out that the inner core might rotate faster than the mantle (the super rotation or differential rotation), and in 1995 Glatzmaier and Roberts suggested that the super rotation (rate) is about three degrees per year. In 1996 Gai derived out a dynamic result, which stated that the inner core rotates faster than the mantle. Based on seismic observations covered a period of 26 years, Song and Richards (1996) first concluded that the super rotation is about one degree per year, and little later, Su, Dziewonski, and Jeanloz concluded that the super rotation is about three degrees per year in agreement with the prediction of Glatzmaier and Roberts. In recent years, a lot of geoscientists made contributions in determining the super rotation, most of whom concluded that the super rotation is not so large as originally declared, and even some scientists concluded that there does not exist super rotation at all. At present, it is generally agreed that there does exist the super rotation but it might most likely not exceed 0.2 degree per year.

In this lecture, the progress on the studies of the Earth's core and the main properties of the core is presented.