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Degree one motion of the inner core and Earth rotation

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The Earth's inner core shows degree one hemispherical variation of anisotropy in the eastern hemisphere(40 degE-180 degE) and in the western hemisphere(180 degW-40 degE).The hemispherical difference may be explained by unequal growth of the inner core. Wen(2006) showed that the Earth's inner core radius enlarged locally beneath middle Africa by 0.98 to 1.75 kilometers from 1 December 1993 to 6 September 2003. In this report we add the gravitational torque of the outer core caused from the surface deformation of the inner core to the gravitational coupling between the mantle and the inner core.We express the form of the outer core to be a cylinder of elliptic cross section in the elliptic coordinate frame. The volume of the outer core is assumed to be the same volume as the outer core excluding the volume of the tangent cylinder of the inner core. By taking account of Wen(2006) results the semimajor axis of the outer core is assumed to be increase 100 m.. The elliptic form of the inner core also depends on the one dimensional gravitational coupling torque between the mantle and the inner core. We assume the outer core to be a rigid body. If the directions of the semimajor axes of the outer core and the inner core do not coincide, the axial gravitational torque acts to restore the outer core and the inner core to the gravitational equilibrium position. This torque relates to the figure of the inner core and the motion of the outer core is transferred to the motion of the mantle. The results show that the free oscillations of the mantle and the outer core, and that the free oscillation period of the mantle (92 years in the previous result) is shorter than the previous value,due to variations of the semimajor axis of the inner core.

Keywords: inner core, outer core, mantle, gravitational torque, degree one motion, Earth rotation