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DYNAMICS OF FREE INNER CORE IN ROTATING SPHERICAL SHELL WITH LIQUID AT VIBRATION

Abstract

Dynamics of free spherical body in a rotating spherical shell with liquid under vibration perpendicular to the axis of rotation and the movement of liquid in the spherical layer formed by the body and the cavity are experimental studied. The body has lower density compared to the liquid and occupies a stable position in the cavity center under the action of centrifugal force.

In [1] an excitation of average differential rotation of light core as a result of tidal oscillations caused by external static field (in the experiment - the gravity field) is studied. The vibrational effect manifests itself only in the resonance regions, where the intensive circular body vibrations are excited, which generate the overrunning or lagging differential rotation of the body. The velocity of differential rotation (lagging or advanced) is comparable to the speed of the cavity. Outside the resonance regions the body dynamics is determined only by the gravity field and coincides with [1].

In the work a detailed study of the influence of vibration on the system is presented, depending on the speed of the cavity rotation, the fluid viscosity, relative density and size of the core.

The additivity of different average vibrational effects (differential rotation speed), caused by vibrations and the gravity field, is demonstrated. The resultant torque applied to the body is determined by a superposition of different mechanisms of vibrational nature. It is shown that the intensity of the differential rotation caused by vibration only is determined by the dimensionless vibration acceleration and is described by a unique dependency for the advanced rotation and for lagging one.

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References

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