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# SUPERCRITICAL FLOWS IN SPHERICAL VIBRATIONAL HYDRODYNAMIC TOP

**Abstract**

The structure of overcritical flow generated by light spherical body in a spherical cavity with fluid which rotates around the horizontal axis is experimentally investigated. The centrifuged sphere makes a slow lagging differential rotation relative to the cavity caused by gravity (hydrodynamic vibrational top [1]). Subcritical flow has the form of a circular column (column of Taylor-Proudman), elongated along the geometric continuation of the sphere. Different modes of column instability manifest themselves with increase of differential rotation velocity. One of them is associated with the development of two-dimensional azimuthal wave on the column border. The second instability mode is manifested in the excitation of 2D vortices elongated along the axis and rotating inside the column [2]. The nonlinear interaction of different instability modes resulting in synchronization of phase velocities and wave numbers is found and studied. It is shown that the thresholds of instability of different modes are defined by the Reynolds number calculated by the speed of differential rotation. A new type of instability - formation of rolls, localized outside of the liquid column is found and investigated; the azimuth drift velocity of the rolls exceeds the speed of rotation of the cavity.

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References

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