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Surface waves in a square container due to its resonant horizontal elliptic motion MITSUAKI FUNAKOSHI, AI HIRAMITSU, Kyoto University — Surface waves in a square container due to its resonant horizontal elliptic or linear motion are investigated theoretically. The motion of the container is characterized by the ratio, expressed as $\tan\phi$, of the length of the minor axis to the length of the major axis of its elliptic orbit, and by the angle θ between the directions of the major axis and one of its sidewalls. Using the reductive perturbation method, nonlinear time evolution equations for the complex amplitudes of two degenerate modes excited by this motion are derived with the inclusion of linear damping. When $\tan\phi$ is small, for any θ these equations have two kinds of stable stationary solutions corresponding to regular co-rotating waves whose direction of rotation is the same as that of the container, and regular counter-rotating waves of the opposite direction of rotation. As $\tan\phi$ increases to one, the region of forcing frequency in which stable regular counter-rotating waves are observed shrinks and then disappears for any θ. Solutions with chaotic or periodic slow variations in amplitude and phase of excited surface waves are also obtained for forcing frequencies where no stable stationary solutions exist.

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