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Subharmonic surface waves in a horizontally vibrated container

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Universidad Politecnica de Madrid — Horizontal vibrations of rectangular containers first produce harmonic waves and then subharmonic waves as the forcing acceleration is increased. A theoretical analysis is performed that provides both the subharmonic instability threshold and the associated patterns. A key ingredient in the theory is an oscillatory bulk flow (OBF) produced by the vibrating container that extends horizontally to a length comparable with the container depth. The OBF involves harmonic temporal oscillations in the vertical pressure gradient at the free surface. It is precisely those pressure gradient oscillations that trigger subharmonic waves, as in the vertical forced Faraday instability. The obtained results compare well with experimental measurements/visualization that will also be presented.

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