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Resonance wave pumping with surface waves. (English) [Zbl 1383.76045](#)
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Summary: In this paper, we present a novel extension of impedance (Liebau) wave pumping to a free-surface condition where resonance pumping could be used for hydraulic energy harvesting. Similar pumping behaviours are reported. Surface envelopes of the free surface are shown and outline two different dynamics: U-tube oscillator and wave/resonance pumping. The latter is particularly interesting, since, from an oscillatory motion, a unidirectional flow with small to moderate oscillations is generated. A linear theory is developed to evaluate pseudo-analytically the resonance frequencies of the pump using eigenfunction expansions, and a simplified model is proposed to understand the main pumping mechanism in this type of pump. It is found that the Stokes mass transport is driving the pump. The conversion of energy from paddle oscillation to mean flow is evaluated. Efficiency up to 22 % is reported.

Reviewer: [Reviewer \(Berlin\)](#)

MSC:

[76B15](#) Water waves, gravity waves; dispersion and scattering, nonlinear interaction
[76R10](#) Free convection
[74F10](#) Fluid-solid interactions (including aero- and hydro-elasticity, porosity, etc.)

Keywords:

[wave breaking](#); [waves/free-surface flows](#); [wave-structure interactions](#)

Software:

[PIVlab](#)

Full Text: [DOI](#)

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