Subharmonic waves produced by oscillating submerged solids
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— Parametric excitation of
subharmonic waves in a container due to the vertical oscillation of a (deeply) submerged solid is considered in this presentation. In general, two parametric forcing mechanisms will appear in this configuration, namely forcing from (directly excited) surface waves and forcing from an oscillatory flow in the bulk. Nevertheless, if the (oscillating) obstacle is submerged deeply enough (as it will be assumed) the second mechanism will dominate. This problem can then be seen as a generalization of the (classical) Faraday waves problem with a non-homogeneous forcing (associated to the oscillating flow generated near the cylinder). In fact, this problem corresponds (in the case of a cylinder with a proper symmetry) to the simplest case of symmetric non-homogeneous forcing of subharmonic waves, and it can be considered as the counterpart of horizontal vibration of containers (where an antisymmetric non-homogeneous parametric forcing is found). The analysis recently developed by the authors in the case of a horizontally vibrated container (Journal of Fluid Mechanics, vol. 739 pp. 196-228, 2014) is adapted here in order to obtain predictions of threshold vibration amplitudes, pattern orientation and periodic or quasi-periodic nature of subharmonic waves.