# On the return to equilibrium problem for axisymmetric floating structures in shallow water

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The return to equilibrium problem is a particular configuration of the floating structure problem. It consists in releasing a partially submerged solid body in a fluid initially at rest and letting it evolve towards its equilibrium position. In naval architecture and hydrodynamical engineering, the solid is assumed to satisfy a linear integro-differential equation, the Cummins equation. Recently Lannes in his paper [3] on the dynamics of floating structures modelled the one-dimensional return to equilibrium problem using a different formulation for the hydrodynamical model with the aim to take into account nonlinear effects. In the two-dimensional axisymmetric setting under the shallow water approximation for the fluid, the nonlinear coupled system has been treated in an abstract way in [2] but it requires compatibility conditions that are not satisfied in the return to equilibrium problem. For this reason, we use a linear-nonlinear hydrodynamic model: since small amplitude waves are expected, the equations in the exterior domain are linearized but the nonlinear effects are taken into account in the interior domain. The solid equation can be written as a nonlinear second order integro-differential equation, whose linearization is the Cummins equation.

### Références

[1] E. Bocchi, *On the return to equilibrium problem for axisymmetric floating structures in shallow water*, submitted, arXiv:1901.04023, 2019.

[2] E. Bocchi, *Floating structures in shallow water: local well-posedness in the axisymmetric case*, submitted, arXiv:1802.07643, 2018.

[3] D. Lannes, *On the dynamics of floating structures*, Annals of PDE, Volume 3: 11, 2017.

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