
On the leapfrogging phenomenon in fluid mechanics

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Abstract

The mathematical analysis of the time evolution of arbitrary vortex tubes in fluid mechanics remains widely open. The particular case of vortex rings, somewhat simpler due to the reduction to cylindrical symmetry, was tackled by Helmholtz and Kelvin in the second half of the nineteenth century, and the subject has largely developed since then. Helmholtz did already described, without being able to observe it, an interaction phenomenon between rings which is now referred to as "leapfrogging", and which has been observed in real fluids since then.

In the talk, I'll describe the problem in its historical perspective and I'll next report on recent works with R.L. Jerrard (for quantum fluids) and E. Miot and P. Gravejat (for classical fluids) which aim at a rigorous mathematical justification of the leapfrogging phenomenon.

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