VORTEX RINGS IN NON-NEWTONIAN VISCOELASTIC FLUIDS PLAY Y-Y

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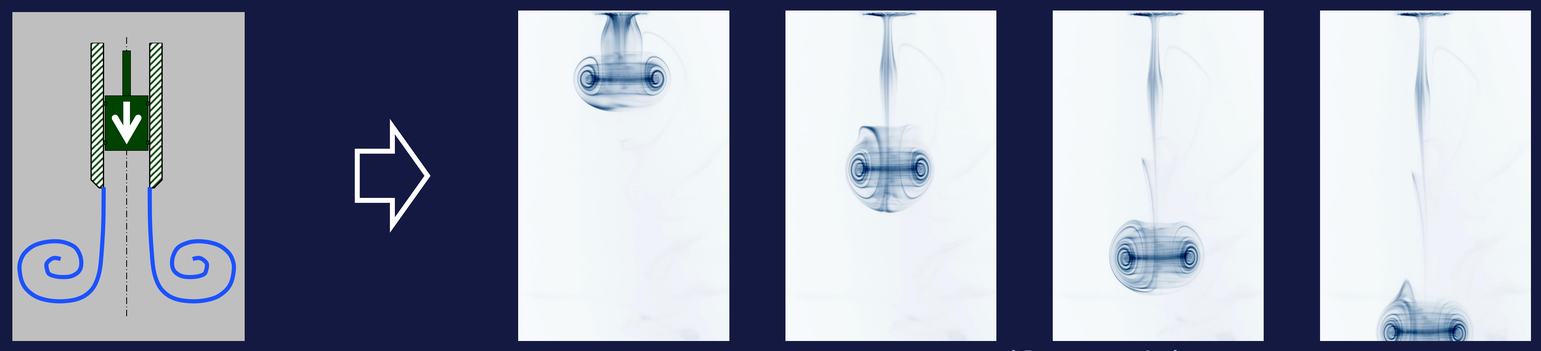
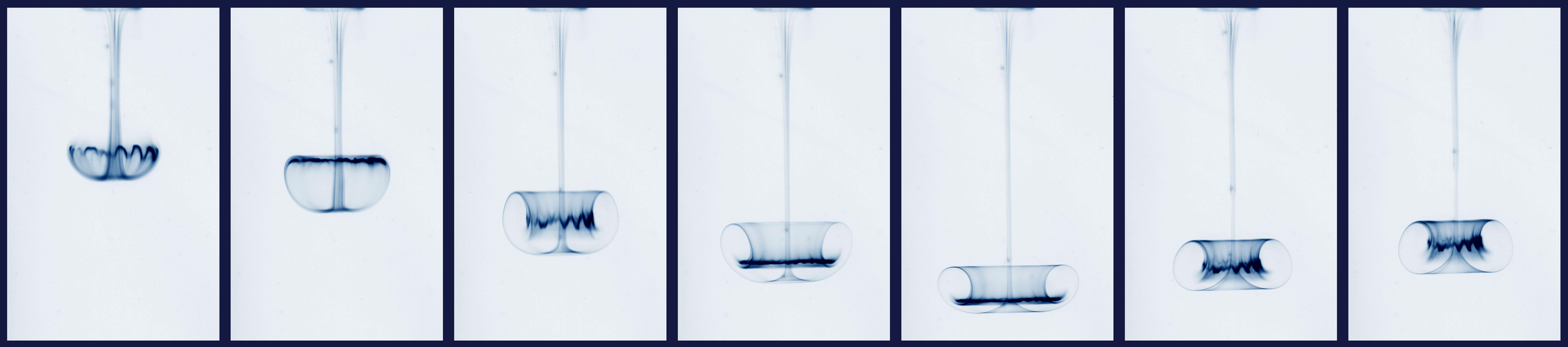
- Typical time evolution of a vortex ring in Newtonian fluid (water)



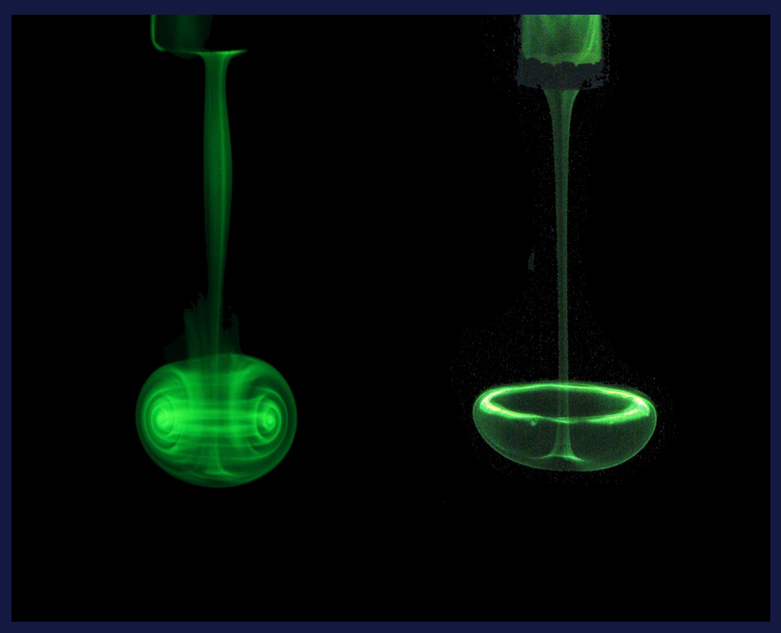
Reynolds number : 500

Are vortex rings always the same whatever the fluid ? no !

- Typical time evolution of a vortex ring in viscoelastic fluid (polymer solution) :



Reynolds number : 500



It is now well Known that both topology and dynamics of vortical structures such as vortex rings strongly depend on generation conditions... But not only !

The present study focuses on the effect of the fluid nature itself. Indeed, despite the same generation conditions (same piston-cylinder apparatus + same stroke ratio ending to the same relative position to the cylinder exit) and the same inertial effect (same generalized Reynolds number), time evolution of vortex rings in several fluids highlights a strong influence of the fluid nature. Newtonian vortex ring furls, propagates by auto-induced effect and expands (increase of its diameter). Non-Newtonian viscoelastic vortex ring, instead, first furls and expands as it is propagating away then stops, unfurls and goes back, contracting in the radial direction.

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