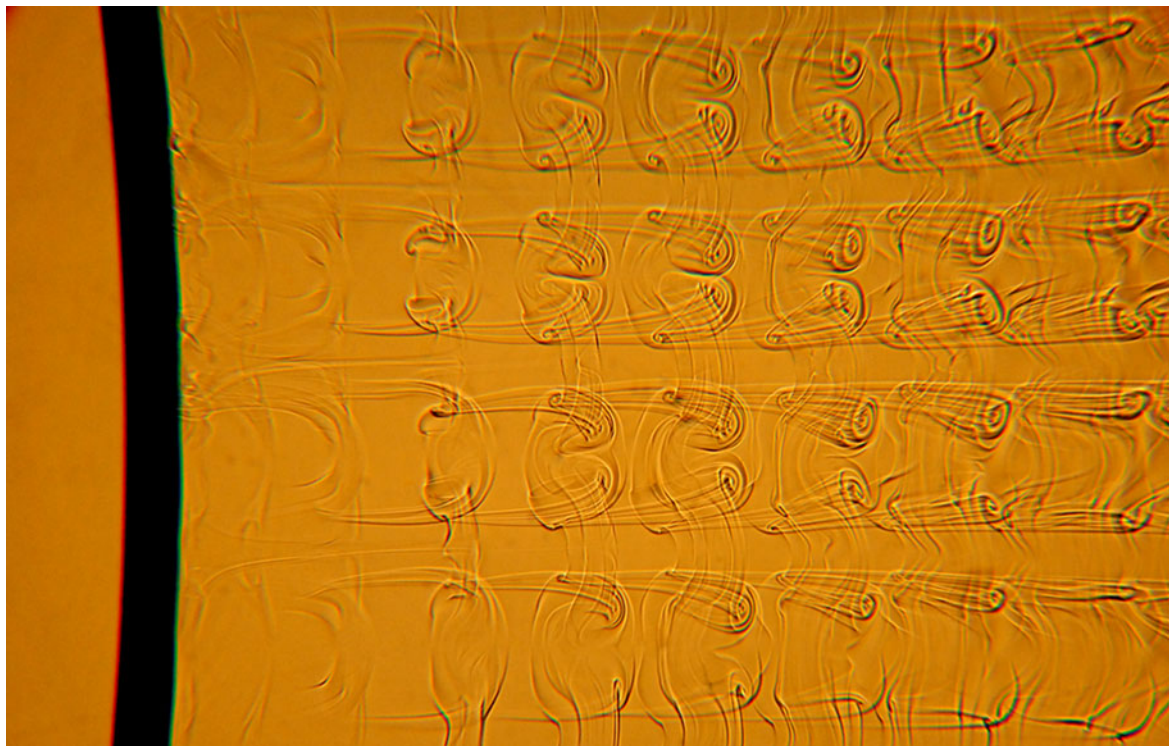


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Shadowgraph visualisation of 3D instability in a stratified cylinder wake

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This picture presents the three-dimensional instability that appears behind a vertical cylinder of diameter $D = 6$ mm towed horizontally at speed $U = 3.6$ cm/s. For the purpose of visualisation, the fluid is weakly stratified by salted water such that the density varies continuously from top to bottom by 15%. The

shadowgraph technique is obtained by putting a small source of parallel light 2 m far from the tank. The luminous rays cross the stratified fluid and are then focused by a 30-cm-wide lens into the camera (unfortunately creating a small distortion of the image). This technique allows to visualise the density structures created by the three-dimensional flow behind the cylinder. Here, the stratification is sufficiently weak to not influence the flow: the Froude number $F = U/ND$ is equal to 3.5 ($N = (-g\partial_z\rho/\rho)^{1/2}$ being the Brunt–Väisälä frequency). The Reynolds number $Re = UD/\nu$ is equal to 185 (ν being the kinematic viscosity). The field of view is approximately 20 by 13 diameters and is located about 150 diameters downstream of the cylinder start-up.

The picture exhibits four horizontal bands which are made of counter-rotating longitudinal vortex pairs, whose tails seem to be entrained to the left by the cylinder. The vortex pairs close to the cylinder are faintly visible whereas the vortex pairs far from the cylinder are very contrasted, which reflects the temporal growth of these structures. The axial wavelength of this instability is approximately 3.3 diameters, which is close to the wavelength found for the mode A instability of a cylinder. Moreover, these counter-rotating vortex pairs are reminiscent of the structure of the mode A instability. We thus think that this visualisation nicely illustrates the well-known instability of a cylinder wake.