LadHyX Seminar – March 27th, 10:45

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Canopy elastic turbulence: Spontaneous formation of waves in beds of slender microposts

Flows through canopies—whether in forests, marine ecosystems, or biological systems like cilia arrays—exhibit complex patterns shaped by fluid properties and obstacle geometry. In large-scale systems, these patterns come from inertial turbulence due to high Reynolds numbers, but at microscopic scales, where inertia is negligible, the viscoelastic effect of a non-Newtonian fluid may take over, governed by the Weissenberg number. In this seminar, we explore how viscoelastic fluids interacting with microstructured canopies give rise to a new form of chaotic flow: canopy elastic turbulence. Using microfluidic experiments, we observe the spontaneous emergence of propagating low-velocity waves, reminiscent of Monami waves in classical canopy turbulence. The flow structure within the canopy exhibits distinct layers, drawing a striking parallel between inertial and elastic turbulence despite their fundamentally different driving mechanisms.

Collaborators at OIST: Ricardo Arturo Lopez de la Cruz, Simon J. Haward, and Amy Q. Shen