Institut de Mécanique des Fluides
2 Allée du Pr Camille Soula, Toulouse

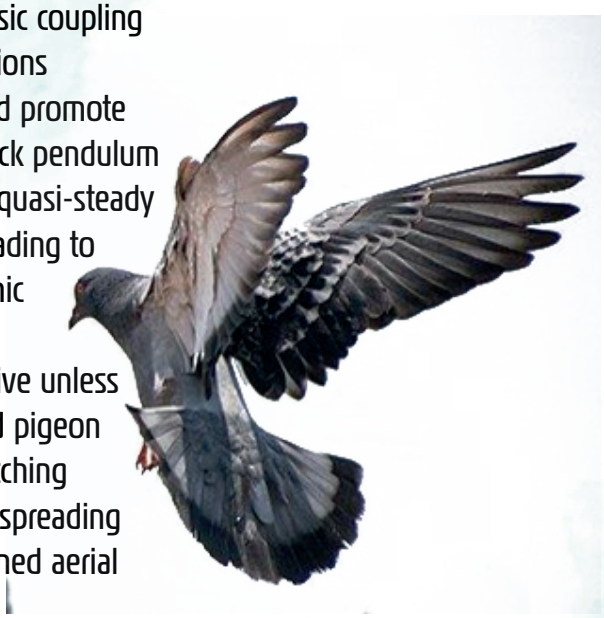
Ariane Gayout

University of Groningen

Mardi 23 Janvier à 10 h 30• Amphithéâtre Nougaro

From pendulum to animal flight: unsteady aerodynamics of flapping objects.

Flapping objects showcase aerodynamic unsteadiness, with intrinsic coupling between motion and vortices. For instance, wind-induced oscillations may trigger flutter resonance but also dampen turbulent gusts and promote stability. In this presentation, I will first develop how a weathercock pendulum stabilizes when exposed to transverse wind. In particular, simple quasi-steady approximations do not capture the correct oscillatory behavior, leading to new models inspired from flutter theory for dynamical aerodynamic coefficients [1]. I will then turn towards animal flight where aerodynamic control is often poorly understood and assumed active unless proven passive. In particular, through the example of a bio-hybrid pigeon tail, I will present how simply spreading may generate passive pitching through aspect ratio variation. Further developments on dynamic spreading may offer new perspectives for passive control stability in unmanned aerial vehicles.



[1] A. Gayout, A. Gylfason, N. Plihon and M. Bourgoin, Fluidelastic modeling of a weathercock stabilization in a uniform flow, Journal of Fluid and Structures, 120:103895, 2023, https://doi.org/10.1016/j.jfluidstructs.2023.103895