Long time behavior in flow–structure interactions

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Flow-structure interactions are ubiquitous in nature. Problems such as attenuation of turbulence or flutter in an oscillating structure [Tacoma bridge], flutter in tall buildings, fluid flows in flexible pipes, in nuclear engineering flows about fuel elements and heat exchanger vanes are prime examples of relevant applications. Mathematically, the models are represented by a 3 D compressible, irrotational Euler Equation coupled to a **nonlinear** dynamic elasticity on a 2 D manifold. Strong boundary–type coupling at the interface between the two media is at the center of the analysis. This provides for a rich mathematical structure, opening the door to several unresolved problems in the area of nonlinear PDE's, dynamical systems and related harmonic analysis and differential geometry. This talk aims at providing a brief overview of recent developments in the area along with a presentation of some recent advances addressing the issues of control and long time behavior [partial structural attractors] subject to mixed boundary conditions arising in modeling of the interface between the two environments.
Part of this talk is based on recent work with D. Bonheur, F.Gazzola and J. Webster: *Annales de L'Institute Henri Poincare Analyse*, 2021 and also work completed while the author was a member of the MSRI program: *Mathematical problem in fluid dynamics* at the University of California Berkeley during the Spring 2021 semester (NSF DMS –1928930).

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