An almost subharmonic instability in the flow past rectangular cylinders

A. Chiarini[a], M. Quadrio[a] and F. Auteri[a]

The flow past bluff bodies with sharp corners is ubiquitous in practical applications and is of importance for fundamental research. The flow is complex, with massive separations at the corners producing shear layers that may reattach, several recirculating regions that may foster different instabilities and a large downstream wake.

The rectangular cylinder is the prototype of such bodies. Already at moderate Reynolds numbers the flow dynamics depends on the aspect ratio AR, i.e. the length-to-thickness ratio[1] .

The primary and secondary instabilities of the flow past a square cylinder (AR=1) have been largely studied over the years[2,3]. In contrast, the instabilities of the flow past longer rectangular cylinders (AR>1) have received less attention, perhaps under the assumption that no substantial changes from the square cylinder are to be expected.

[a] Dep. Aerospace Sciences and Technologies, Politecnico di Milano, Italy

[1] Okajima, *J. Fluid Mech.* **123**, 379-398 (1982).

[2] Robichaux et al., *Phys. Fluids* **11**(3)**,** 560-578 (1999).

[3] Blackburn and Sheard, *Phys. Fluids* 22(3)**,** 031701 (2010).

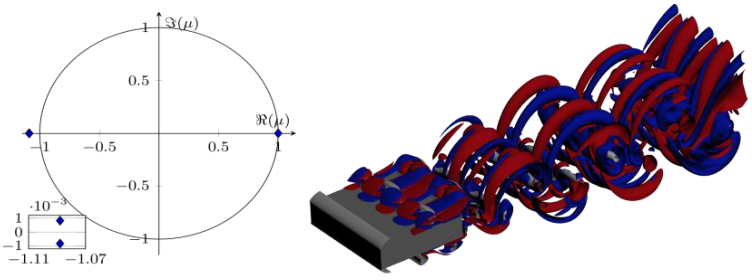

Figure 1: (a) The unstable Floquet multipliers in the complex plane. (b) Instantaneous flow visualisation from DNS for AR=5 at Re=500.