Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Spanwise structure of the flow past a fixed or freely vibrating cylinder in the early turbulent regime REMI BOURGUET, SIMON GSELL, MARIANNA BRAZA, IMFT / CNRS — The flow patterns developing downstream of slender bodies with bluff cross-section have been the object of intense research in the past decades. Particular attention was paid to the vortex patterns emerging in the plane perpendicular to the body axis. In the present study, focus is placed on the spanwise structure of the flow, in the early turbulent regime. The existence of dominant spanwise wavelengths had already been reported. However, many aspects remained to be explored, among others, the streamwise evolution of the spanwise patterns and their possible alteration when the body oscillates. These aspects are examined here on the basis of direct numerical simulations of the flow past a circular cylinder at Reynolds number 3900. The body is either fixed or subjected to vortex-induced vibrations. A systematic analysis of the spanwise patterns reveals persistent trends of their amplitude and wavelength in the different compartments of the flow, i.e. the separating shear layer and wake regions. Physical mechanisms are proposed to explain these trends. It is also found that the spanwise structure of the flow is differently altered in these two regions once the cylinder vibrates, the alteration being concentrated in the separating shear layers.

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Date submitted: 24 Jul 2017 Electronic form version 1.4