

Abstract Submitted
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Scale-by-scale energy fluxes in anisotropic non-homogeneous turbulence behind a square cylinder¹ FELIPE ALVES PORTELA, GEORGE PAPANAKIS, JOHN CHRISTOS VASSILICOS, Imperial College London — The turbulent wake behind a square section cylinder is studied by means of high resolution direct numerical simulations using an in-house finite volume code. The Reynolds number based on the cylinder side is 3900. Single- and two-point statistics are collected in the lee of the cylinder for over 30 shedding periods, allowing for an extensive description of the development of the turbulence. The power spectrum in the frequency domain of velocity fluctuations displays a near $-5/3$ power law in the near wake, where the turbulence is neither isotropic nor homogeneous. In the same region of the flow, two-point statistics reveal a direct cascade of fluctuating kinetic energy down the scales as a result of the combined effect of linear and non-linear interactions. For scales aligned with the mean flow the non-linear interactions dominate the cascade. Conversely, for scales normal to the mean flow the cascade is dominated by the linear interactions while the non-linear term is mostly responsible for redistributing energy to different orientations.

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Felipe Alves Portela
Imperial College London

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