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Wavelet analysis of vortex bursting JORI RUPPERT-FELSOT, LMD-CNRS, ENS, Paris, MARIE FARGE, LMD-CNRS, ENS, Paris, France, PHILIPPE PETITJEANS, PMMH, ESPCI, Paris, France — We study the quasi-periodic bursting of a three-dimensional vortex immersed in a laminar channel flow. We measure the velocity field by PIV and analyze the time evolution of the bursting process. We use the orthogonal wavelet transform to separate the flow into coherent and incoherent components and then the continuous wavelet transform to analyze the evolution of each component separately. We found that the coherent flow is intermittent, long-range correlated and sustain the turbulent cascade, while the incoherent flow is non intermittent, exhibits an enstrophy equipartition spectrum and leads to turbulent dissipation. In order to better understand the buildup of the turbulent cascade and to quantify the flow intermittency, we have designed new wavelet-based diagnostics which find out, when in time, where in space, and at which scale, the activity is dominant . We observe that the bursting process starts as an excitation of the small scales inside the vortex core, and then spreads in space and all over the inertial scales. We recover the Kolmogorov $k^{-5/3}$ scaling only for time averages, since the spectral slope of energy varies in time, between k^{-1} during bursting, and k^{-2} after vortex bursting.

Kai Schneider
CMI, Universite de Provence, Marseille, France

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