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Turbulent stripe in direct numerical simulation of transitional channel flow[1] TAKAHIRO TSUKAHARA, YASUO KAWAGUCHI, Tokyo University of Science, HIROSHI KAWAMURA, Tokyo University of Science, Suwa —
We present a series of "large-scale" DNS conducted in two types of plane channel flows—Poiseuille (PF) and Couette flows (CF), considering the subcritical-transition regime. Thorough the simulations in a periodic domain with streamwise and spanwise lengths of $327\delta \times 128\delta$ (δ: the channel half width) or larger, we show that stripe patterns of oblique bands, alternating between turbulence and laminar flow, are the intrinsic regime in the reverse transition (from uniform turbulence to laminar) for both PF and CF. The pattern is oriented obliquely to the streamwise direction at an angle of 20–25° and similar to the one that takes place in a Taylor-Couette flow between counter-rotating cylinders, where spiral turbulence is observed by Coles (JFM 21, 1965). The emergence of turbulent stripes in CF has been found experimentally by Prigent et al. (Phys. Rev. Lett. 89, 2002) and analyzed numerically by Barkley & Tuckerman (JFM 576, 2007). However, the mechanism responsible for the stabilization of the stipe pattern is still an open question. In this work, we will focus on similarity and difference between the turbulent stipes in PF and CF, with emphasis on the wavelength and the angle of its modulation.

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