Stabilising effects of pressure gradient dithering in channels with porous walls

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The flow in channels with porous walls admits a similarity solution. For low values of the Reynolds number, there is one solution only, which is symmetric. At a critical value of the Reynolds number, there is a pitchfork bifurcation where two additional similarity solutions appear, both asymmetric. Ferro and Gnavi [*Phys. Fluids* 12 (2000) 797] in their study of the spatial stability of symmetric solutions extended this type of analysis to include general perturbations, and showed that perturbations of the symmetric solution at the entrance of the channel may grow without bound inside, destabilising the flow if the Reynolds number is high enough. The stability of the asymmetric solutions was also analysed, and it was found that these solutions also lose their spatial stability when the Reynolds number increases. In this paper the influence of a small amplitude perturbation of prescribed frequency (dithering) in the pressure gradient along the channel is evaluated, and it is shown that it has a stabilising effect on the symmetric solutions. The results are interesting for their possible application to flow stabilisation in processes such as separation of a binary mixture by gaseous diffusion, and control of boundary layer separation.