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Effect of viscosity on the stability of confined plane wakes[1] OUTI TAMMISOLA, L. DANIEL SODERBERG, FREDRIK LUNDELL, Linne Flow Centre, KTH Mechanics, Stockholm, SWEDEN — Modern papermaking machines often separates different layers of fibres by vanes in the headbox. The wakes behind the vanes may introduce instabilities and thereby unwanted mixing between the layers. To be able to control such mixing the stability of confined two-dimensional streamwise developing wakes has been analysed. The analysis has been performed numerically using an ansatz assuming two-dimensional temporal global modes. Initially the results are compared to results found in literature that are based on an inviscid local analysis assuming uniform velocity layers. In the present work viscosity is taken into account both through its influence on the base- flow as well as in the stability analysis. This gives a Reynolds number as a third parameter in addition to the shear ratio and confinement relation that controls the inviscid problem. The viscous effects are found to be considerable and it is shown that the global stability is a function of Reynolds number. The most obvious reason seems to be the base flow development. The results also indicate that the effects of confinement can be both stabilizing and destabilizing depending on the Reynolds number. In addition, the development of the most unstable mode with Reynolds number for confined wakes is shown to be clearly different from that of unconfined wakes.

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