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Initial- value problem for the two-dimensional growing wake S. SCARSOGLIO, D. TORDELLA, Politecnico di Torino, W.O. CRIMINALE, University of Washington — A general three-dimensional initial-value perturbation problem is investigated as to effects in a two-dimensional but growing wake. The linearized perturbation analysis considers both the early transient as well as the asymptotic behavior of the disturbance (Blossey, Criminale & Fisher, JFM 2006 submitted). The representation of the mean flow is physically accurate, since it has been obtained by considering the lateral entrainment process and associated streamwise evolution of mass flow (increase) and kinetic energy (decrease) (Tordella & Belan, PoF 2003). This base model is combined with a change of coordinate (moving coordinate trasform) (Criminale & Drazin, Stud. Appl. Math, 1990). The evolution analysis considers inviscid disturbances that are expanded in terms of small values of the wavenumber. The long time behavior is represented by means of a multiple spatial and temporal scale description of the velocity and vorticity perturbations. The limit for small wavenumbers has been studied. It is seen that an increase of the entrainment in the base flow yields instability and grows algebraically in time. This result is also obtained when considering a more general problem where larger wavenumbers, wavelengths of the order of the thickness of the variable shear region, are allowed. Comparison with a recent spatio-temporal multiscale Orr-Sommerfeld analysis of the 2D wake instability (Tordella, Scarsoglio & Belan, PoF 2006). is presented. The perturbation dynamics is examined for different base flow configurations.

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