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A multiscale approach to study the stability of long waves in near-parallel flows STEFANIA SCARSOGLIO, DANIELA TORDELLA, Politecnico di Torino, WILLIAM CRIMINALE, University of Washington — The linear stability of a two-dimensional non-parallel flow is considered as an initial-value problem. A spatio-temporal multiscale approach is assumed. The choice of the polar wavenumber ($k \to 0$) as the small parameter (Blossey, Criminale & Fisher 2007) leads to a regular perturbation scheme. The introduction, in the perturbation Fourier decomposition, of a complex longitudinal wavenumber (Scarsoglio, Tordella & Criminale 2007) makes the problem well-posed at any order. By imposing arbitrary three-dimensional disturbances in terms of the vorticity, both the early transient as well as the asymptotic fate can be observed (Criminale & Drazin 1990). An example concerning the stability of a growing wake is presented (basic flow as $U(x,y), V(x,y)$, Tordella & Belan 2003). A summary of significant early time transients is shown. In the longitudinal perturbation case, asymptotic temporal results are compared with multiscale normal mode analyses (small parameter $1/R$) for the intermediate and far wake (Tordella, Scarsoglio & Belan 2006; Belan & Tordella 2006).

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