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Influence of axial flow and aspect ratio on the stability of vortex pairs VINCENT BRION, DENIS SIPP, LAURENT JACQUIN, Onera — A planar vortex pair with axial flow is simulated using DNS. The evolution of the flow is stopped when the aspect ratio of the dipole has reached a desired value. Values between 0.2 and 0.4 are investigated. A tail of vorticity forms downstream the dipole as it evolves toward higher aspect ratios. Using three dimensional stability analyses, we study the sensibility of the Widnall modes of the dipole about the swirl number of the base flow and the aspect ratio. Those short-wave modes are recovered for two-dimensional vortex pairs. New modes appear as we progressively increase the axial flow. The increase in aspect ratio seems to widen the bands of instability. Long time instability modes are then compared to short time modes that are found by a code of optimal perturbation based on an adjoint method. We show that the perturbation that gives the highest increase in energy at short time is localized in the vicinity the centre of each vortex whereas the perturbation that gives the highest increase in energy at long time is localized at the periphery of the vortices.

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