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From a Desingularized Vortex Sheet Model to a Turbulent Mixing Layer UJJAYAN PAUL, RODDAM NARASIMHA, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) — The temporal mixing layer is studied using the model of a slightly perturbed vortex sheet which is unstable and tends to roll-up in a spiral. The flow is inviscid and incompressible. A point vortex model tends to evolve into a chaotic cloud of point vortices instead of a smooth double branched spiral. The vortex sheet model is derived (in closed form) from the basic equations of vortex dynamics. The problem of finite time singularity is handled by a technique that invokes longitudinal circulation density diffusion along the sheet at singular points. The present model uses linear segments to interpolate the sheet. Although it is computationally involved compared to point vortices, the vortex sheet does not get distorted and rolls-up into a smooth double branched spiral. The accuracy of such simulations can be independently verified by using the laws of vortex dynamics and conserved quantities. We observe the growth of the two-dimensional shear layer with time and the merger of vortex like structures. The dependence of the mixing layer on the initial conditions is studied in detail and tries to answer the question whether the vortex sheet model yields a turbulent mixing layer.

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