

# Mixing and diffusion in planar vortices

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If a passive scalar field such as dye or temperature is placed in a smooth planar vortex, for example a Gaussian monopole, the scalar becomes wound up into a spiral structure because of differential rotation. An analogous process occurs if weak non-axisymmetric vorticity is introduced, for example by perturbing the vortex using an external irrotational flow. Although the wind-up of vorticity and scalar look very similar, there are a number of differences because the vorticity is coupled back to the flow field, and this is important close to the centre of the vortex. We show that this leads to rapid suppression of vorticity and some surprising power laws. We also discuss the way in which differential rotation enhances dissipation of scalar and vorticity, and the relevant time-scales, especially close to the centre of the vortex.

## References

- [1] Bajer, K., Bassom, A. P., Gilbert, A. D. 2000 Decay of perturbations near the centre of a strong vortex. *W Advances in Turbulence VIII, Proceedings of the Eighth European Turbulence Conference, Barcelona, 27-30 June 2000*, C. Dopazo (ed.), pp. 729–732. CIMNE, Barcelona 2000.
- [2] Bajer, K., Bassom, A. P., Gilbert, A. D. 2001. Accelerated diffusion in the center of a vortex. *J. Fluid Mech.* **447**, 395–411.