Effective diffusivity of passive scalars in rotating flows

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We use direct numerical simulations to compute turbulent transport coefficients for passive scalars in turbulent rotating flows. Effective diffusion coefficients in the directions parallel and perpendicular to the rotation axis are obtained by studying the diffusion of an imposed initial profile for the passive scalar, and calculated by measuring the scalar average concentration and the average spatial flux as a function of time. The Rossby and Schmidt numbers are varied to quantify their effect on the effective diffusion. It is find that rotation reduces scalar diffusivity in the perpendicular direction. The perpendicular diffusion can be estimated from mixing lenght arguments using the characteristic velocities and lengths perpendicular to the rotation axis. deviations are observed for small Schmidt numbers, for wich turbulent transport decreases and molecular diffusion becomes more significant.