

# Diffusion and mixing in incompressible flows

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We study diffusion and mixing in different fluid dynamics models, mainly related to incompressible flows. In this setting, mixing is a purely advective effect which causes a transfer of energy to high frequencies. Mixing acts to enhance the dissipative forces, giving rise to what we refer to as enhanced dissipation. We understand by this the identification of a decay time-scale, which is faster than the purely diffusive one. We will give a general quantitative criterion that links mixing rates (in terms of decay of negative Sobolev norms) to enhanced dissipation time-scales. Finally, we show the existence of a logarithmic time scale, by employing the exponential mixing rates shown for Anosov contact flows.