JOZSEF VASS, University of Waterloo
An Exact Model of Fully Developed Turbulence

Fully developed turbulence occurs at the infinite extreme of the Reynolds spectrum. It is a theoretical phenomenon which can only be approximated experimentally or computationally, and thus its precise properties are only hypothetical, though widely accepted. It is considered to be a chaotic yet stationary flow field, with self-similar fractalline features. A number of approximate models exist, often exploiting this self-similarity. We hereby present the mathematical model of fractal potential flows, and link it philosophically to the phenomenon of turbulence, building on the experimental observations of others. The model hinges on the recursive iteration of a fluid dynamical transfer operator. We show the existence of a unique attractor in an appropriate space, which will pose as our model for the fully developed turbulent flow field. Its singularities are shown to form an IFS fractal, resolving Mandelbrot's conjecture. Meanwhile we present an isometric isomorphism between flows and probability measures, hinting at a wealth of future research.