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Titolo	Mathematical Foundation of Turbulent Viscous Flows [[electronic resource]] : Lectures given at the C.I.M.E. Summer School held in Martina Franca, Italy, September 1-5, 2003 / / by Peter Constantin, Giovanni Gallavotti, Alexandre V. Kazhikhov, Yves Meyer, Seiji Ukai ; edited by Marco Cannone, Tetsuro Miyakawa
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Sommario/riassunto	Five leading specialists reflect on different and complementary approaches to fundamental questions in the study of the Fluid Mechanics and Gas Dynamics equations. Constantin presents the Euler equations of ideal incompressible fluids and discusses the blow-up problem for the Navier-Stokes equations of viscous fluids, describing some of the major mathematical questions of turbulence theory. These questions are connected to the Caffarelli-Kohn-Nirenberg theory of singularities for the incompressible Navier-Stokes equations that is explained in Gallavotti's lectures. Kazhikhov introduces the theory of strong approximation of weak limits via the method of averaging, applied to Navier-Stokes equations. Y. Meyer focuses on several nonlinear evolution equations - in particular Navier-Stokes - and some related unexpected cancellation properties, either imposed on the initial condition, or satisfied by the solution itself, whenever it is localized in space or in time variable. Ukai presents the asymptotic analysis theory of fluid equations. He discusses the Cauchy-Kovalevskaya technique for the Boltzmann-Grad limit of the Newtonian equation, the multi-scale analysis, giving the compressible and

incompressible limits of the Boltzmann equation, and the analysis of their initial layers.