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Hydrodynamics of Onsagers vortex flow and fractional quantum Hall effect

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Turbulent flows of incompressible liquid in two dimensions are comprised of dense systems of vortices. In 1949 Onsager suggested to treat vortices as a macroscopical system whose statistical properties are described by Gibbsian statistical ensemble [1]. In the talk I address hydrodynamics of the vortex fluid. The hydrodynamics of the vortex fluid is different from Euler hydrodynamics of the original fluid. It features the anomalous stress absent in Euler's hydrodynamics, which yields a number of interesting effects. Some of them are: a deflection of stream lines, a correction to the Bernoulli law, accumulation of vortices in regions with high curvature in the curved space.

Remarkably, that the hydrodynamics of vortex flows is identical to that of electronic fluid in the fractional quantum Hall regime (FQHE). I will elaborate a deep relation between two seemingly unrelated subjects.

[1] L. Onsager, Nuovo Cimento, Suppl. 6, 249, 279 (1949)