

## Dual fluid for Kerr-Newman black hole

The AdS/CFT correspondence is a relationship between a quantum gravity theory on  $d+1$  dimensional Anti-de-Sitter (AdS) space-time (or bulk) and conformal field theory (CFT) which is the quantum field theory on  $d$ -dimensional space-time (or boundary). It was proposed by Juan Maldacena in 1997. This duality is very useful because it enables us to convert the problem in field theory to string theory problem and vice versa, therefore, we can choose the easier side of the problem to find the solution if the problem can't be solved by the traditional method.

The Fluid/Gravity correspondence is the long wavelength regime of AdS/CFT duality where the microscopic mean free path of the system is much less than the scale of variation. It was invoked in 2005 by Đàm Thanh Sơn and his collaborator. By applying the AdS/CFT correspondence to the system of quark-gluon plasma, they were able to describe the behavior of quark-gluon plasma and discovered the ratio of two related quantities in two different dynamical systems, the shear viscosity of the quark-gluon plasma and the entropy density of the dual black hole. Furthermore, this conjecture was also confirmed by the experiment at Heavy-ion collider in 2008.

The Fluid/Gravity correspondence is an interesting topic because it is very well known that the Navier-Stokes equation can describe behaviors of a non-relativistic incompressible fluid. However, we still lack in the understanding of relativistic fluid and some phenomenon such as turbulence; therefore, the study of fluid/gravity duality might lead us to a new perspective of physics that is undiscovered yet.

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