Homogeneous solutions to the Euler equation

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Abstract

In this talk we describe new results on classification and rigidity properties of stationary homogeneous solutions to the 3D and 2D Euler equations. The problem is motivated by its relation to the Onsager conjecture, recent exclusion results for self-similar blowup, and a connection with the isometric immersion theory. In 2D a full classification of solutions will be provided. In 3D we reveal several new classes of solutions and prove their rigidity properties. In particular, irrotational solutions are characterized by vanishing of the Bernoulli function; and tangential flows are necessarily 2D axisymmetric pure rotations. The arguments reveal geodesic features of the Euler equation on the sphere. We further discuss the case when homogeneity corresponds to the Onsager-critical state. We will show that anomalous energy flux at the singularity vanishes, which is suggestive of absence of extreme 0-dimensional intermittencies in fully developed turbulence.