Visualizing Schnirelman's weak solutions for 2D Euler

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In [2], A. Shnirelman presented a construction of weak solutions of the incompressible 2D Euler equations on the two dimensional torus which is compactly supported in time. Earlier, V. Scheffer presented a construction of a weak solution of the incompressible Euler equations on the plane which is compactly supported in space-time, see [1]. These constructions are of fundamental importance because they show that the standard notion of weak solution for the incompressible Euler equations is not strong enough to guarantee uniqueness. Both constructions produce flows with somewhat fractal nature, but Shnirelman's construction is much simpler to formulate. The purpose of this presentation is to explore Shnirelman's flows from a numerical point of view, exhibiting suitable approximate flows which can be visualized using standard computational techniques and to understand the geometrical structure of these flows.

References

[1] V. Scheffer, *An inviscid flow with compact support in space-time*, J. Geom. Analysis, **3** (1993), no. 4, 343–401.

[2] A. Shnirelman, *On the nonuniqueness of weak solution of the Euler equation*, Comm. Pure Appl. Math. **50** (1997), no. 12, 1261–1286.