

On the pressure of the incompressible fluids and the axisymmetric flows

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Abstract

In this talk we discuss some observations on the divergence free tensor field equation, $\operatorname{div} T = 0$ in the classical field theories in \mathbb{R}^N . For classical fields and compressible fluid equations such that $T \in L^1(\mathbb{R}^N)$ this observation implies a Liouville type of results for stationary fields, while for the time dependent incompressible fluids it says that the region of positivity of the pressure is unbounded in \mathbb{R}^N . We can also extend some parts of these results to the case when $T \in L^p(\mathbb{R}^N), p > 1$. For the 3D axisymmetric incompressible fluids without swirl it also says that the quantity $\int_{-\infty}^{\infty} (p + v_r^2) dx_3$ decreases monotonically in the radial direction. In the later part of the talk we discuss observations related to the blow-up problem of the 3D axisymmetric Euler equations.