Covariant Formulation of Fluid Dynamics and Estakhr's Material Geodesic Equation, far down the Rabbit hole AHMAD REZA ESTAKHR, Researcher — "When i meet God, I am going to ask him two questions, why relativity and why turbulence. A. Einstein" You probably will not need to ask these questions of God, I've already answered both of them. $U^\mu = \gamma(c, u(\vec{r}, t))$ denotes four-velocity field. $J^\mu = \rho U^\mu$ denotes four-current mass density. Estakhr's Material-Geodesic equation is developed analogy of Navier Stokes equation and Einstein Geodesic equation. $\frac{DJ^\mu}{D\tau} = \frac{dJ^\mu}{D\tau} + \Gamma^\mu_{\alpha\beta} J^\alpha U^\beta = J_\nu \Omega^{\mu\nu} + \partial_\nu T^{\mu\nu} + \Gamma^\mu_{\alpha\beta} J^\alpha U^\beta$ Covariant formulation of fluid dynamics, describe the motion of fluid substances. The local existence and uniqueness theorem for geodesics states that geodesics on a smooth manifold with an affine connection exist, and are unique. EMG equation is also applicable in different branches of physics, it all depend on what you mean by 4-current density, if you mean 4-current electron number density then it is plasma physics, if you mean 4-current electron charge density then it is $\frac{DJ^\mu}{D\tau} = J_\nu F^{\mu\nu} + \partial_\nu T^{\mu\nu} + \Gamma^\mu_{\alpha\beta} J^\alpha U^\beta$ electromagnetism.

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