

Non-Singular Gravitational Collapse of a Dust Cloud in Einstein-Cartan Theory

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Abstract : It is now known that the end state of the collapse process of a dense star under its own gravity is the formation of a spacetime singularity. This is the spacetime event where the energy density and spacetime curvature diverge, and the classical general relativity breaks down. As we know, a realistic star is composed of fermions so that their spin effects could alter the final fate of the collapse scenario. The underlying theory within which the inclusion of spin effects can be worked out is the Einstein-Cartan theory. In this theory, the spacetime torsion which is defined as a geometrical quantity, is related to an intrinsic angular momentum of fermions (spin). In this work, we study the collapse process of a homogeneous spin fluid in such a framework and show that taking into account the spin effects of the collapsing cloud could prevent the formation of spacetime singularity.

Keywords : gravitational collapse, einstein-cartan theory, spacetime singularity, black hole physics

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