GR 17: Fundamental Problems and General Formalism

Time: Friday 9:30–10:30   Location: H-HS VII

GR 17.1 Fri 9:30 H-HS VII

The gravitating kinetic gas - Lifting the Einstein Vlasov system to the tangent bundle — •Christian Pfeifer[1], Manuel Hohmann[1], and Nicoleta Voicu[2] — [1]University of Tartu, Tartu, Estonia — [2]Transilvania University, Brasov, Romania

In this talk I will present a new model for the description of a gravitating kinetic gas, by coupling the 1-particle distribution function (1PDF) of the gas directly to the gravitational field, lifted to the tangent bundle of spacetime. This procedure takes the influence of the velocity distribution of the kinetic gas particles on their gravitational field fully into account, instead of only on average, as it is the case for the Einstein-Vlasov system.

By using Finsler spacetime geometry I construct an action for the kinetic gas on the tangent bundle, which is added as matter action to a canonical Finslerian generalisation of the Einstein-Hilbert action. The invariance of the kinetic gas action under coordinate changes gives rise to a new notion of energy-momentum conservation of a kinetic gas in terms of an energy-momentum distribution tensor. The variation of the total action with respect to the spacetime geometry defining Finsler function yields a gravitational field equation on the tangent bundle, which determines the geometry of spacetime directly from the full non-averaged 1PDF. This equation can be regarded as generalisation of the Einstein-Vlasov system, which takes all features of the kinetic gas into account.

GR 17.2 Fri 9:50 H-HS VII

The Hawking Energy in Cosmology — •Dennis Stock — University of Bremen, Center of Applied Space Technology and Microgravity (ZARM)

The definition of gravitational energy is a complex issue in general relativity. Amongst other candidates, Hawking's quasi-local energy satisfies many natural limits, however, fails in general to be positive and monotonous. In this talk, I will discuss how one could use the Hawking energy on a past light cone in cosmology and under which circumstances it can be shown to be positive and monotonously increasing.

GR 17.3 Fri 10:10 H-HS VII

Hamiltonian treatment of asymptotic symmetries in gauge theories — •Roberto Tanzi — University of Bremen, Center of Applied Space Technology and Microgravity (ZARM), 28359 Bremen

Asymptotic symmetries are an important feature of gravity (where they give rise to the BMS group), of electromagnetism, and of other gauge theories. The interest in this topic has increased in the last few years, in particular after it has been conjectured by Hawking, Perry, and Strominger that it could be related to the solution of the long-standing information loss paradox.

I will discuss the Hamiltonian approach to asymptotic symmetries in gauge theories (first pursued by Henneaux and Troessaert), with a particular focus on non-abelian gauge theories.