

Contribution ID: 15

Type: **not specified**

A new formulation of strong-field magnetohydrodynamics for neutron stars

Tuesday, 14 March 2023 15:30 (20 minutes)

I will discuss our recent formulation of magnetohydrodynamics (MHD) which can be used to describe the evolution of strong magnetic fields in neutron star interiors. The approach is based on viewing MHD as a theory with a one-form global symmetry and developing an effective field theory for the hydrodynamic modes associated with this symmetry. In the regime where the local velocity and temperature variations can be neglected, I will derive the most general constitutive relation for the electric field in the presence of a strong magnetic field. This constitutive relation not only reproduces the phenomena of Ohmic decay, ambipolar diffusion, and Hall drift derived in a phenomenological model by Goldreich and Reisenegger, but also reveals new terms in the evolution of the magnetic field which cannot easily be seen from such microscopic models. Our new formulation gives predictions for novel diffusive phenomena and for the two-point correlation functions among various components of the electric and magnetic fields. At the end of my talk, I will comment on various future directions and open problems, which will include the study of chiral effects in magnetised plasmas.

Presenter: GROZDANOV, Sašo (University of Edinburgh and University of Ljubljana)

Session Classification: Neutron stars II