The emergence of Barnett effect within relativistic spin MHD

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The kinetic-theory-wise formulation of relativistic dissipative nonresistive magnetohydrodynamics for massive spin-half particles in the presence of a magnetic field is presented. Using a relaxation-time approximation for the collision kernel of the underlying relativistic Boltzmann equation the nonequilibrium corrections to the phase-space distribution function and multiple transport coefficients are calculated. The emergence of the well-known Einstein–de Haas and Barnett effects from the resulting framework is shown. It is demonstrated that the coupling between spin and the magnetic field appears in the first order of the gradient expansion.

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