1136-65-45 **Zheng Sun*** (zheng_sun@brown.edu). *A discontinuous Galerkin method for nonlinear partial differential equations with a gradient flow structure.*

We consider a class of time-dependent second-order partial differential equations with a gradient flow structure. The problem is governed by a decaying entropy. The solution usually corresponds to a density distribution, hence positivity (non-negativity) is expected. This class of equations covers important cases such as Fokker-Planck type equations and aggregation models, which have been studied intensively in the past decades. In this talk, we propose a high-order discontinuous Galerkin method for these equations. If the interaction potential is not involved, or the interaction is defined by a smooth kernel, our semi-discrete scheme admits an entropy inequality on the discrete level. Furthermore, by applying the positivity-preserving limiter, our fully discretized scheme produces non-negative solutions for all cases under a time step constraint. Numerical examples are given to confirm the high-order accuracy for smooth test cases and to demonstrate the effectiveness for preserving long time asymptotics. (Received December 12, 2017)