1106-65-789 **Jean-Luc Guermond***, Department of mathematics, TAMU, College Station, TX 77843-3368.

Approximation by continuous finite elements of invariant sets of hyperbolic systems.

Some properties of continuous finite elements to approximate invariant sets of hyperbolic systems are investigated. In the first part of the talk it is shown that it is possible to construct a second-order, explicit, maximum principle satisfying, Lagrange finite element method for solving nonlinear scalar conservation equations. The technique is based on a graph Laplacian viscous bilinear form, a high-order entropy viscosity method, and the Boris-Book-Zalesak flux correction technique. The algorithm works for arbitrary meshes in any space dimension and for all Lipschitz fluxes. A priori error estimates are proved for BV initial data. The formal second-order accuracy of the method and its convergence properties are tested on a series of linear and nonlinear benchmark problems.

The technique is extended to the shallow water equations and the compressible Euler system in the second part of the talk. It is shown in these cases that some important positivity properties can be preserved by the method: height of the water, density, internal energy. A minimum principle of the entropy is also investigated. This work is done in collaboration with B. Popov (Texas A&M). (Received September 06, 2014)