Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Proper Orthogonal Decomposition methods for particle-based transport calculations in plasmas DIEGO DEL-CASTILLO-NEGRETE, D. SPONG, S. HIRSHMAN, Oak Ridge National Laboratory — The Proper Orthogonal Decomposition (POD) is a powerful technique to analyze large data sets by projecting the data into an optimal set of low-order modes that capture the main features of the data. POD methods have been widely used in image and signal processing and also in the study of coherent structures in neutral fluids. However, the use of these techniques in plasma physics is a relatively new area of research. Here we discuss recent novel applications of POD methods to particle-based transport calculations in plasmas. We show that POD techniques provide an efficient method to filter noise in the reconstruction of the particle distribution function. As a specific application we consider Monte Carlo simulations of plasma collisional relaxation and guiding-center transport in magnetically confined plasma in toroidal geometry [1]. We also discuss recent results on the application of POD methods to PIC-codes in the context of the Vlasov-Poisson system, and the use of POD methods in projective integration. In particular, we show how POD modes can be used as effective macroscopic variables to accelerate Monte-Carlo calculations. [1] D. del-Castillo-Negrete, et al. *Phys. of Plasmas* 15, 092308 (2008).

Diego del-Castillo-Negrete
Oak Ridge National Laboratory

Date submitted: 09 Jan 2009 Electronic form version 1.4