1057-65-80 **Christopher R Schrock*** (christopher.schrock@wpafb.af.mil), Wright-Patterson AFB, OH 45433, and **Aihua W Wood** (aihua.wood@afit.edu), Wright-Patterson AFB, OH 45433. *Initial Development of Distributional Direct Simulation Monte Carlo (DSMC) Methods.*

The Direct Simulation Monte Carlo (DSMC) method has gained popularity in recent years for treatment of flows in which the assumptions behind the continuum equations of fluid mechanics break down. Such flows are of key importance in rarefied aerodynamics and micro-scale flows. Although the value and necessity of computational kinetic theory has been realized, there are still a number of issues that make DSMC unattractive for practical use. In traditional DSMC methods, simulated particles may possess only a single velocity. As each simulated particle may represent millions of actual particles, this representation leads to a nonphysical representation of the velocity distribution function and limits the method to converge only weakly in L^1. The authors will present our recent developments and preliminary results of new DSMC algorithms that allow each simulated particle's velocity to be distributed and for which numerical evidence suggests strong convergence, as well as a proof of weak convergence. Initial estimates of computational complexity will also be presented. (Received January 08, 2010)