Abstract Submitted
for the APR10 Meeting of
The American Physical Society

Extending the validity of Lagrangian Perturbation Theory SHARVARI NADKARNI-GHOSH, Dept. of Physics, Cornell University, DAVID CHERNOFF, Dept. of Astronomy, Cornell University — Lagrangian Perturbation Theory (LPT) has been widely used to model the non-linear growth of large-scale structure analytically. However, it is known that the Lagrangian series fails to converge when applied to spherical voids. The work to be presented discusses the convergence properties for homogeneous spherical top-hats with arbitrary initial density and velocity perturbations. For this special class of problems, we derive the time of validity of the series and demonstrate how to extend the range of validity. The conclusion is that LPT should be viewed as a finite difference approximation, which, similar to the Euler-Poisson system can diverge prior to shell crossings and it requires a time-step condition to assure stability and yield convergent results.

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Date submitted: 22 Oct 2009 Electronic form version 1.4