A Comparison of AMR and SPH codes for Galaxy Formation Simulations

Brian O’Shea
University of California, San Diego

Collaborators: Ken Nagamine (CfA), Mike Norman (UCSD), Lars Hernquist (CfA), Volker Springel (MPA)
Goal: To study the chemical evolution of the universe from $z=30 \rightarrow 5$

Codes:


GADGET: Lagrangian Smooth Particle Hydrodynamics (SPH)/N–body code (Springel et al. 2001)

Code comparison:

- Dark matter / adiabatic hydro comparison
- Radiative cooling
- Star formation and feedback
Dark Matter–Only Comparison

AMR

SPH
Dark Matter Mass Function

Best results found for $64^3$ dm particles/$128^3$ grid cells (AMR) for comparable resolution (due to PM algorithm)
Mean Separation of DM Halo Peak Densities
Baryon Distribution Functions
Gas Mass Fraction
Conclusions

- Initial results are better than we had expected
- To obtain comparable results the AMR mesh size must be twice the number of particles
- Quite a bit of work remains to be done – detailed comparisons
- Continued agreement with more physics will lend confidence to predictions made with either code