A Comparison of AMR and SPH codes for Galaxy Formation Simulations

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Goal: To study the chemical evolution of the universe from z=30 –5

Codes:

    Enzo: Eularian hydrodynamical adaptive Mesh Refinement (AMR)/N–body code (Norman & Bryan 1998)
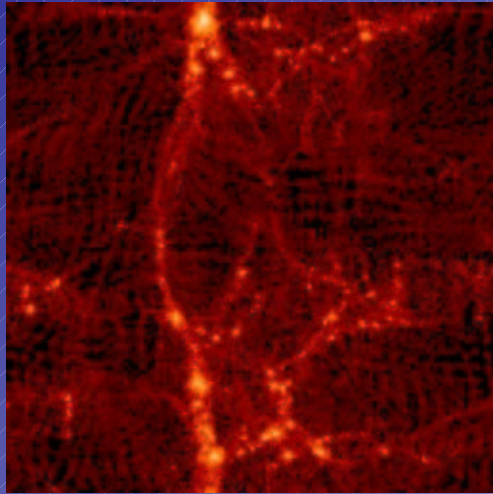
    GADGET: Lagrangian Smooth Particle Hydrodynamics (SPH)/ N–body code (Springel et al. 2001)
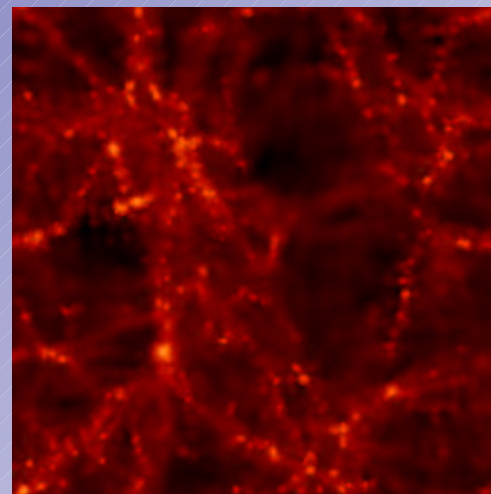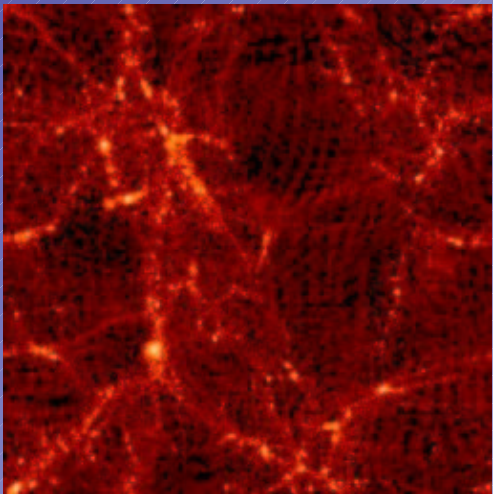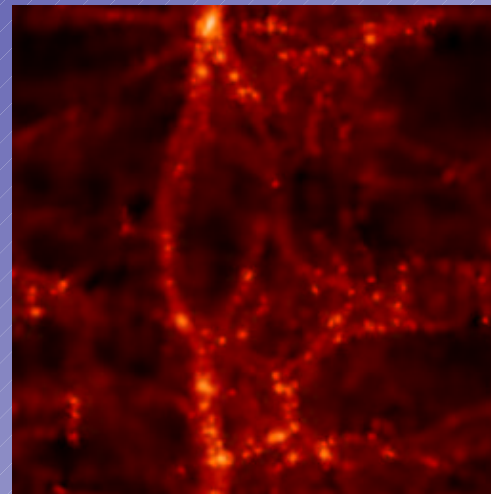
Code comparison:

- Dark matter / adiabatic hydro comparison
- Radiative cooling
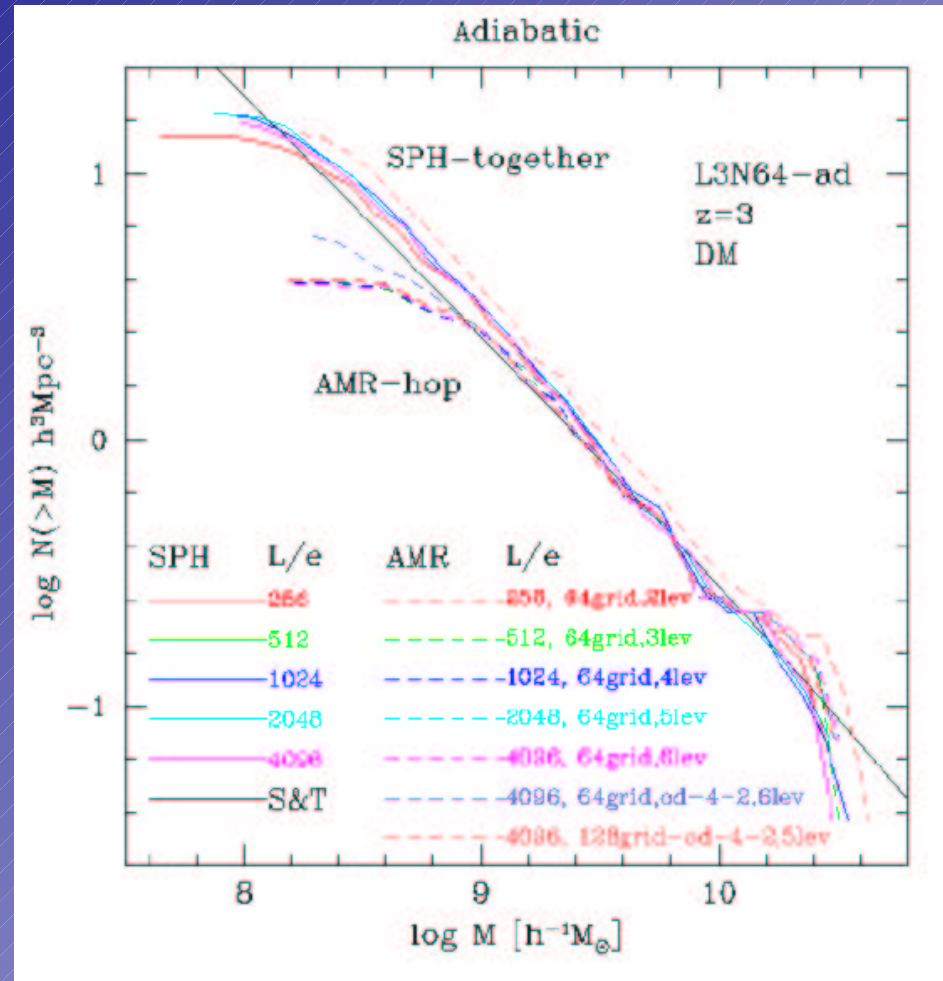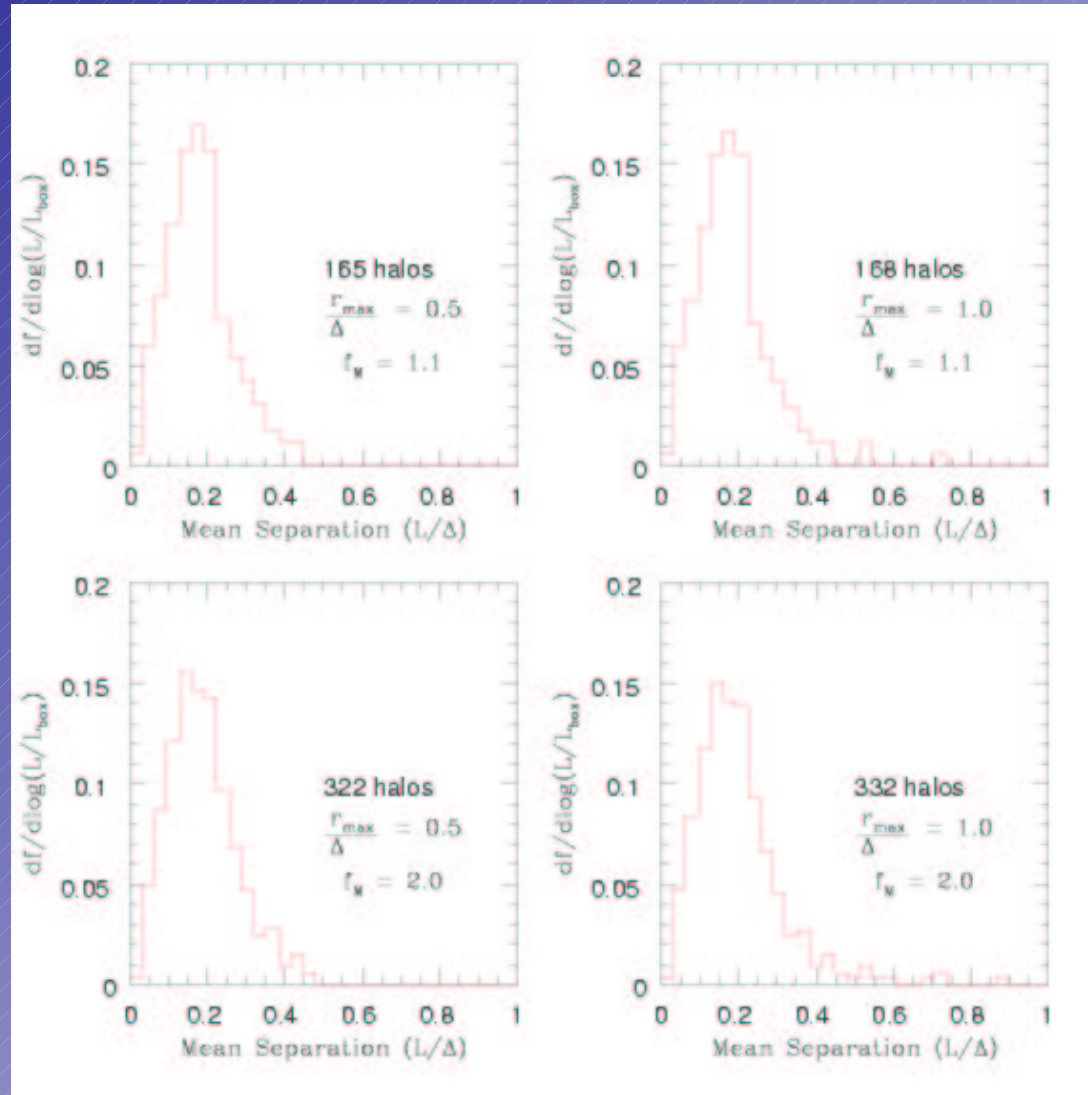- Star formation and feedback

Dark Matter–Only Comparison
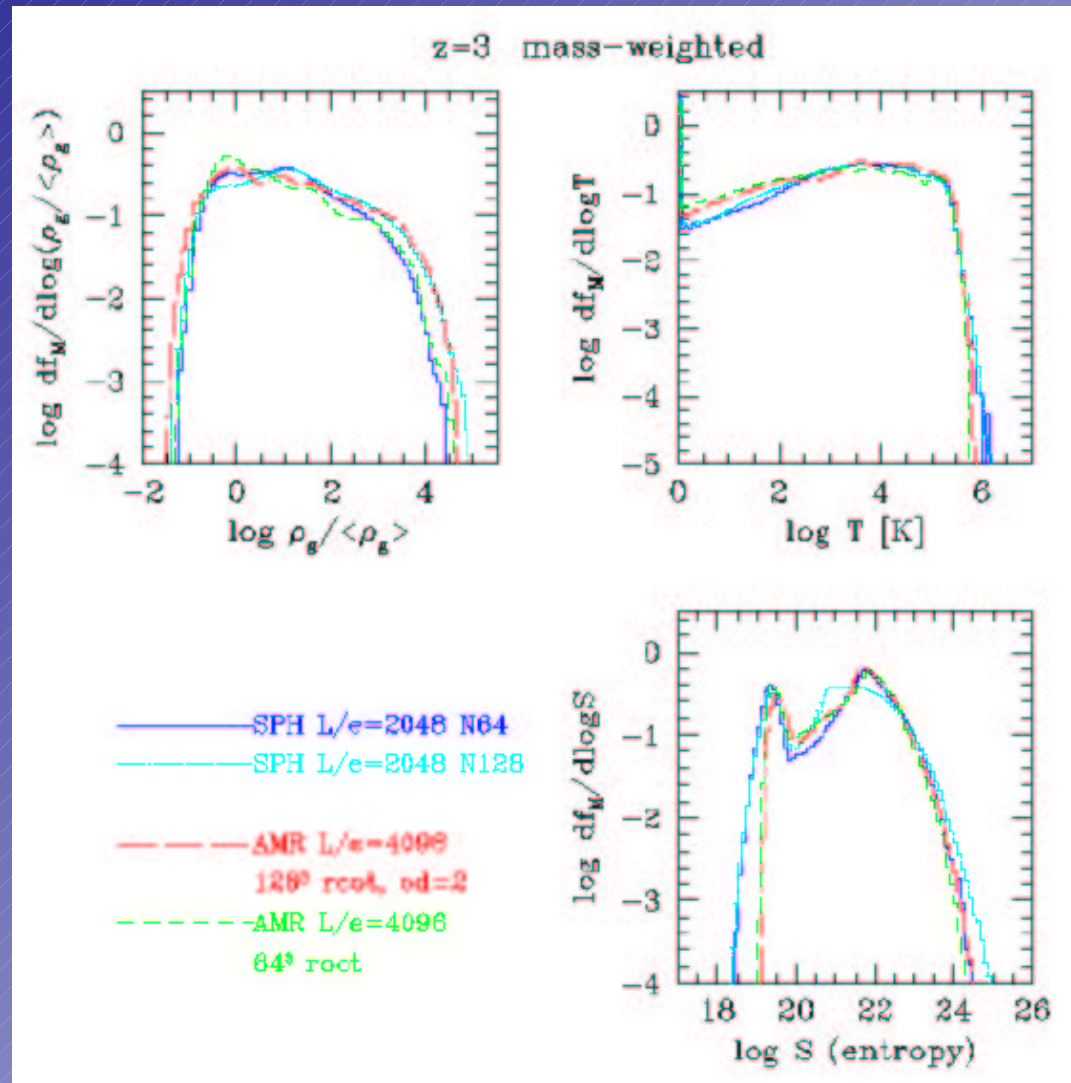
AMR

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