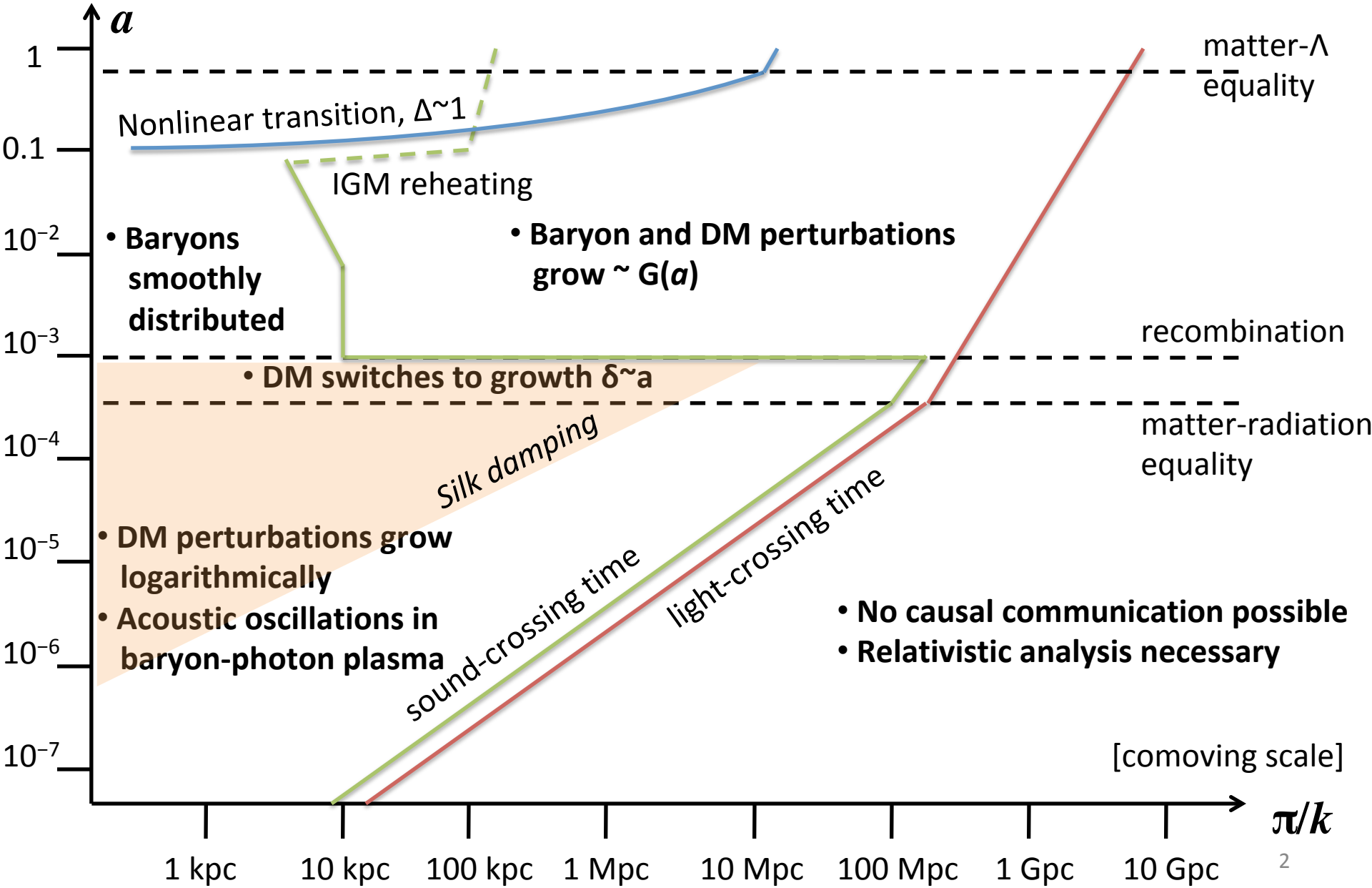
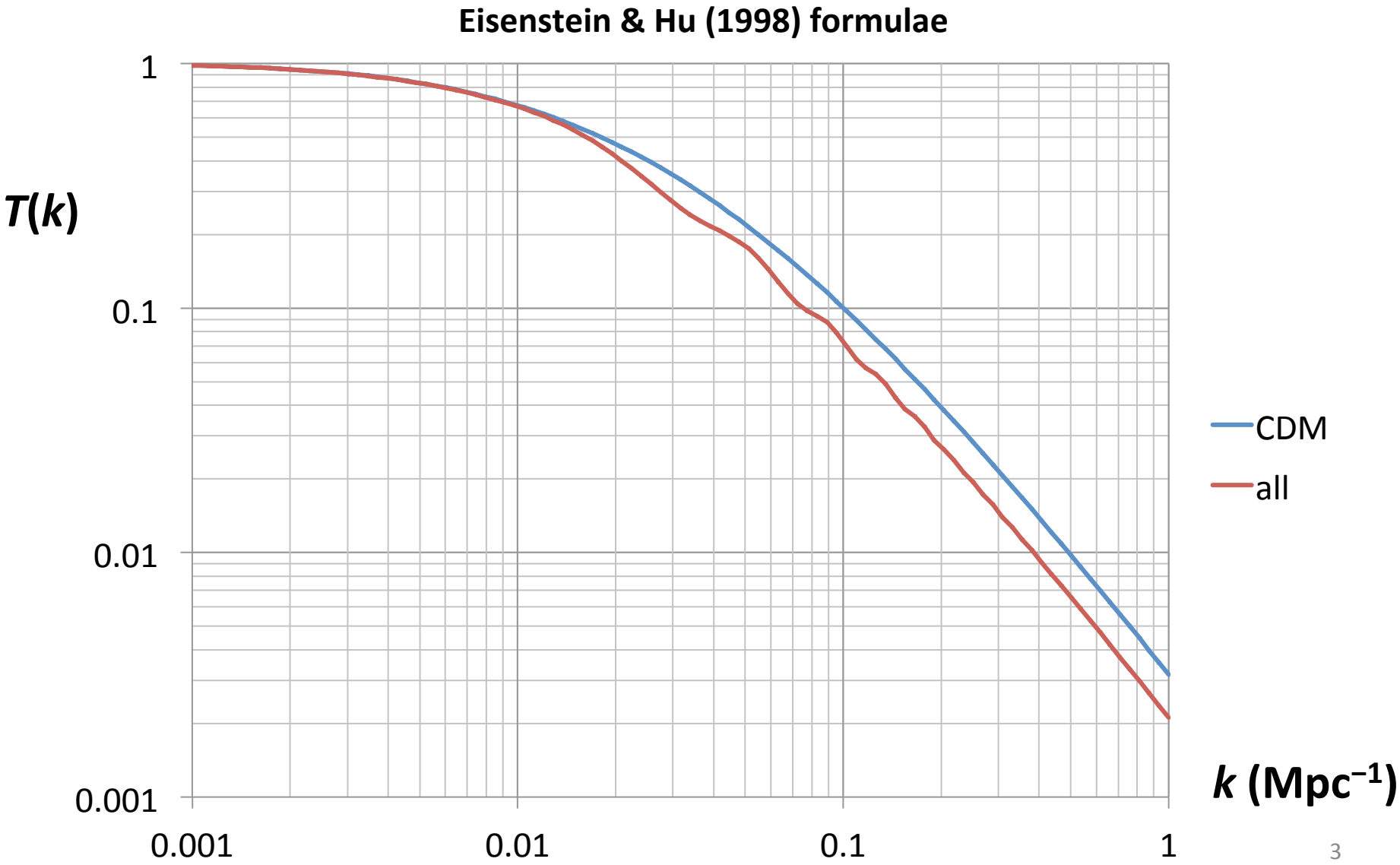
Supplement to Lecture XI: Structure Formation (Numerical Results)

Scales of interest



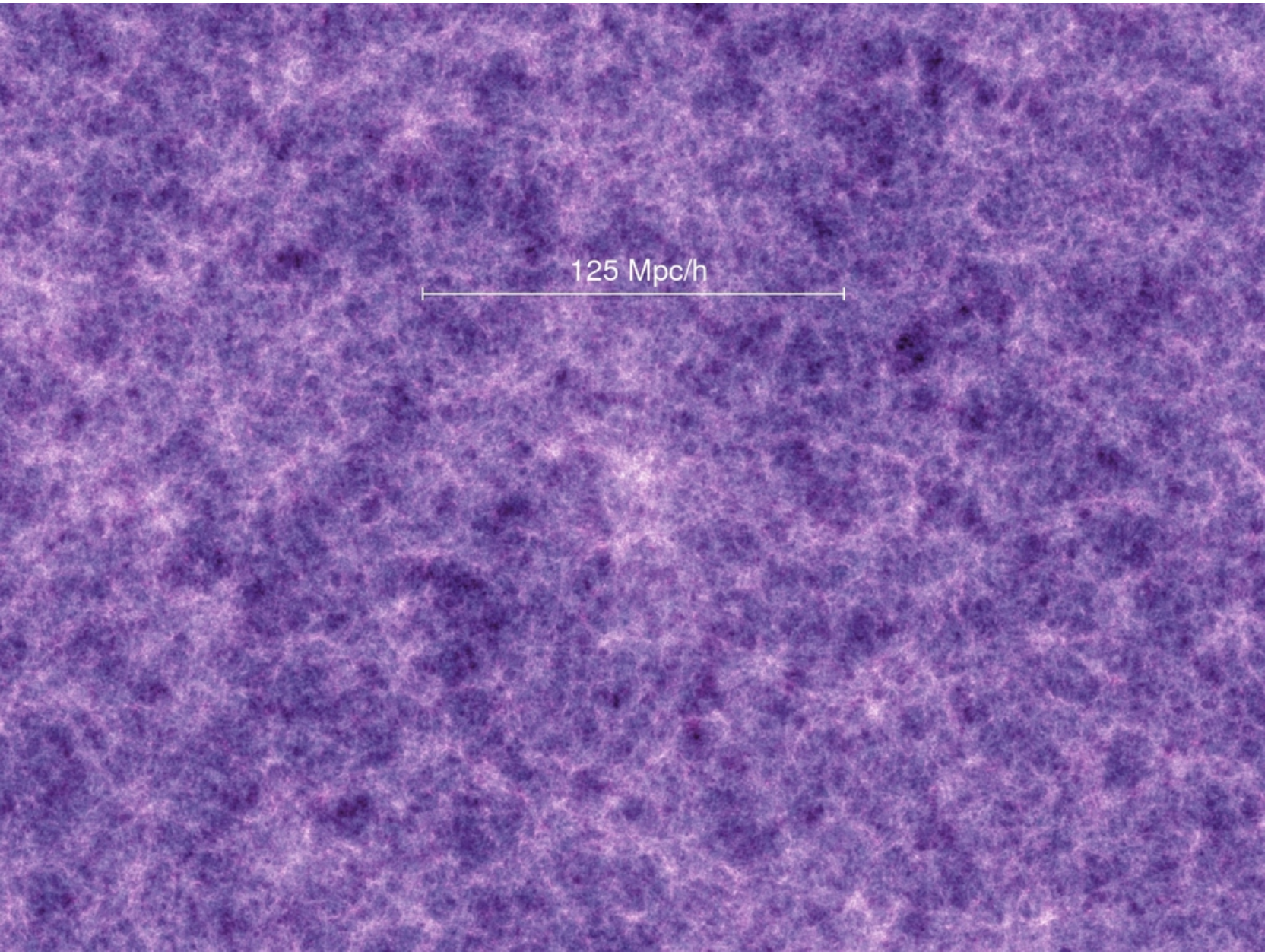
Transfer function: results



Major Techniques

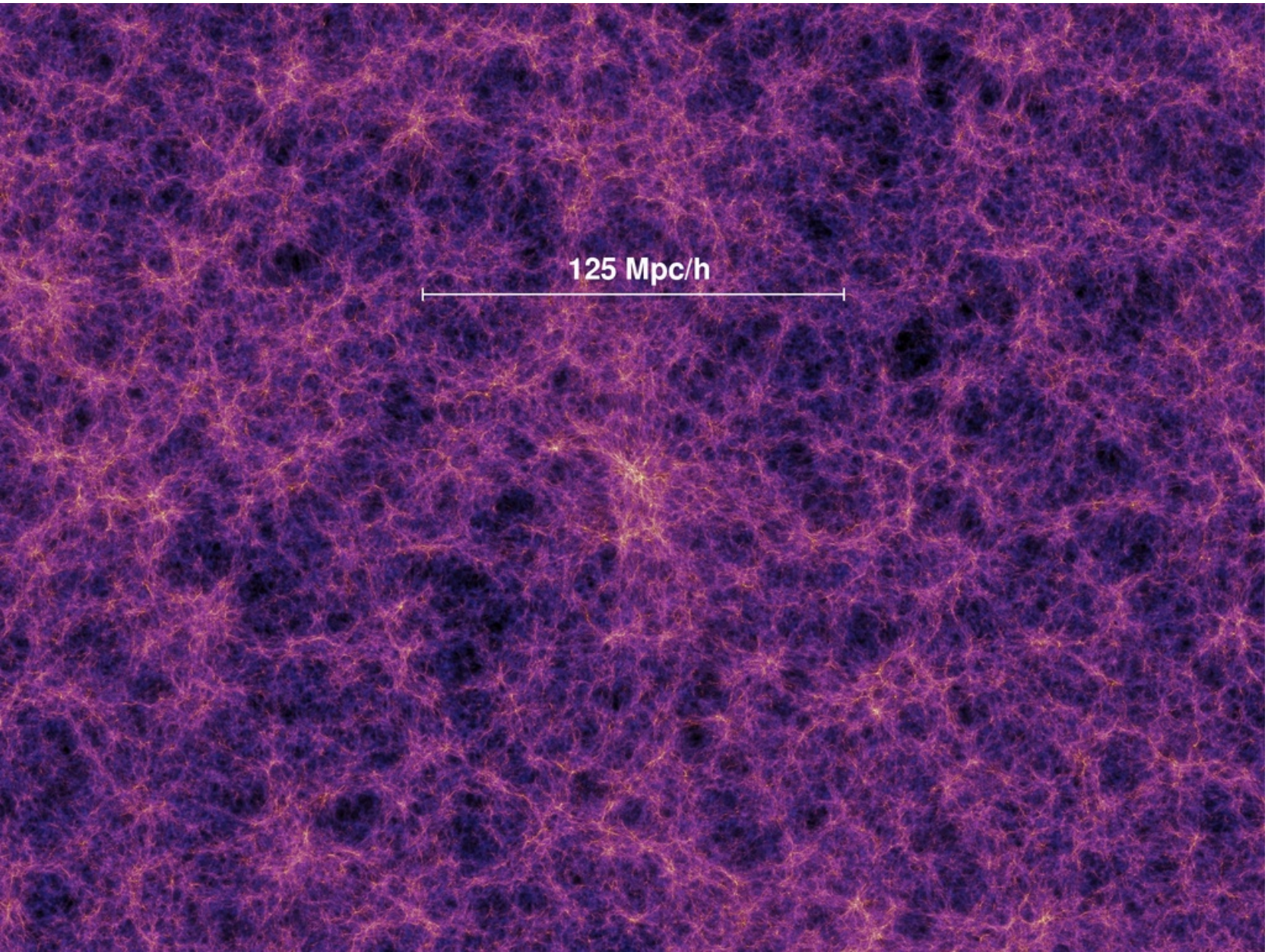
1. Higher-order perturbation theory
   - Useful for weakly nonlinear evolution, e.g. large scale structure at ~ 10 Mpc scales
   - But will never understand galaxy formation by doing this!
2. N-body simulations
   - "Exact" solution of DM-only evolution even when $\delta >> 1$
   - Understand formation/structure of galaxy haloes, merger history, …
3. Analytic treatments of halo formation
   - Useful for gaining intuition
   - But not as accurate as full N-body approaches

Simulated Dark Matter Distribution (15 Mpc/h thick slice)
Millenium Simulation, Springel et al 2005



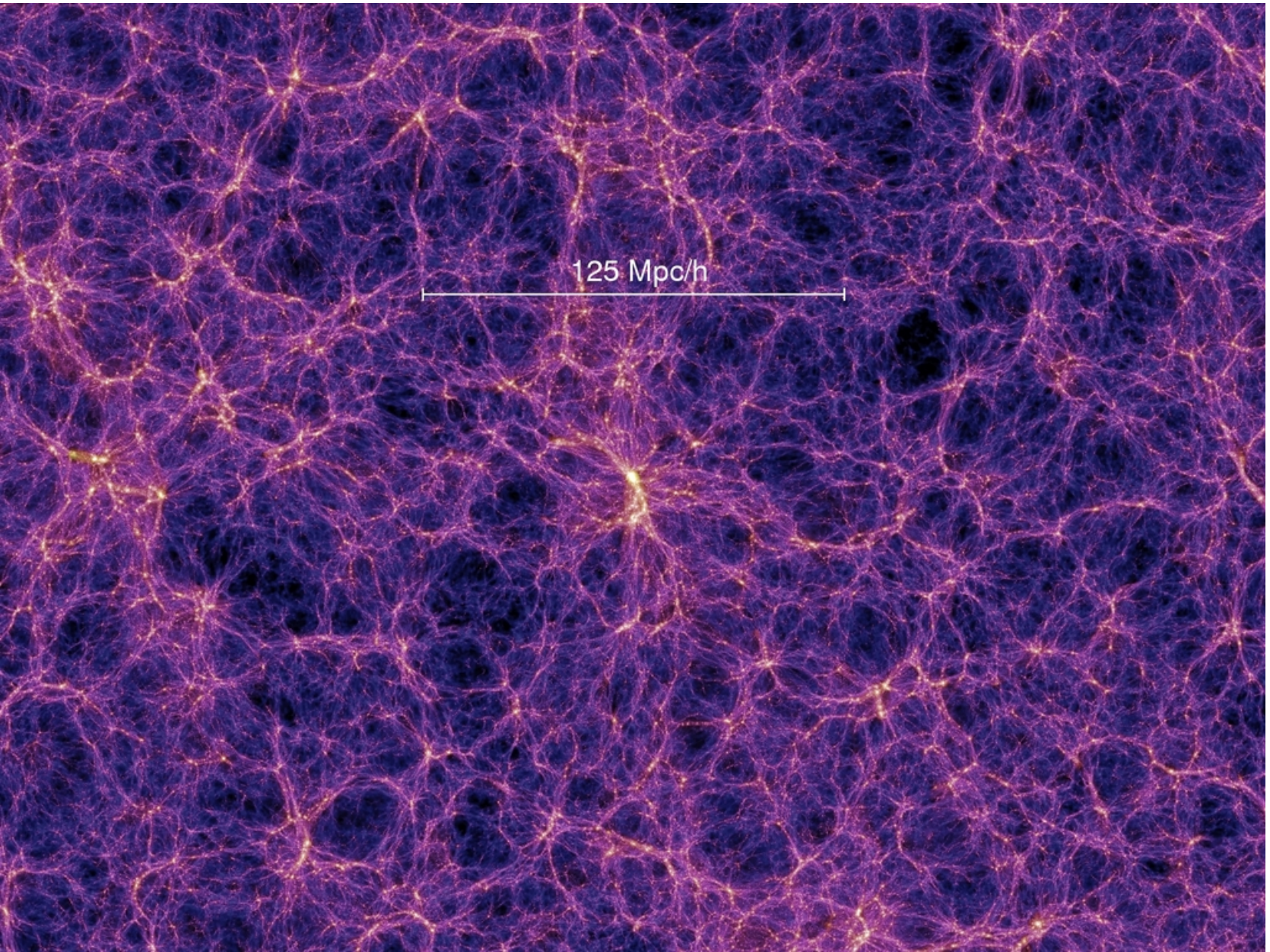
z=18.3

Simulated Dark Matter Distribution (15 Mpc/h thick slice)
Millenium Simulation, Springel et al 2005



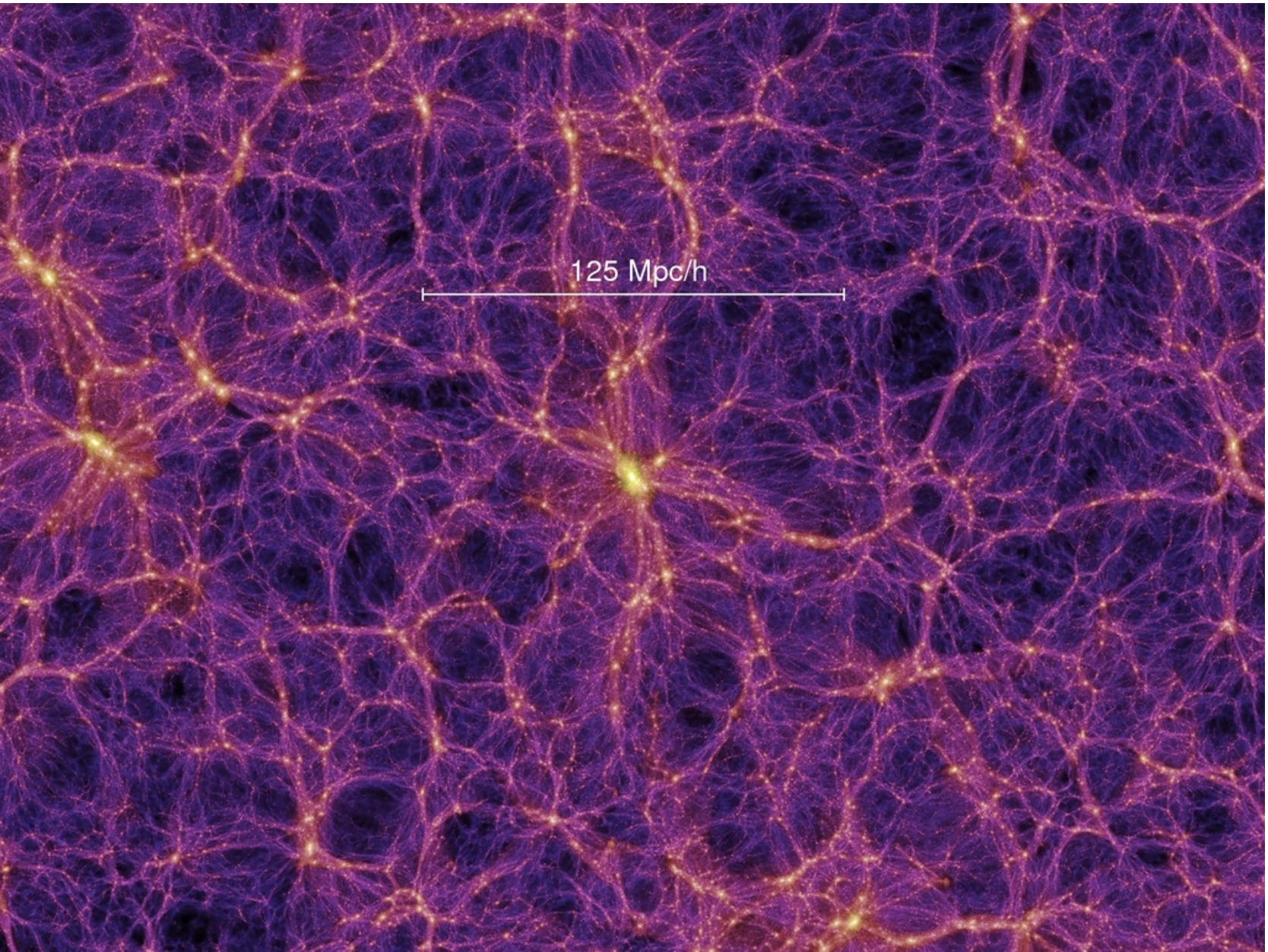
z=5.7

Simulated Dark Matter Distribution (15 Mpc/h thick slice)
Millenium Simulation, Springel et al 2005



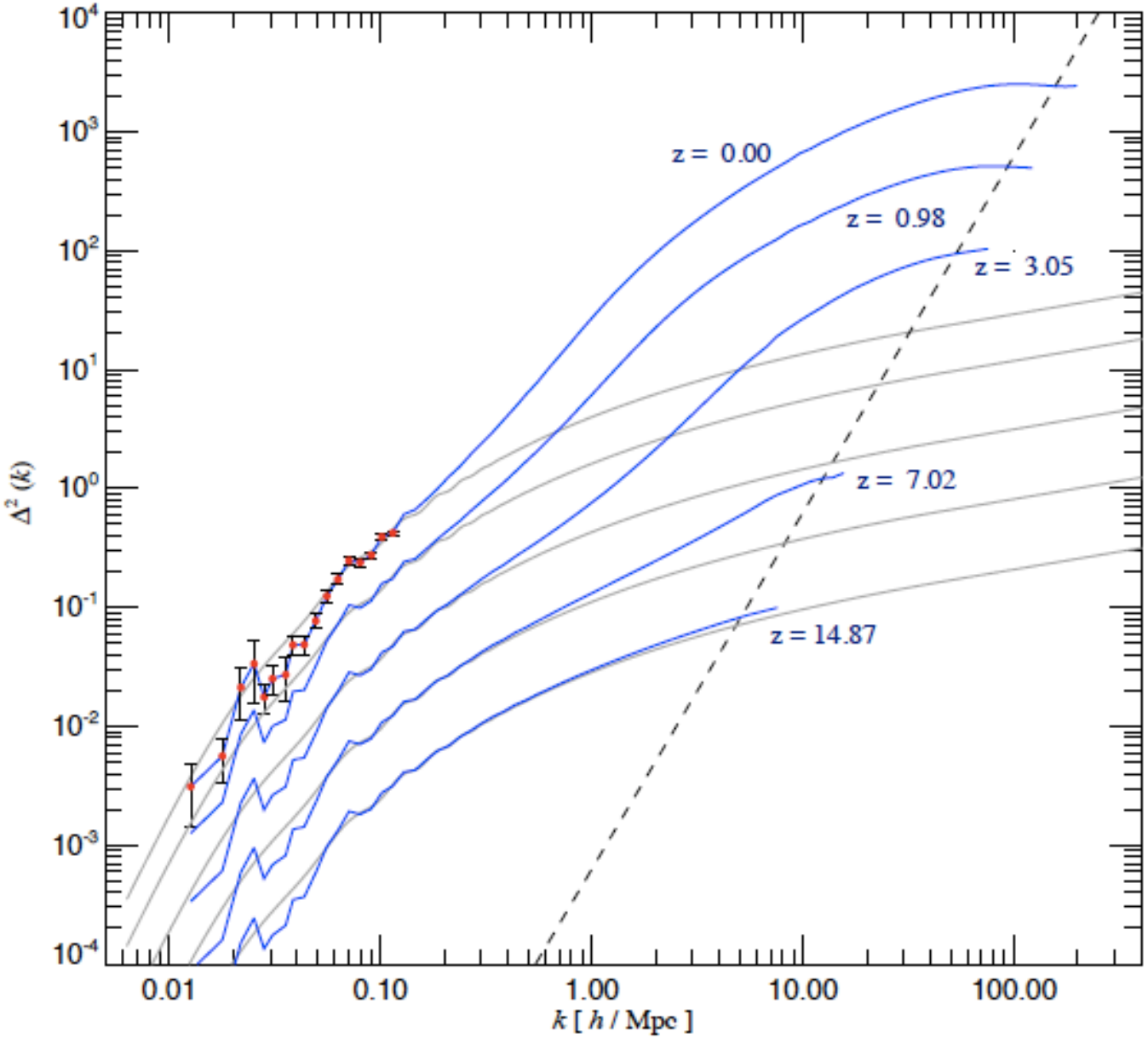
z=1.4

Simulated Dark Matter Distribution (15 Mpc/h thick slice)
Millenium Simulation, Springel et al 2005



z=0.0

Nonlinear Power Spectrum



Millenium Simulation
Springel et al 2005

Gray = linear theory