The Physical Nature of Cosmic Accretion of Baryons & Dark Matter into Halos and their Galaxies

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Wetzel & Nagai 2014 arXiv:1412:0662

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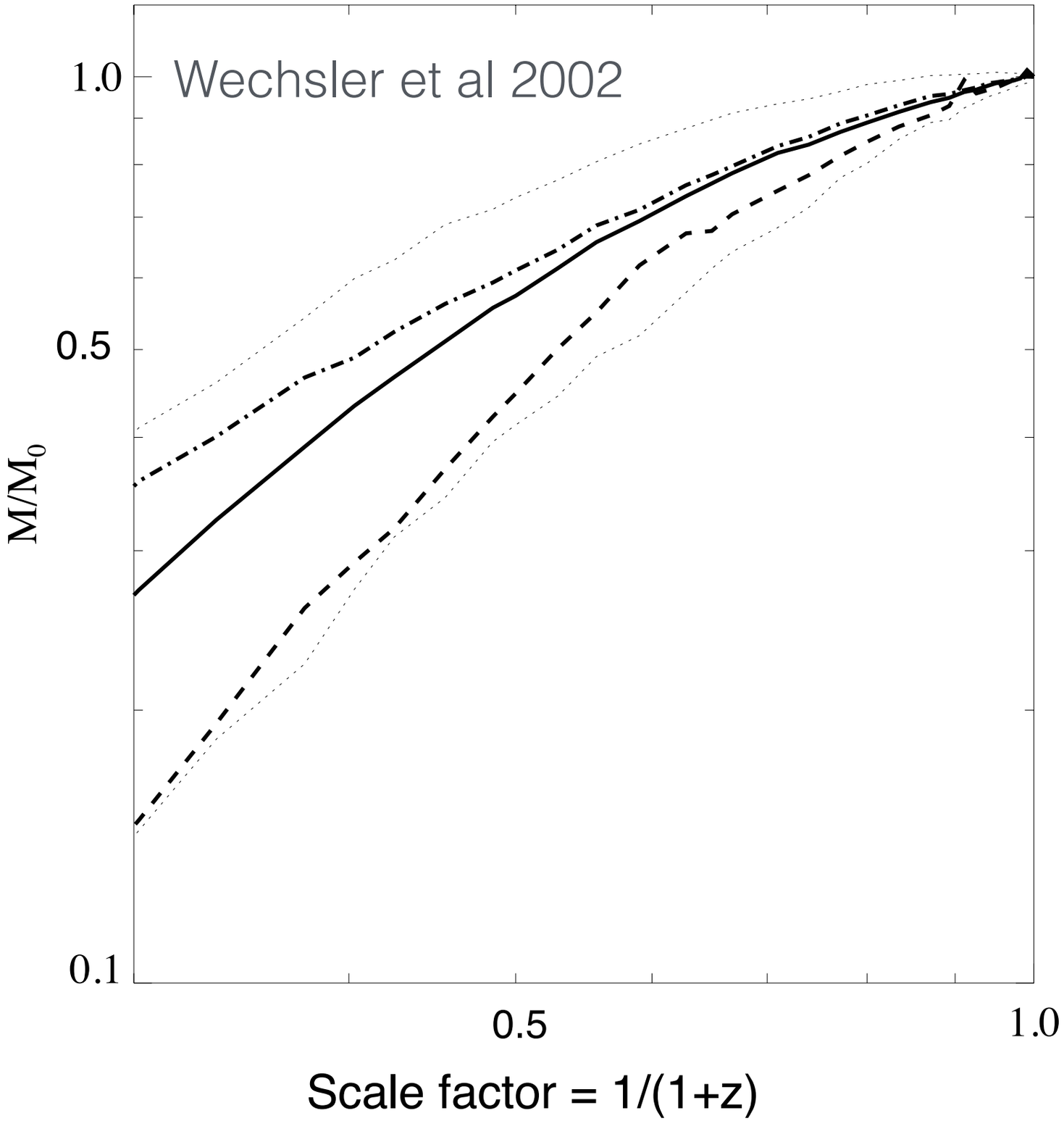
Outline

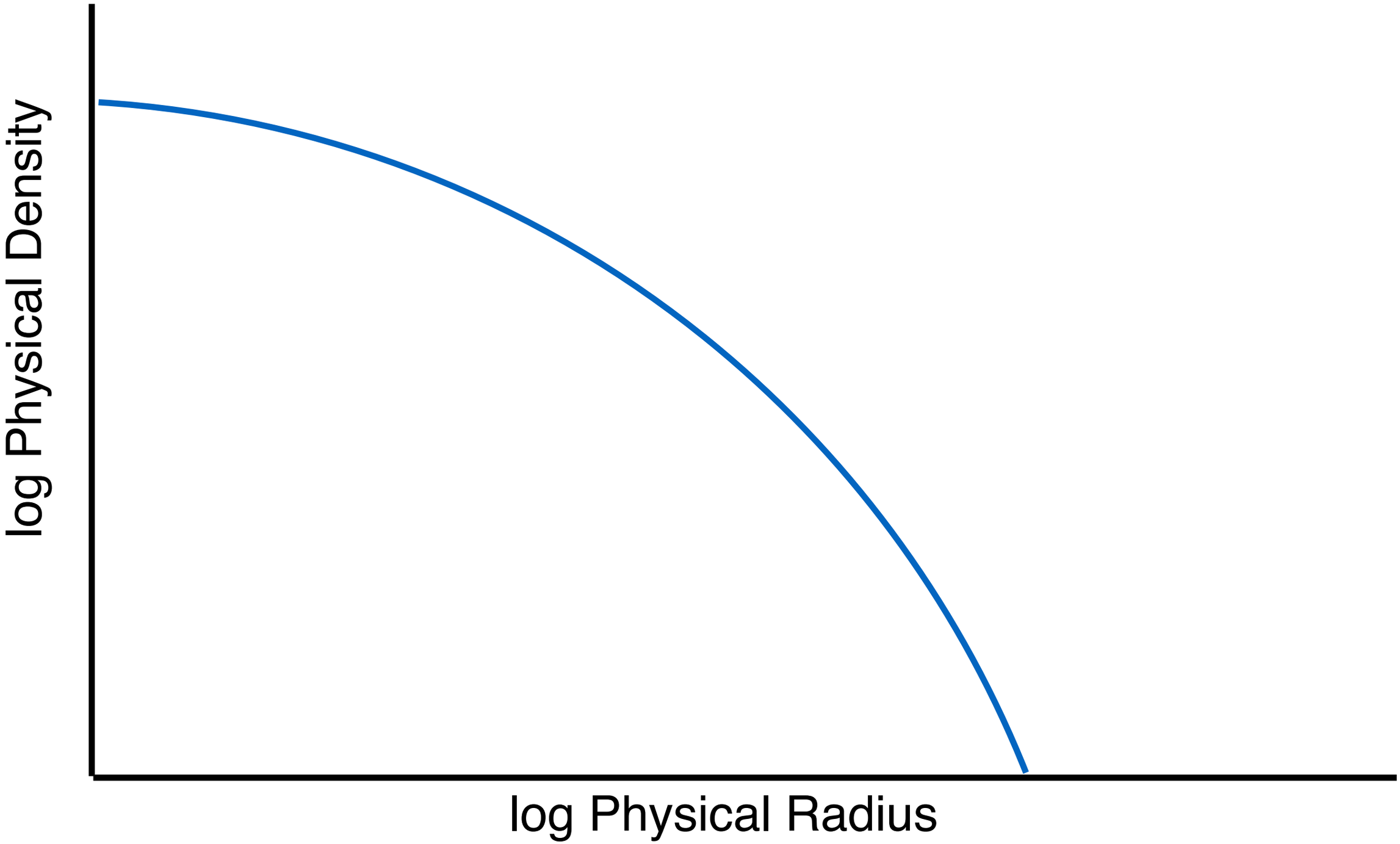
1. Physical Cosmic Accretion of Dark Matter

2. Physical Cosmic Accretion of Baryons

Standard picture of cosmic accretion into halos

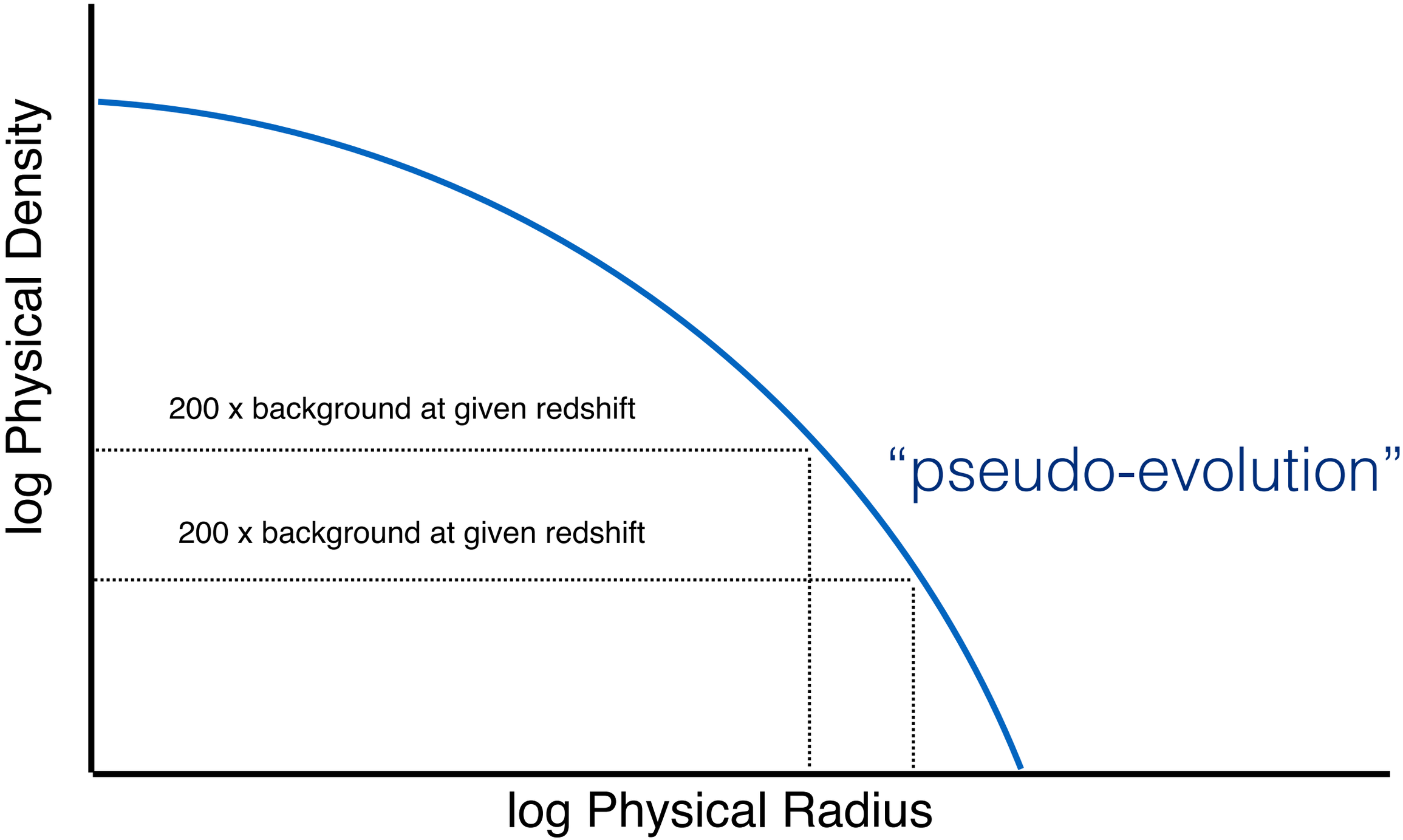


Physical nature of cosmic accretion into galactic halos



see Diemand et al 2007, Cuesta et al 2008, Diemer et al 2013

Physical nature of cosmic accretion into galactic halos



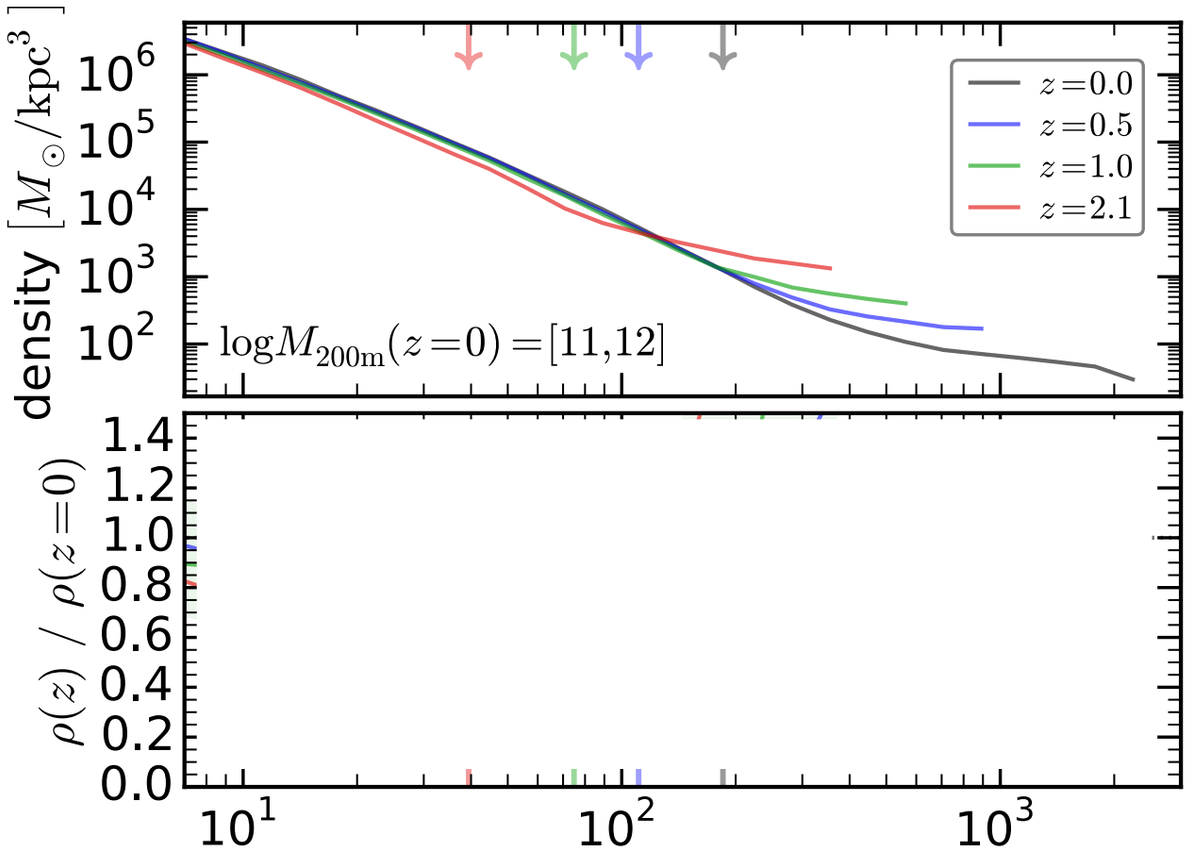
see Diemand et al 2007, Cuesta et al 2008, Diemer et al 2013

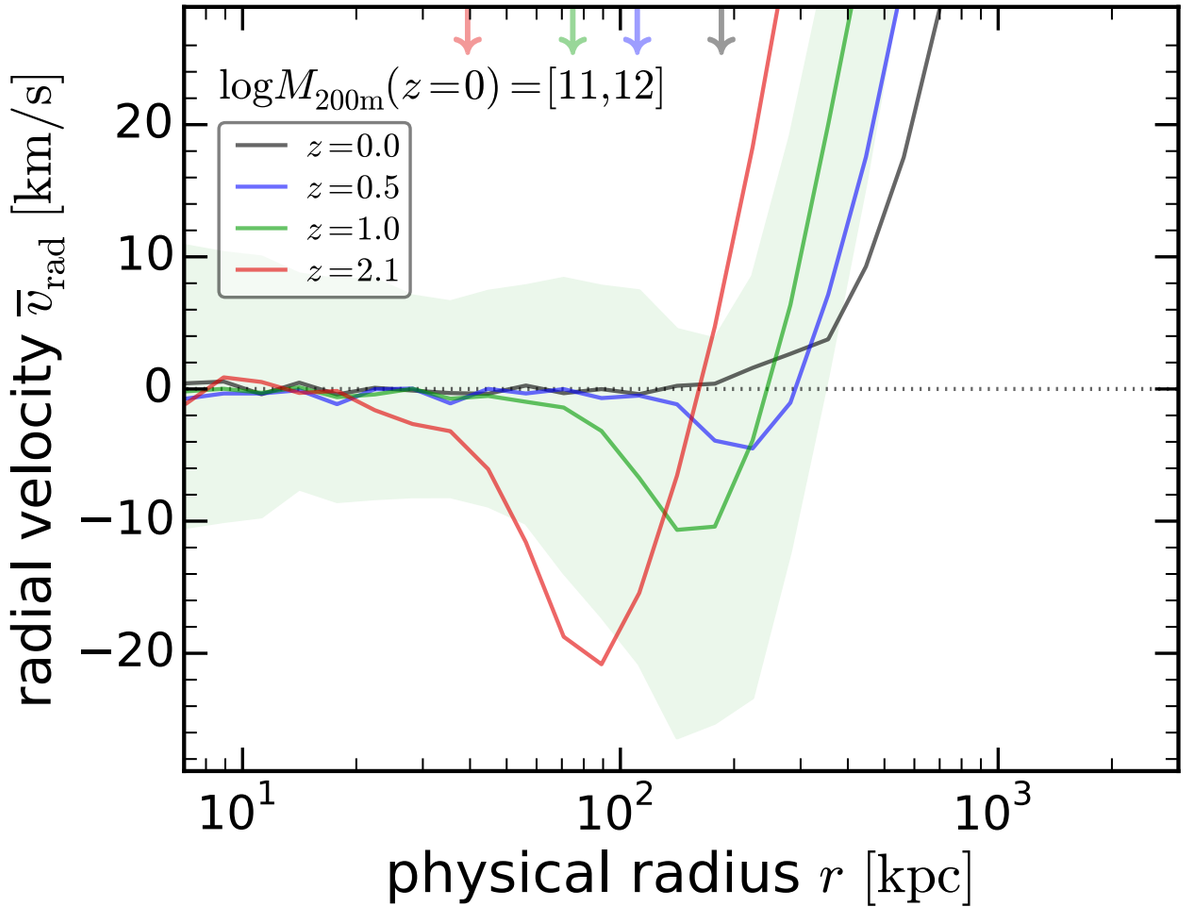
Physical Cosmic Accretion of Dark Matter

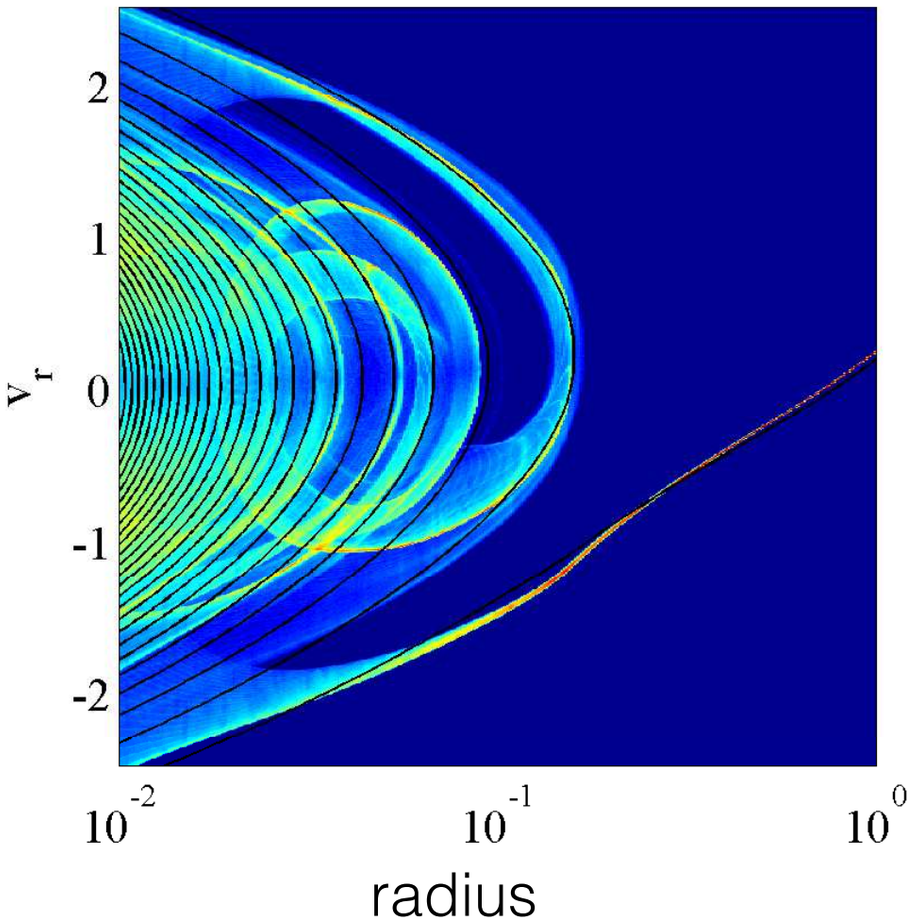
(simulation of only dark matter)

$$\frac{\mathrm{d}^2 r}{\mathrm{d}t^2} = -\frac{G\,m(<r)}{r^2} + \frac{8\pi G}{3}\rho_\Lambda r$$

Adhikari, Dalal & Chamberlain 2014

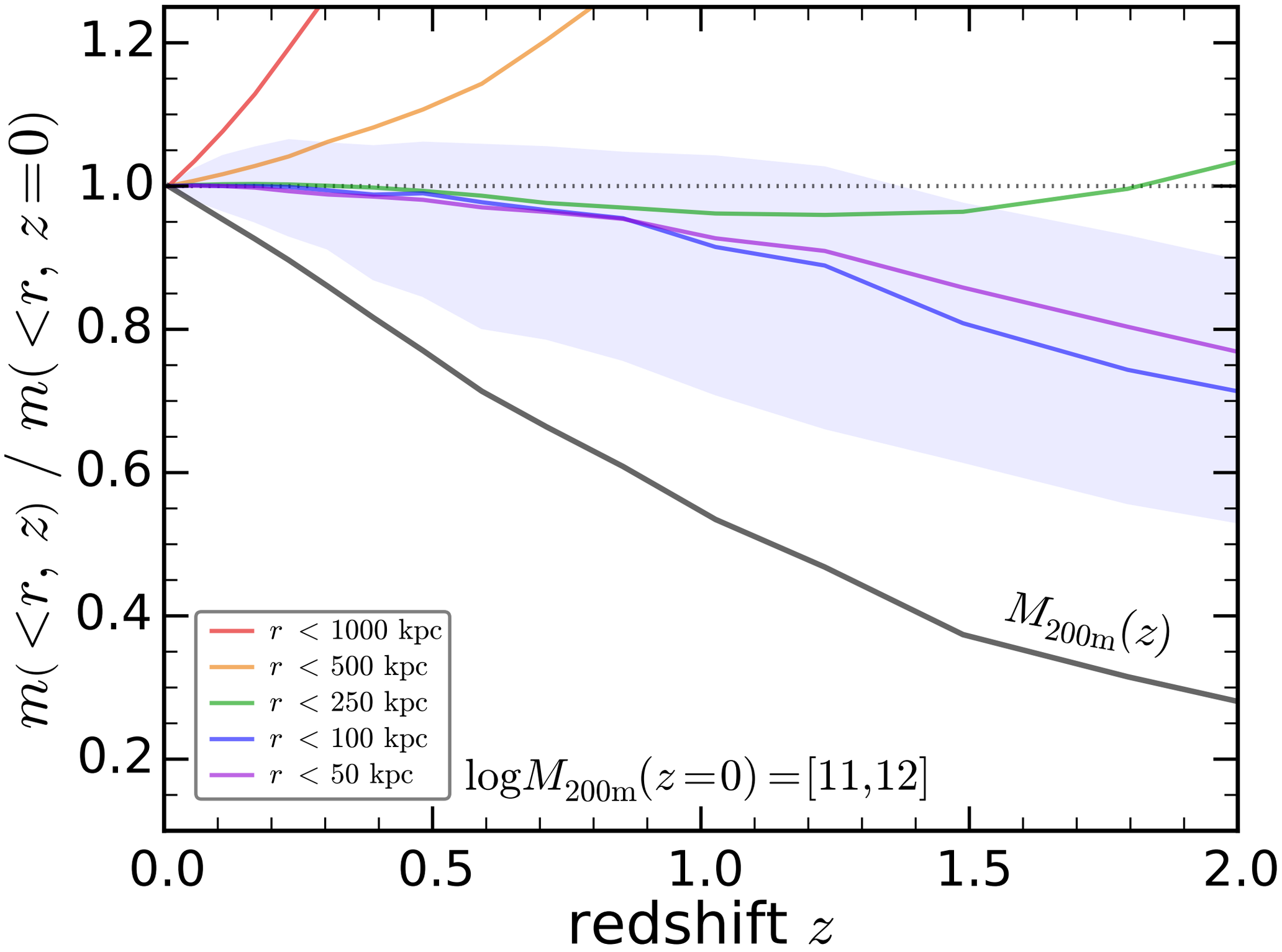






Physical Cosmic Accretion of Dark Matter

from simulation with only dark matter



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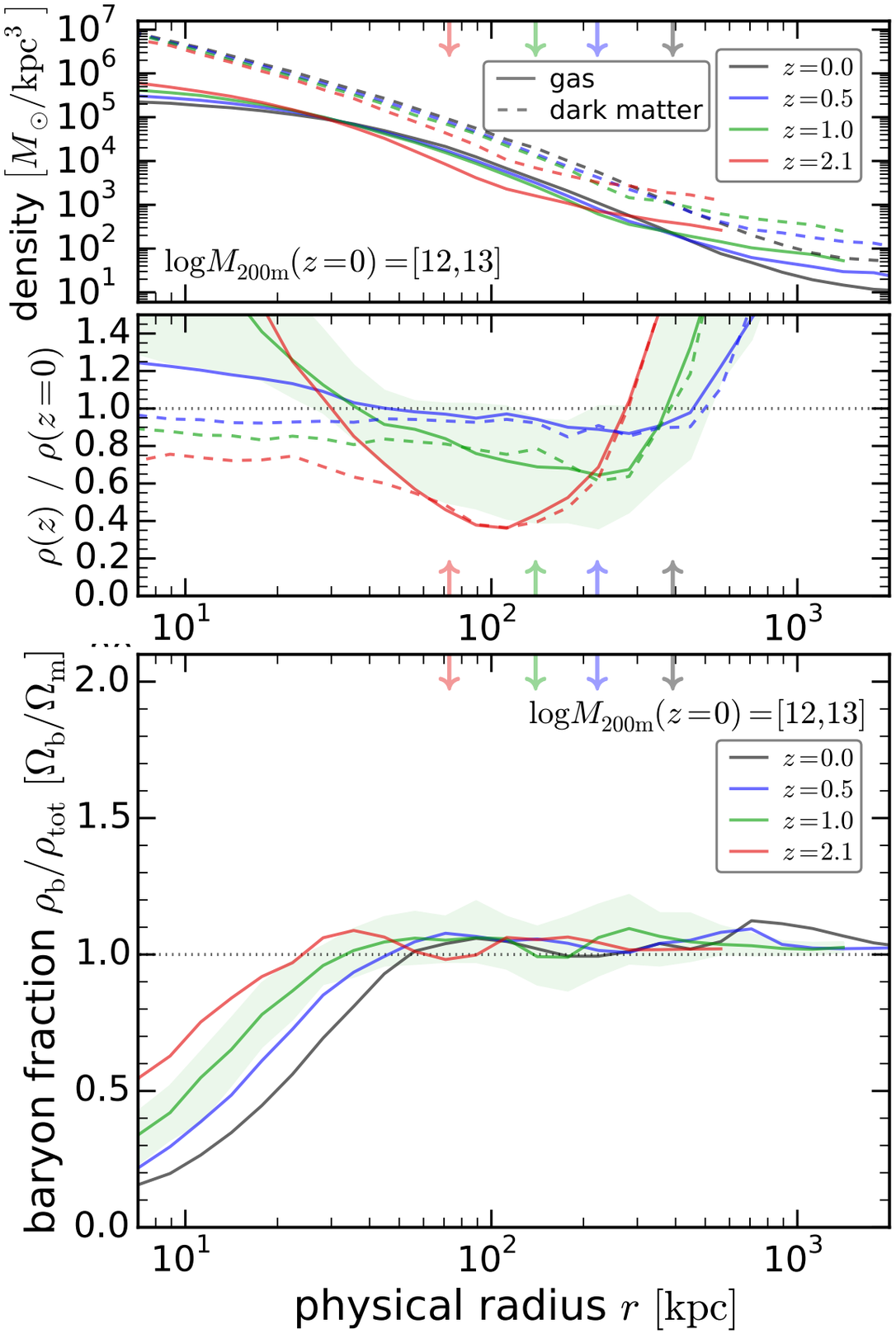
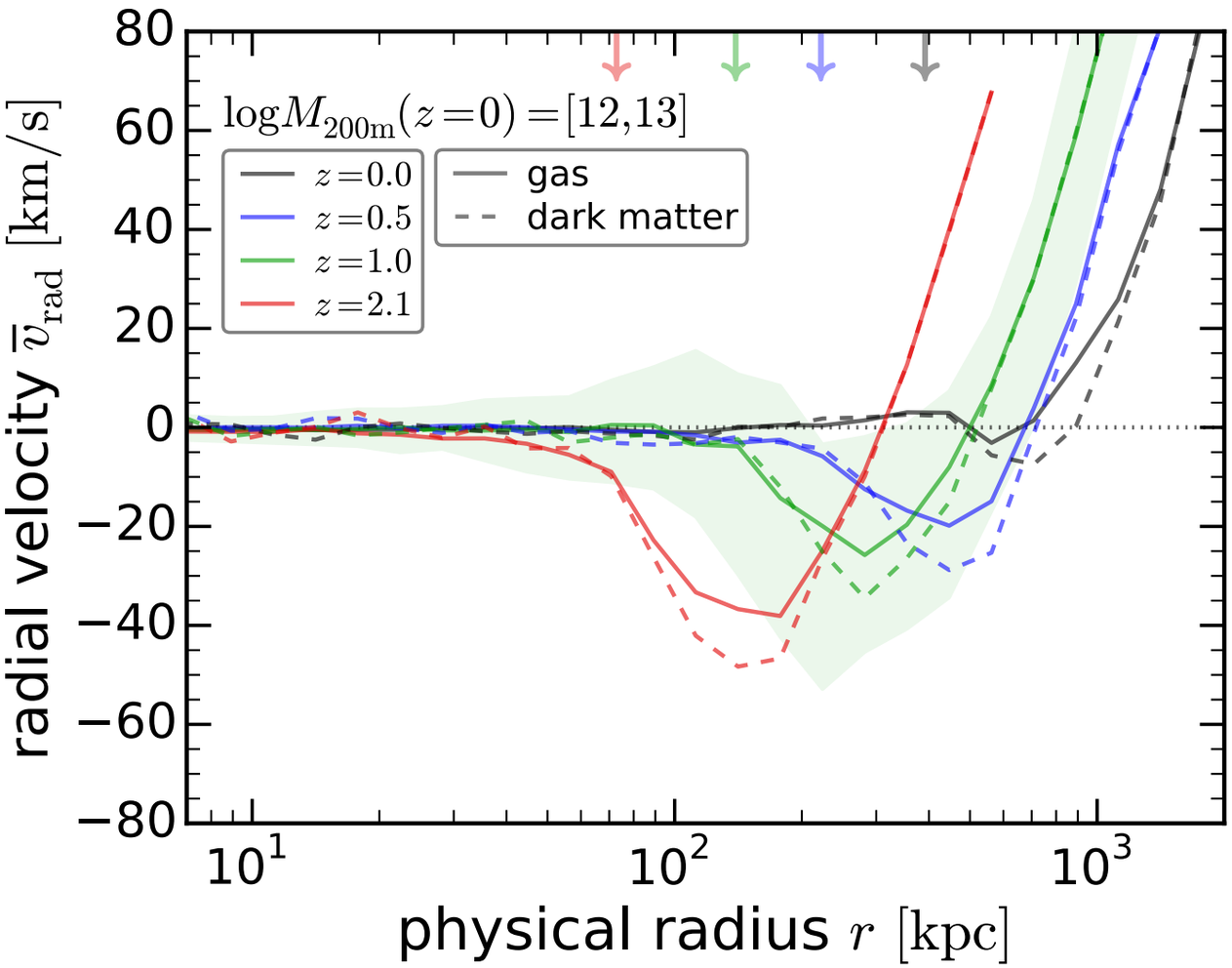
Physical accretion of gas & dark matter

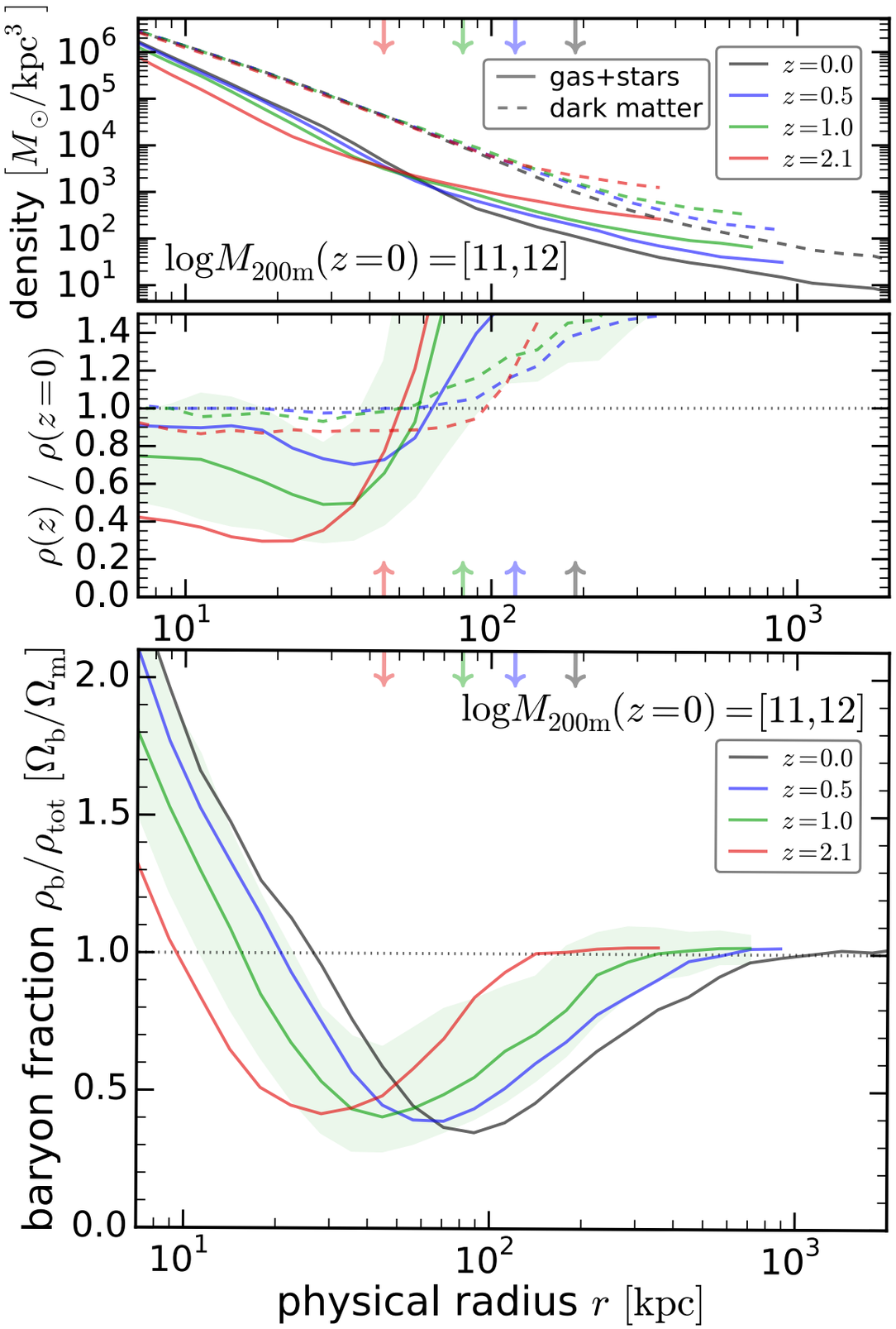
from simulation with gas - non-radiative

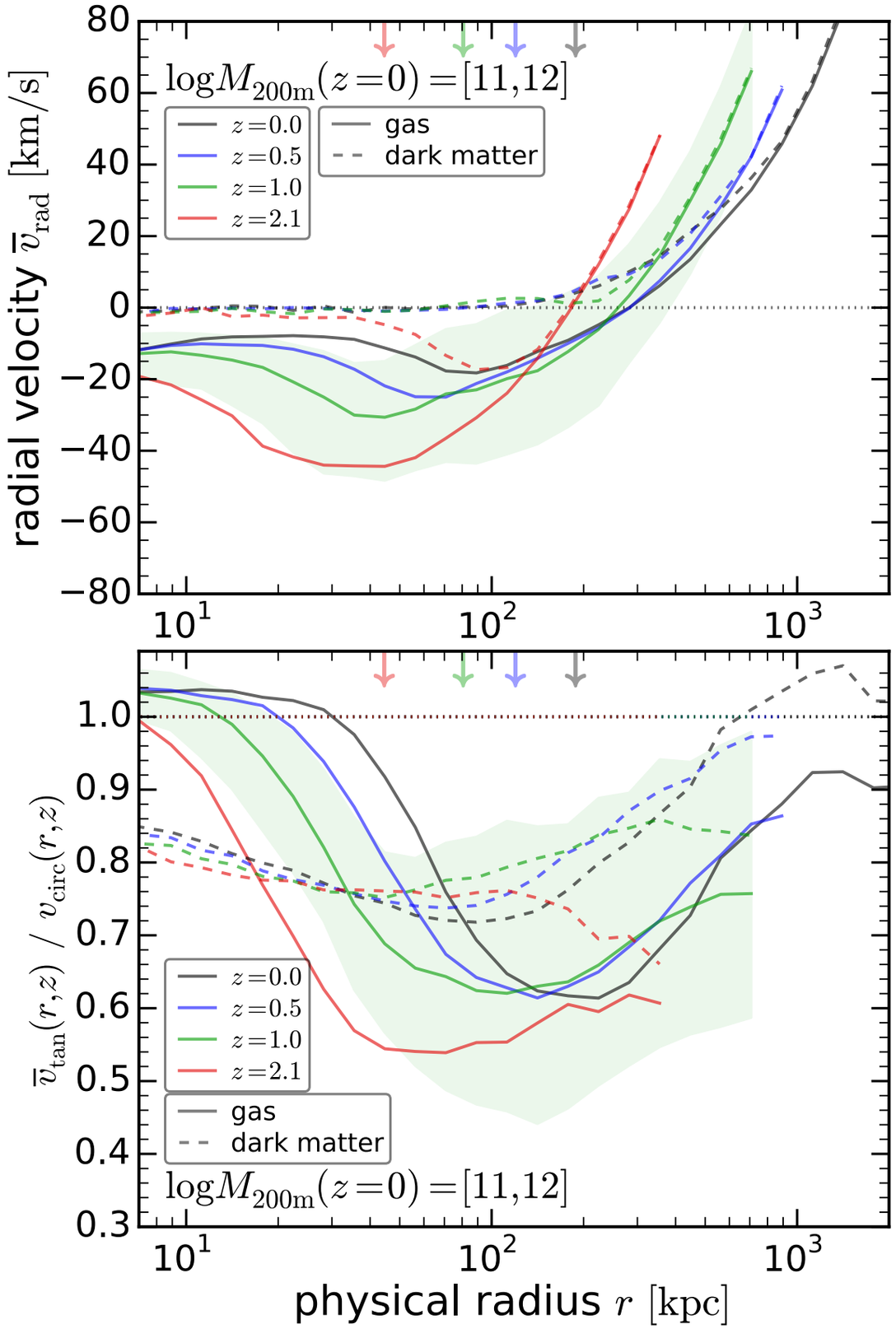




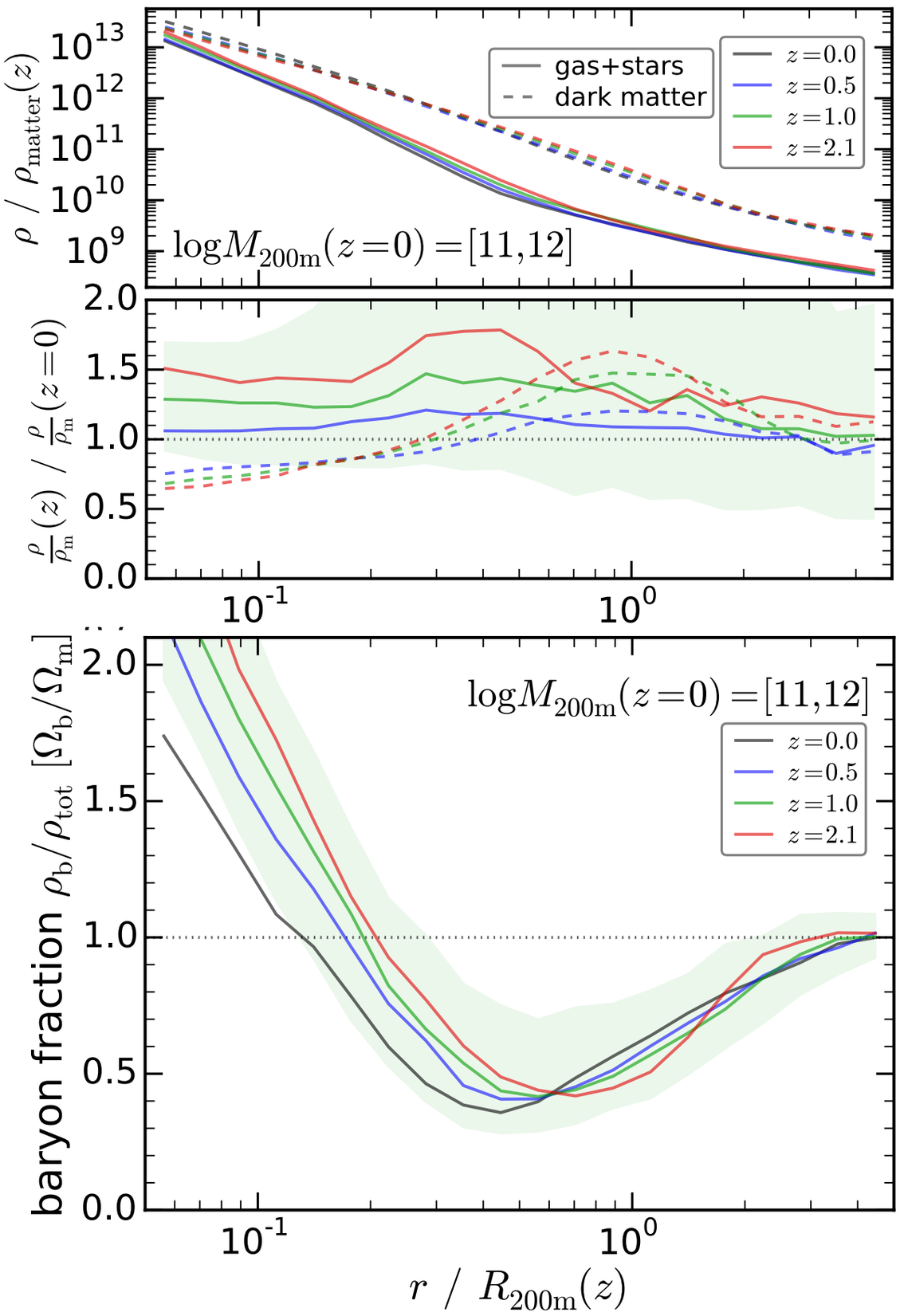
Physical accretion of baryons & dark matter

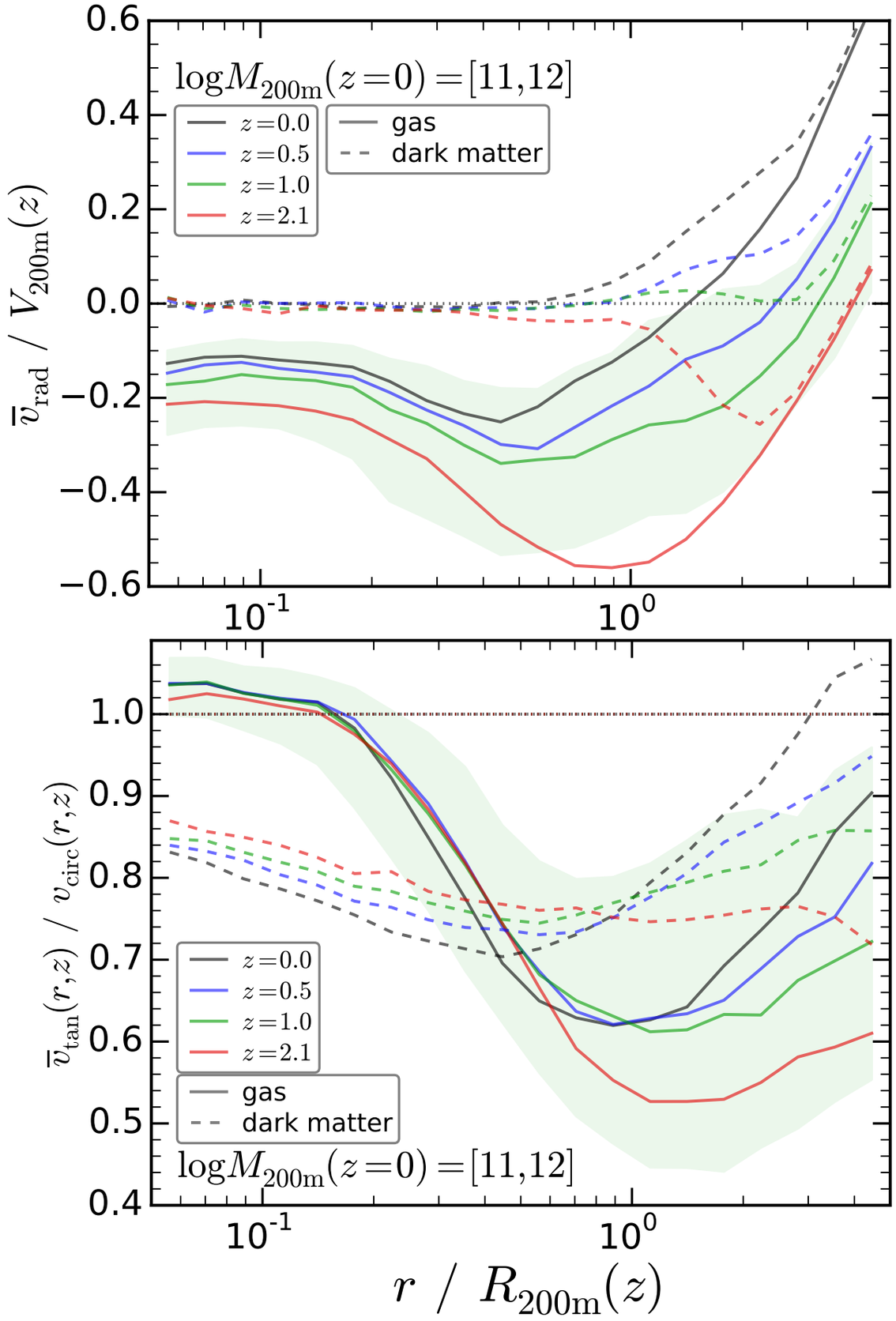
from simulation with star formation + thermal feedback





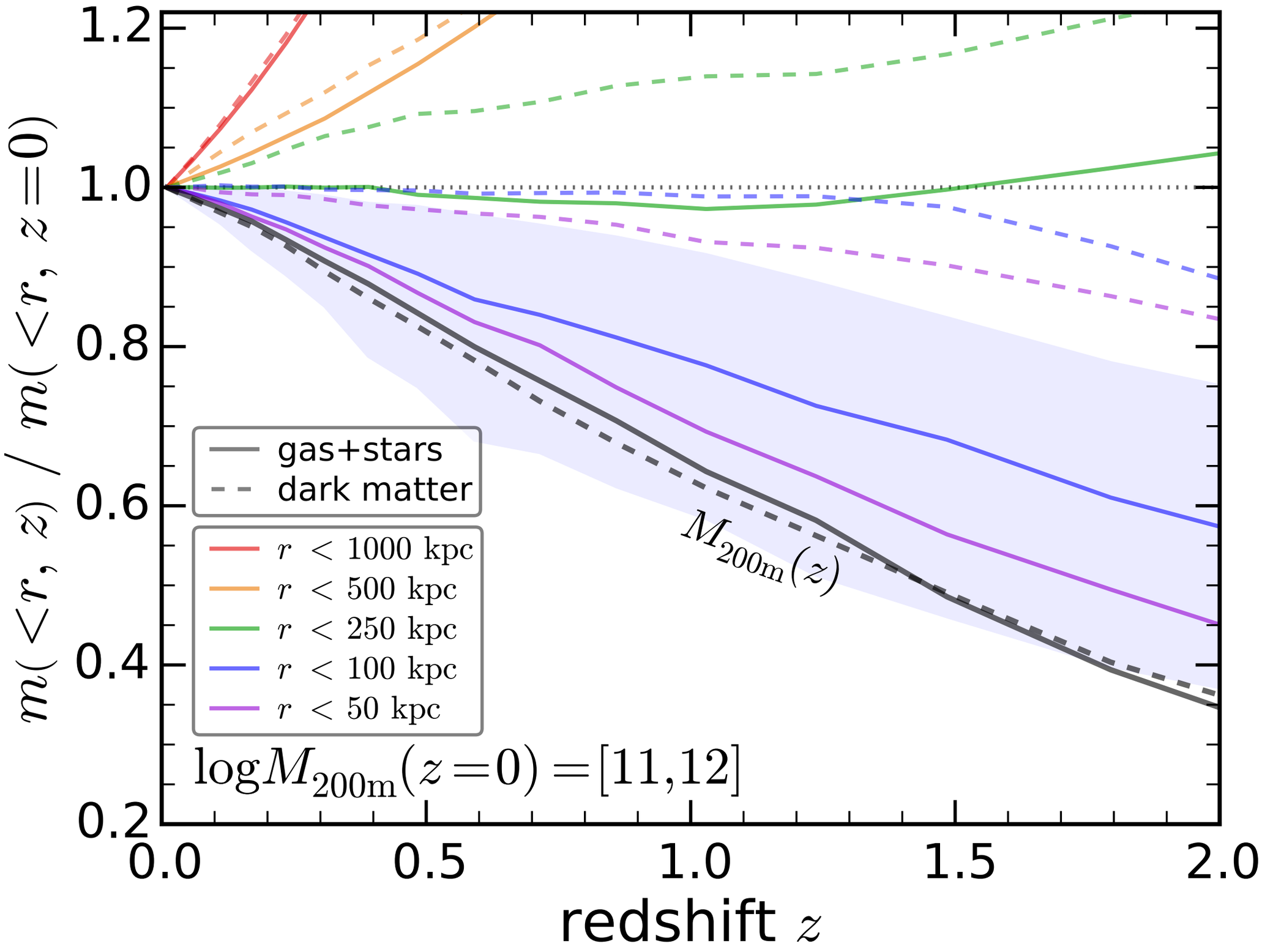
Physical significance of R_{200m}?





Physical accretion of baryons & dark matter

from simulation with star formation + feedback



Physical Cosmic Accretion of Dark Matter & Baryons

- Dark matter growth is subject to pseudo-evolution
  - at z <~ 1, no significant growth of mass at any radius

- Baryon growth is not subject to pseudo-evolution
  - Physical growth at all radii because gas is dissipational
  - Accretion rate at all r < R_{200m} (nearly) tracks that at R_{200m}
  - Accretion radius of low-mass halos not increase at z <~ 1

- Most meaningful radius to measure cosmic accretion of both dark matter and gas is ~2 $R_{200m}(z)$