

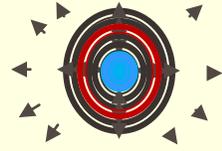
A new probe of dark energy

Giorgos Korkidis

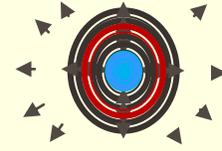
University of Crete &
Institute of Astrophysics FORTH

09-09-2022, **Workshop on Tensions in Cosmology**, Corfu summer institute/Corfu, Greece



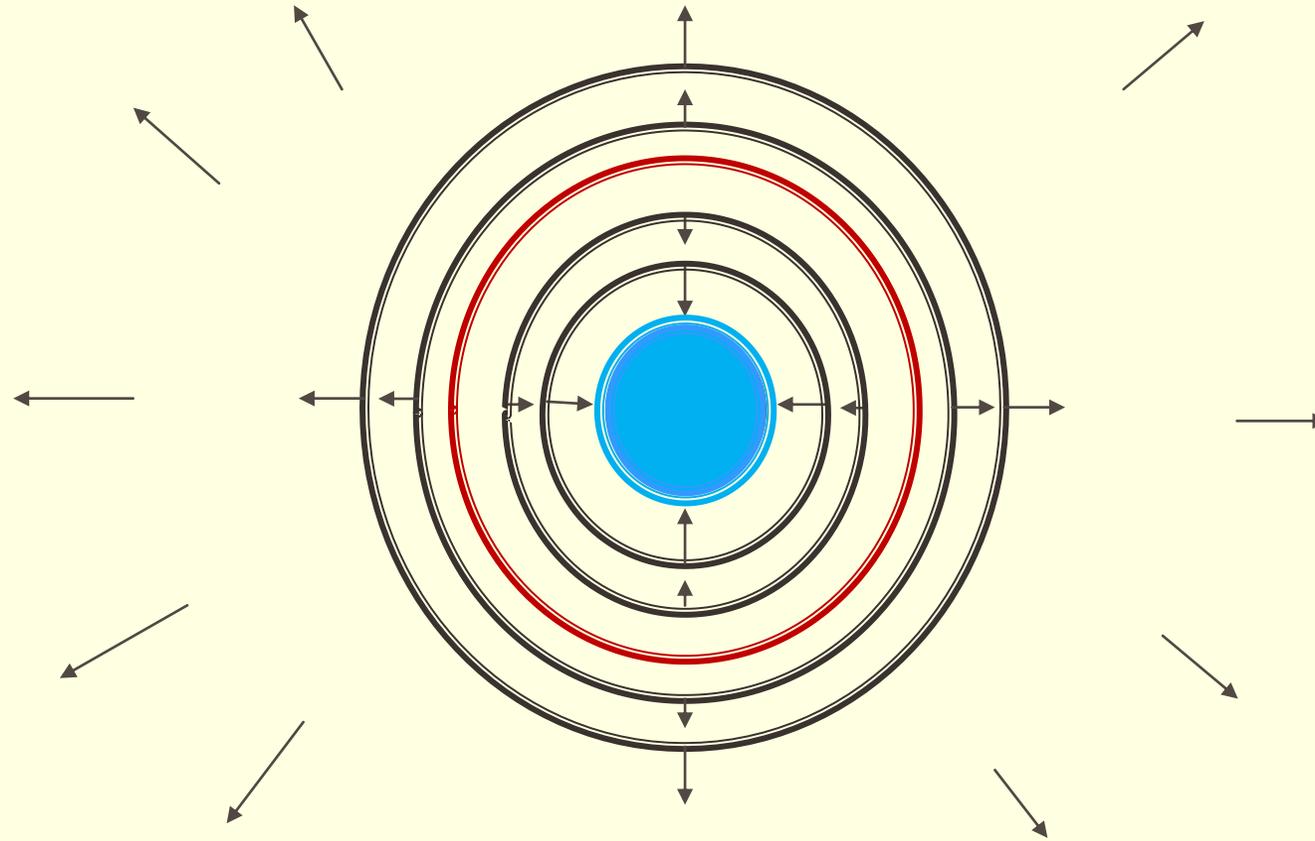


Outline



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1. Turnaround density as a probe of dark energy:
 - What is the turnaround density?
 - Spherical collapse insights
 2. The turnaround density in realistic structures: cosmological simulations
 3. Discussion

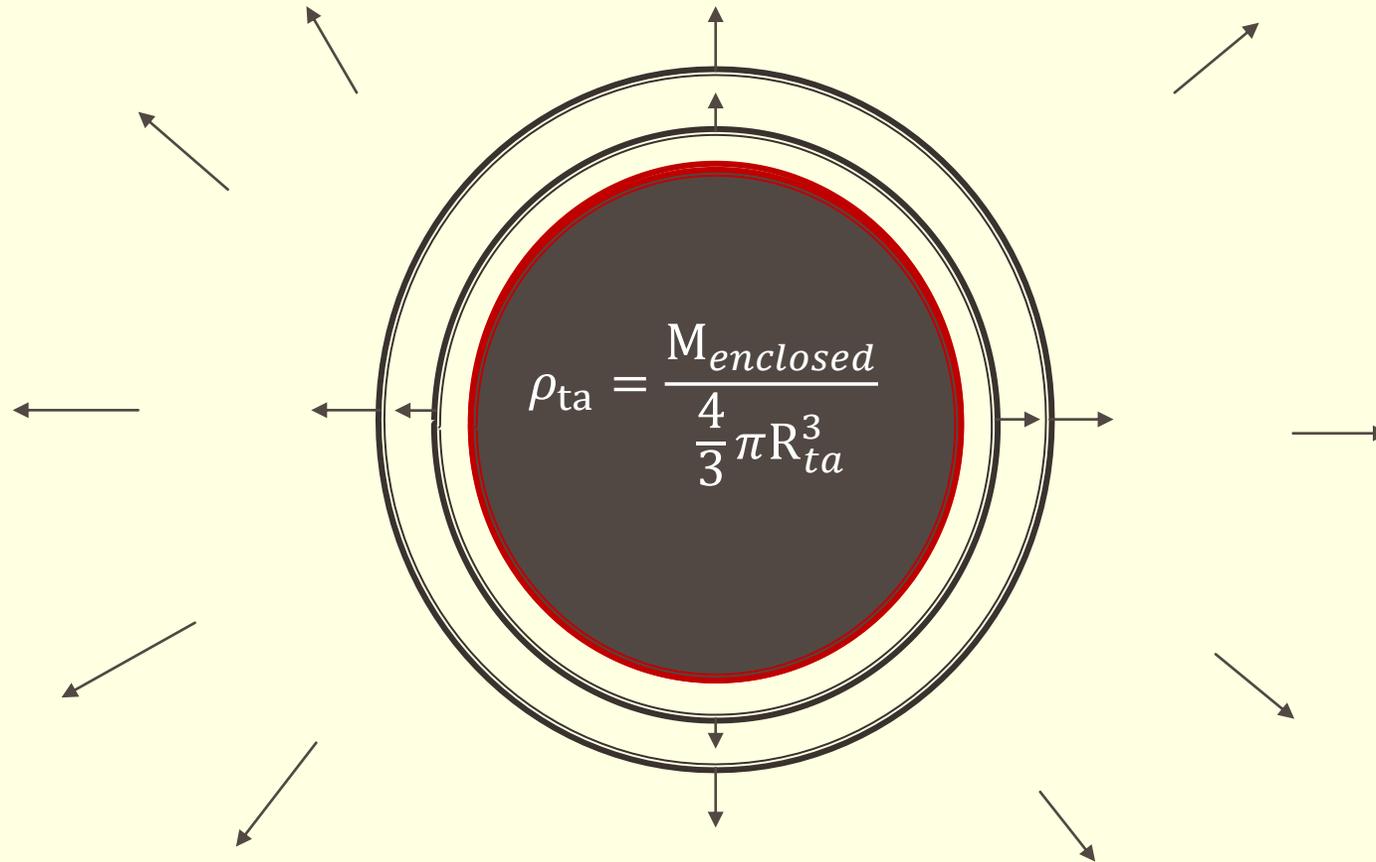
The spherical collapse model



There are two phases in this scheme:

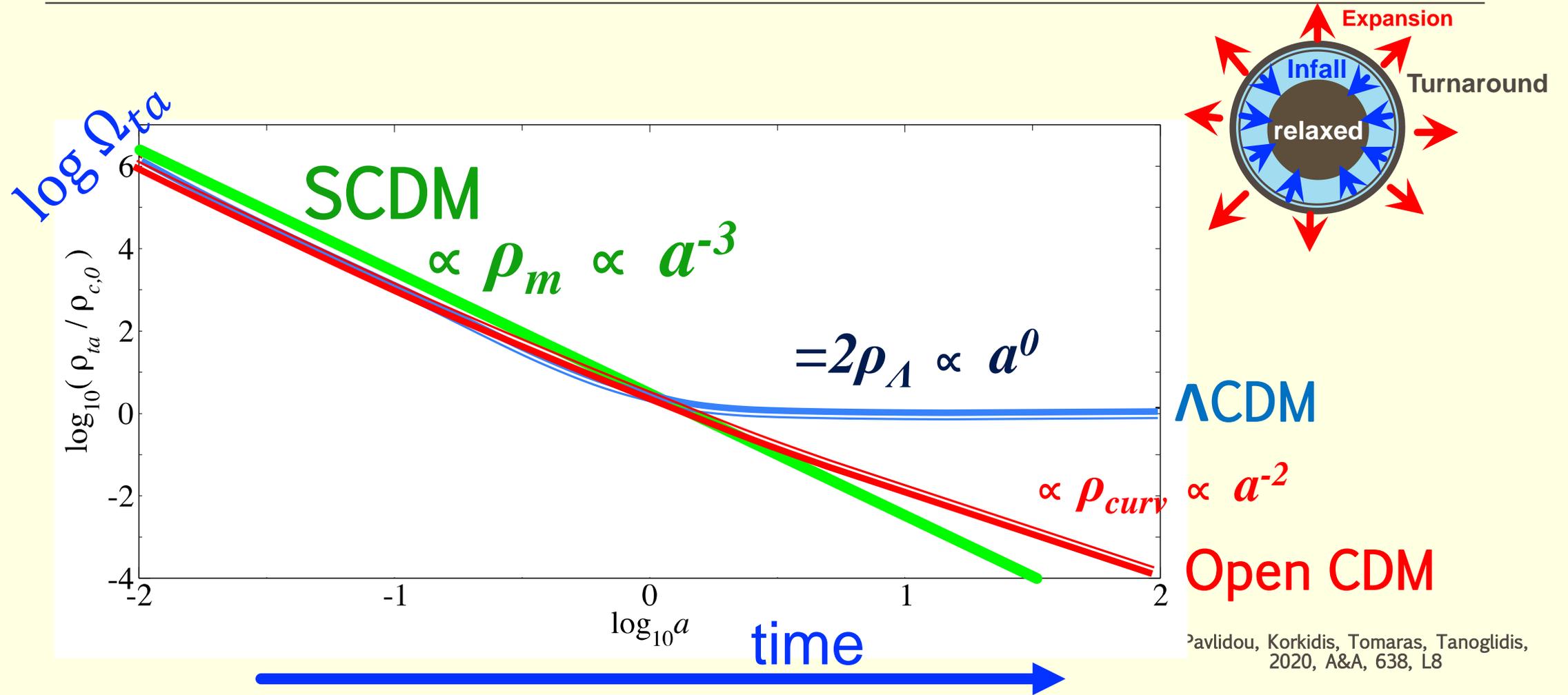
- Turnaround
- Virialization !

Turnaround under spherical symmetry

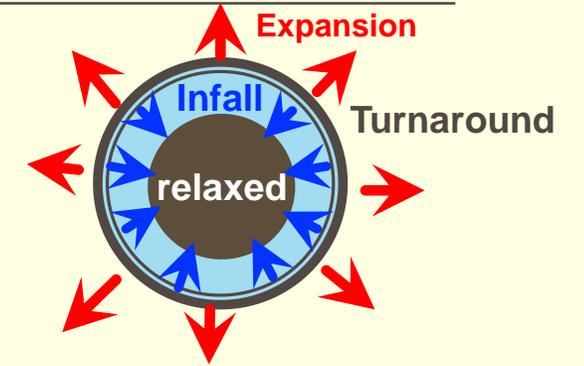
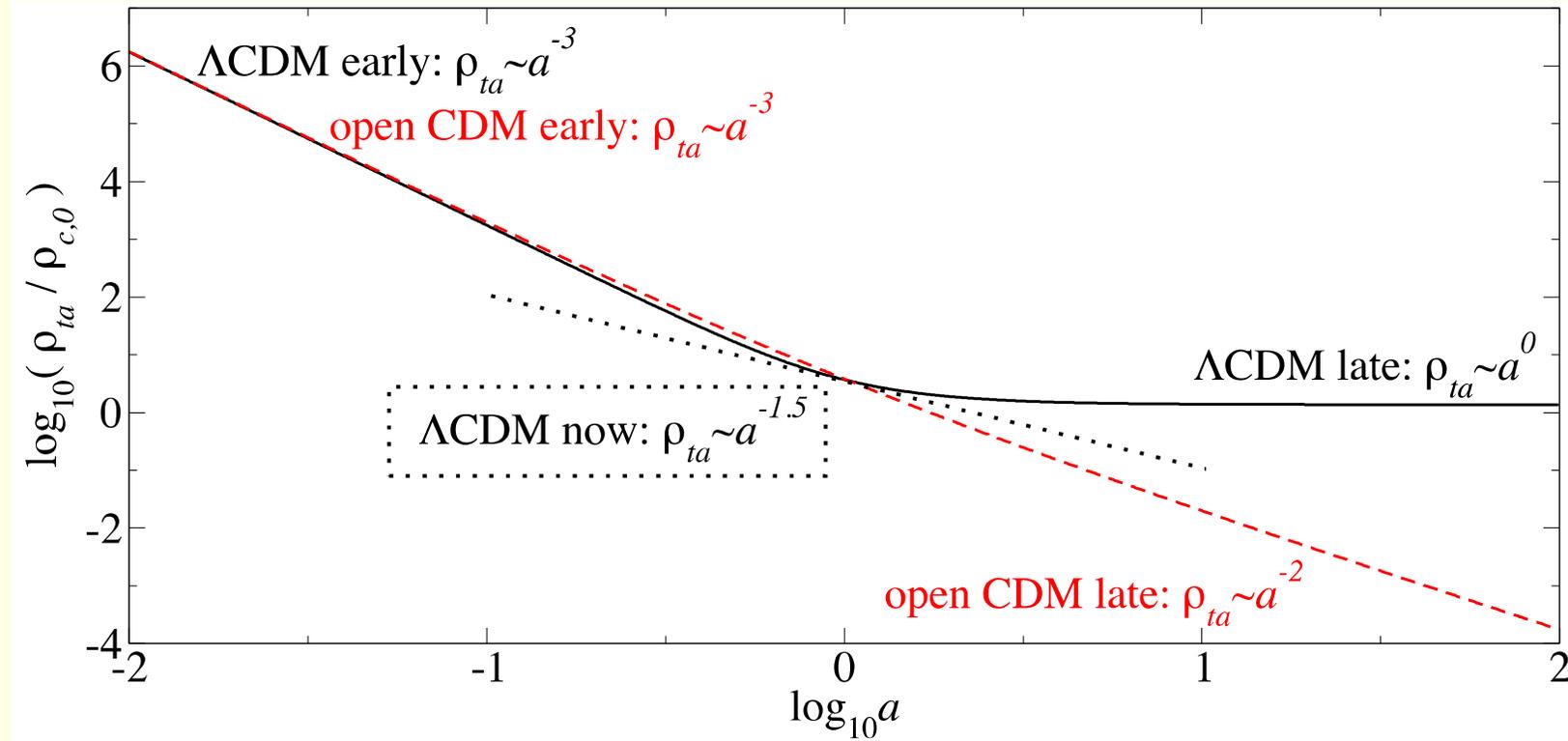


The "turnaround density", ρ_{ta} , is the same for structures of all masses at a given cosmic epoch.

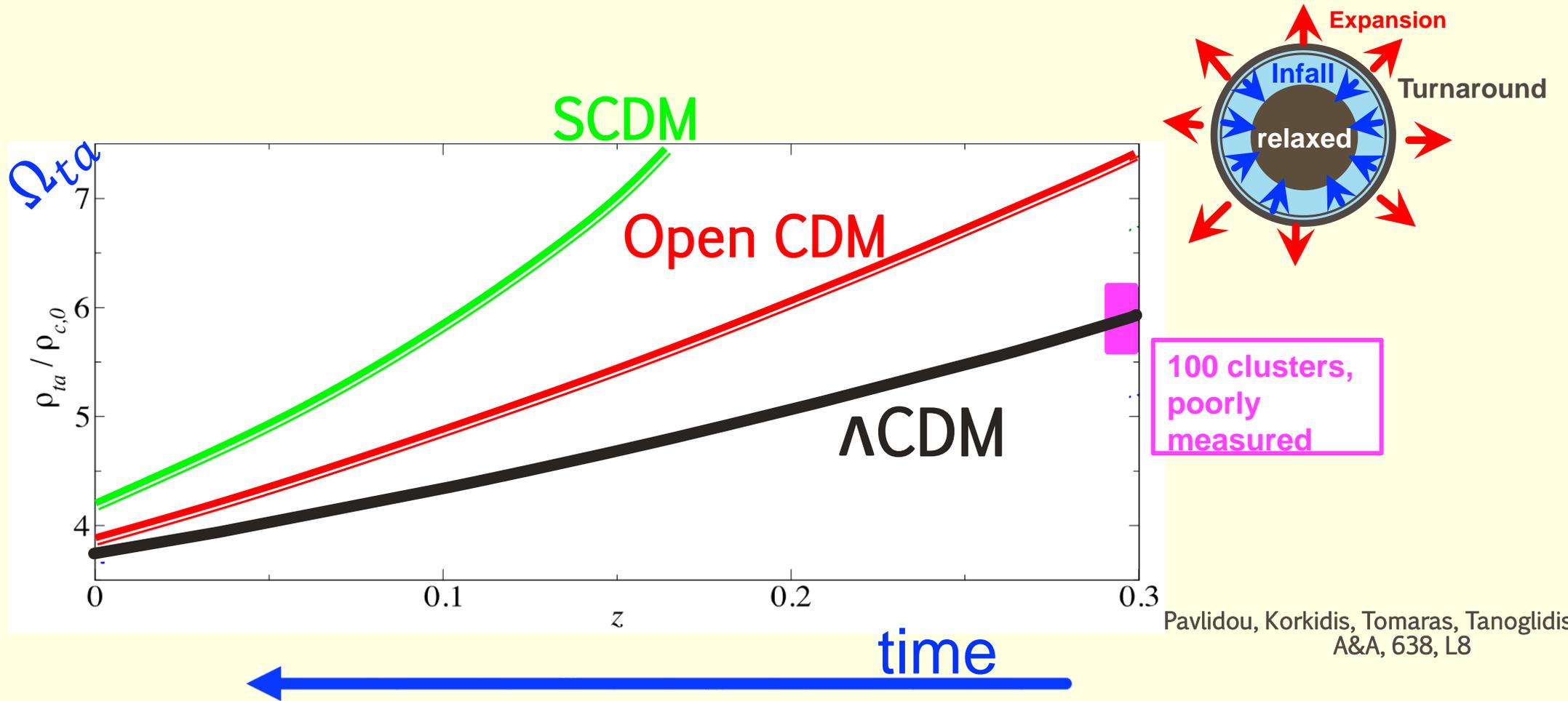
Turnaround under spherical symmetry



Turnaround under spherical symmetry

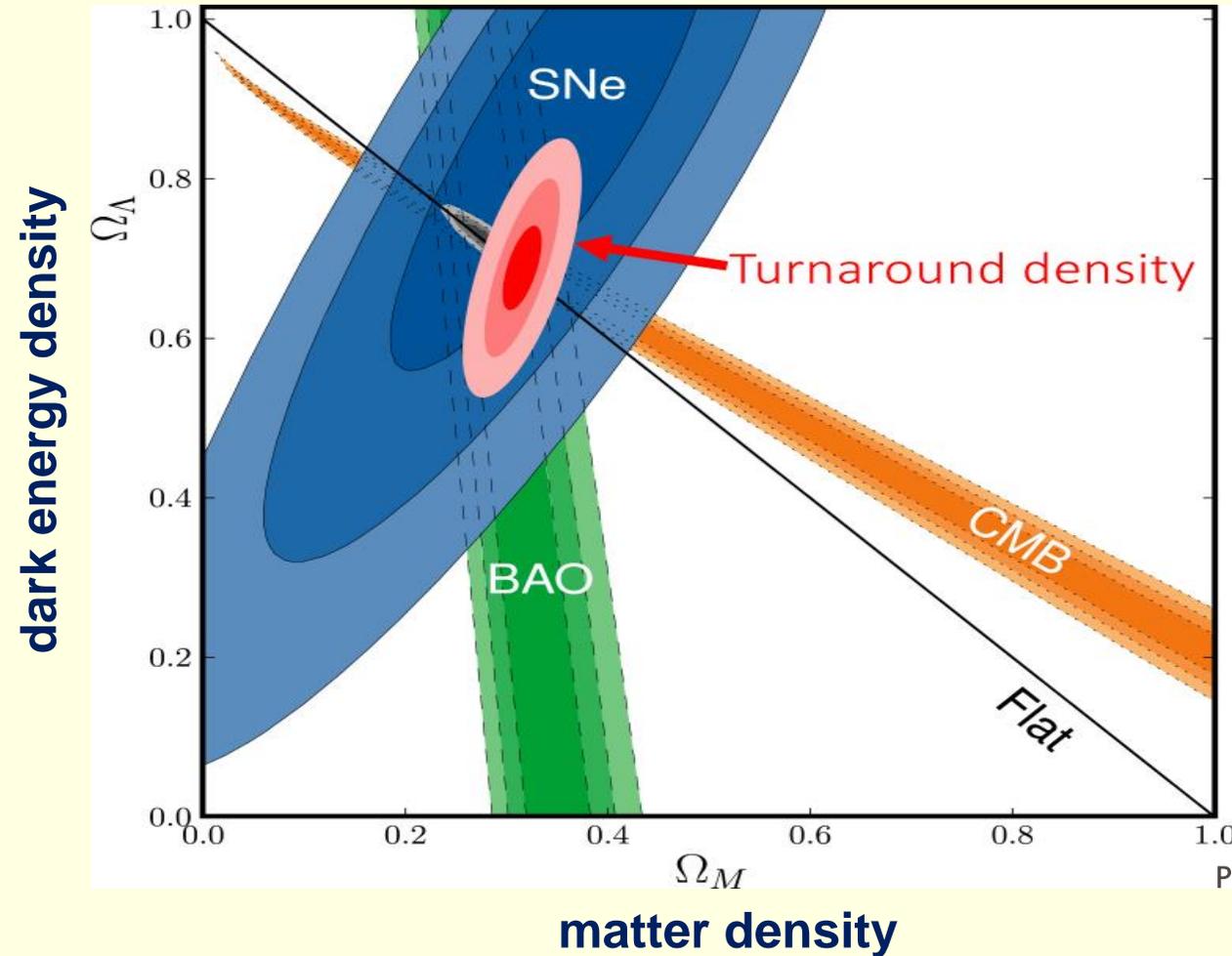


Turnaround under spherical symmetry

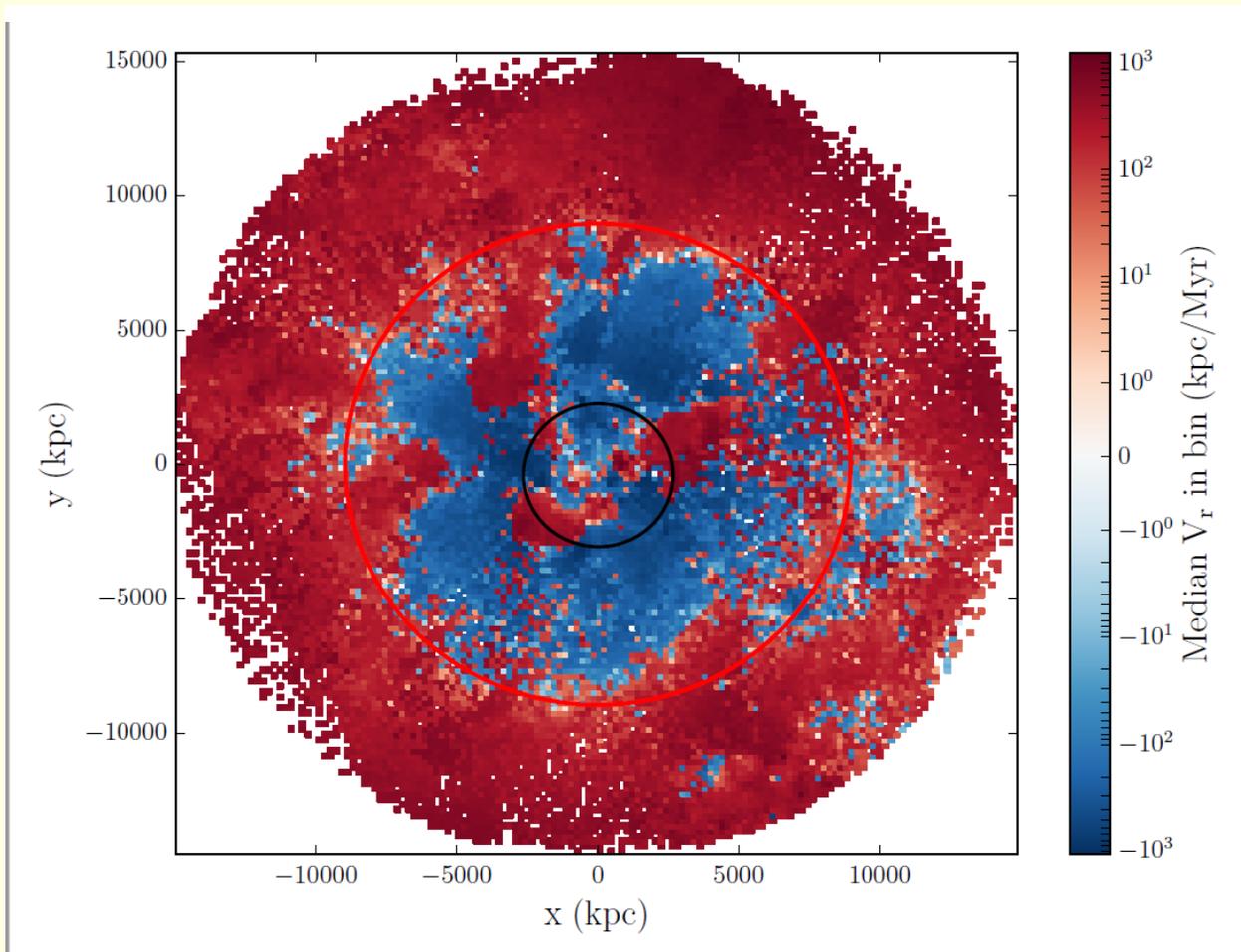


Pavlidou, Korkidis, Tomaras, Tanoglidis, 2020, A&A, 638, L8

Turnaround under spherical symmetry



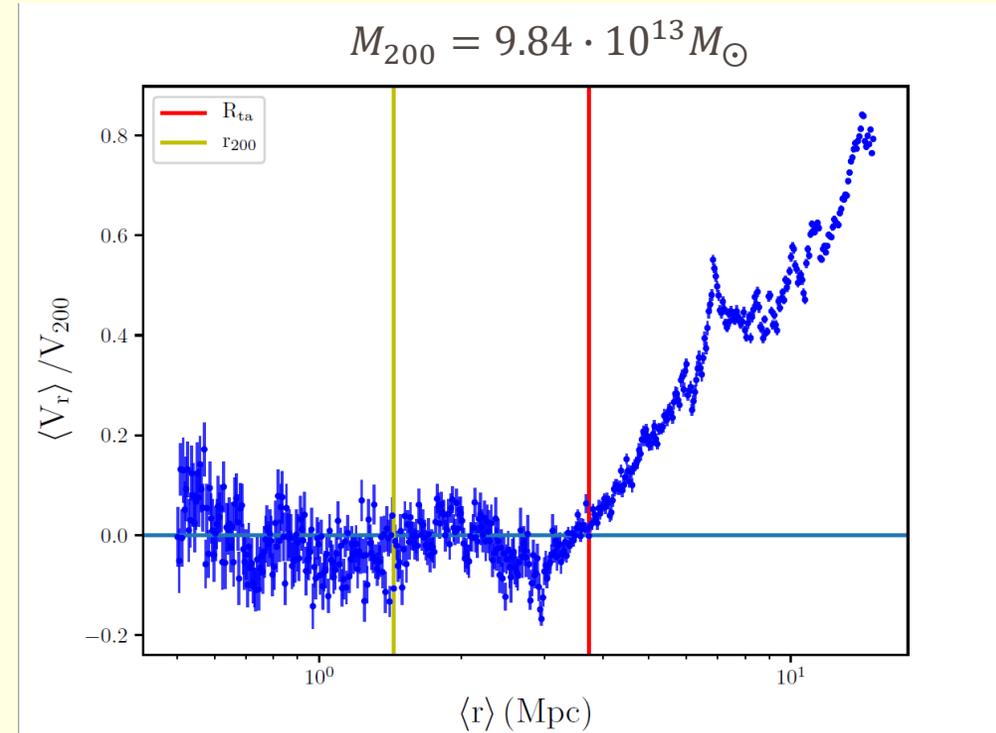
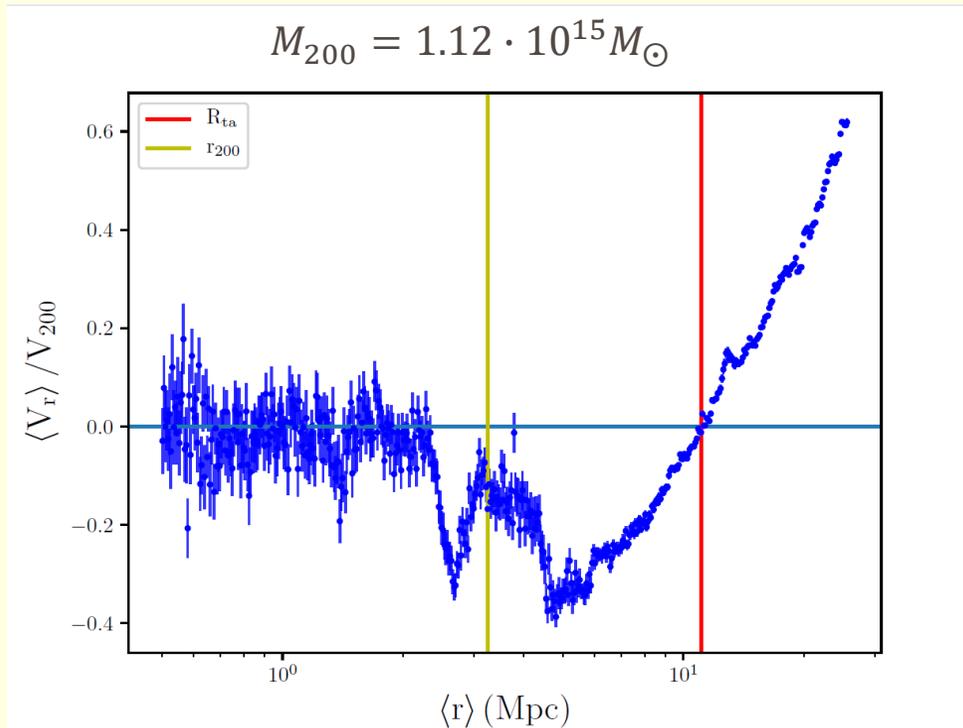
The Turnaround density in the presence of full 3D effects: cosmological simulations



1. Can a single Turnaround radius meaningfully characterize a realistic 3D structure?
2. Is ρ_{ta} a universal quantity of realistic clusters?
3. Does ρ_{ta} probe cosmology in simulations?

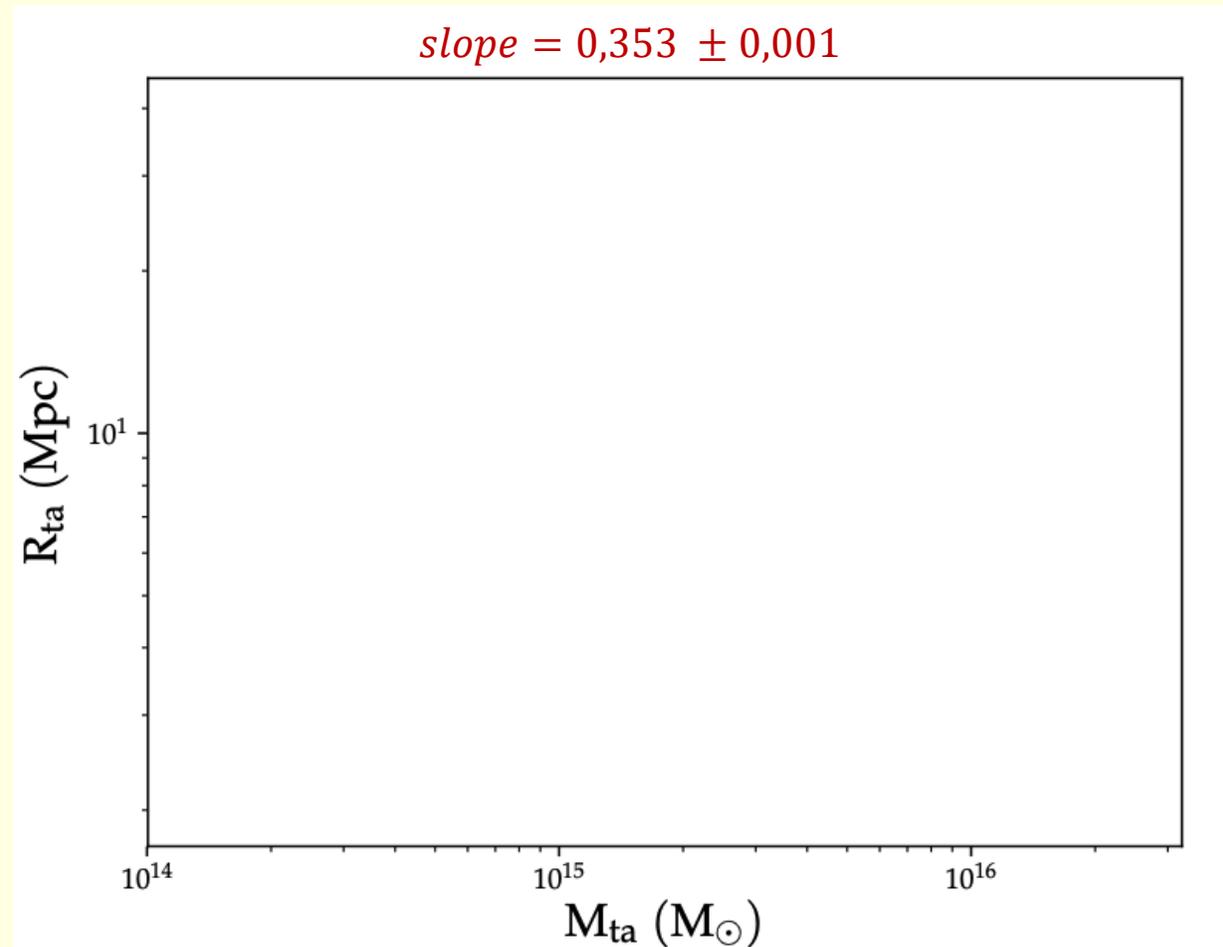
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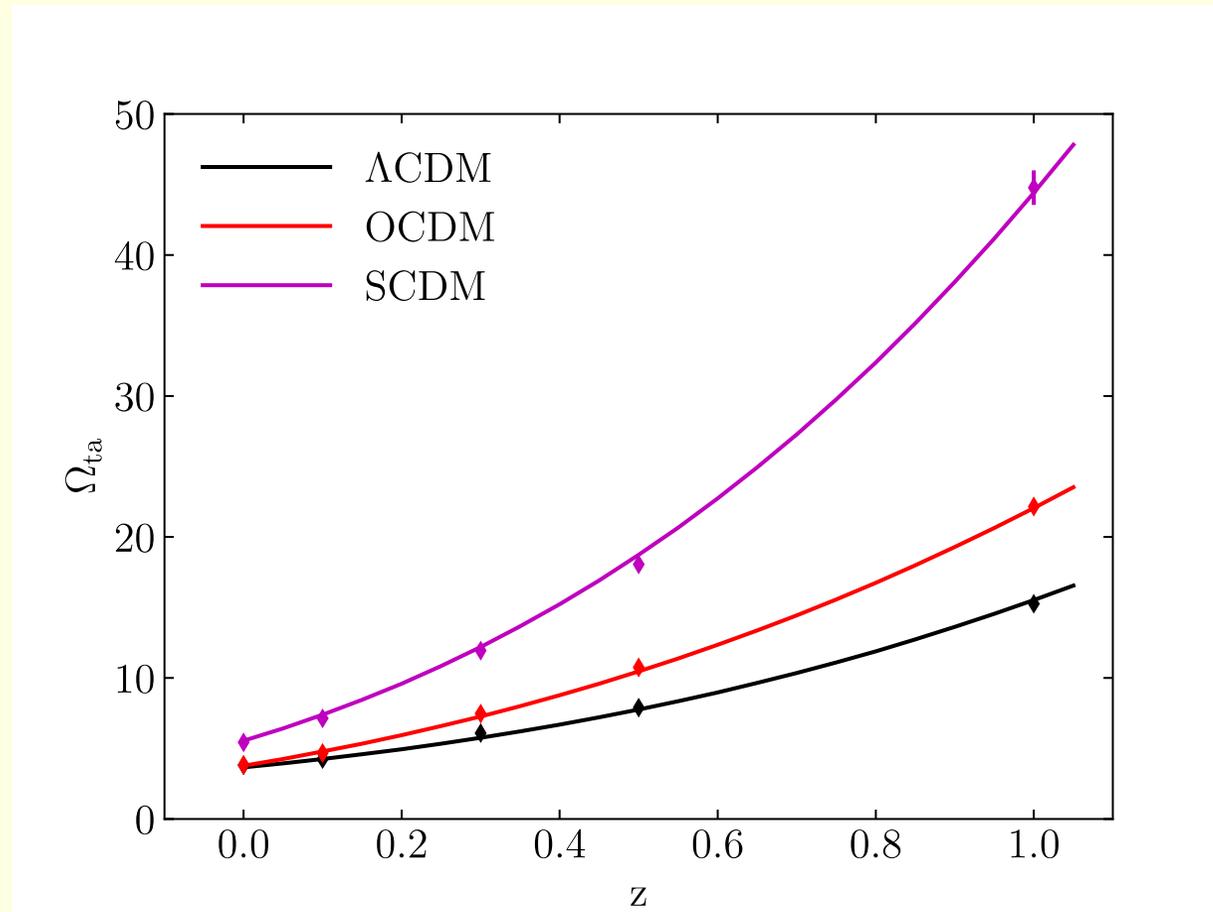
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The Turnaround density in the presence of full 3D effects: cosmological simulations

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Recap

- The average matter density within the turnaround radius of a cluster is universal
- It does depend on z and cosmology
- These predictions is consistent for realistic simulated structures
- Some of the virtues of turnaround: sensitive to Λ , cluster-scale

Thank you