VANDERBILT UNIVERSITY

Can Skewness and Kurtosis Measurements on Large-scale Structure Detect Primordial Non-Gaussianity?

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Skewness and Kurtosis

$$S_3 = \frac{\langle \delta^3 \rangle}{\langle \delta^2 \rangle^2}$$

$$S_4 = \frac{\langle \delta^4 \rangle - 3\langle \delta^2 \rangle^2}{\langle \delta^2 \rangle^3}$$

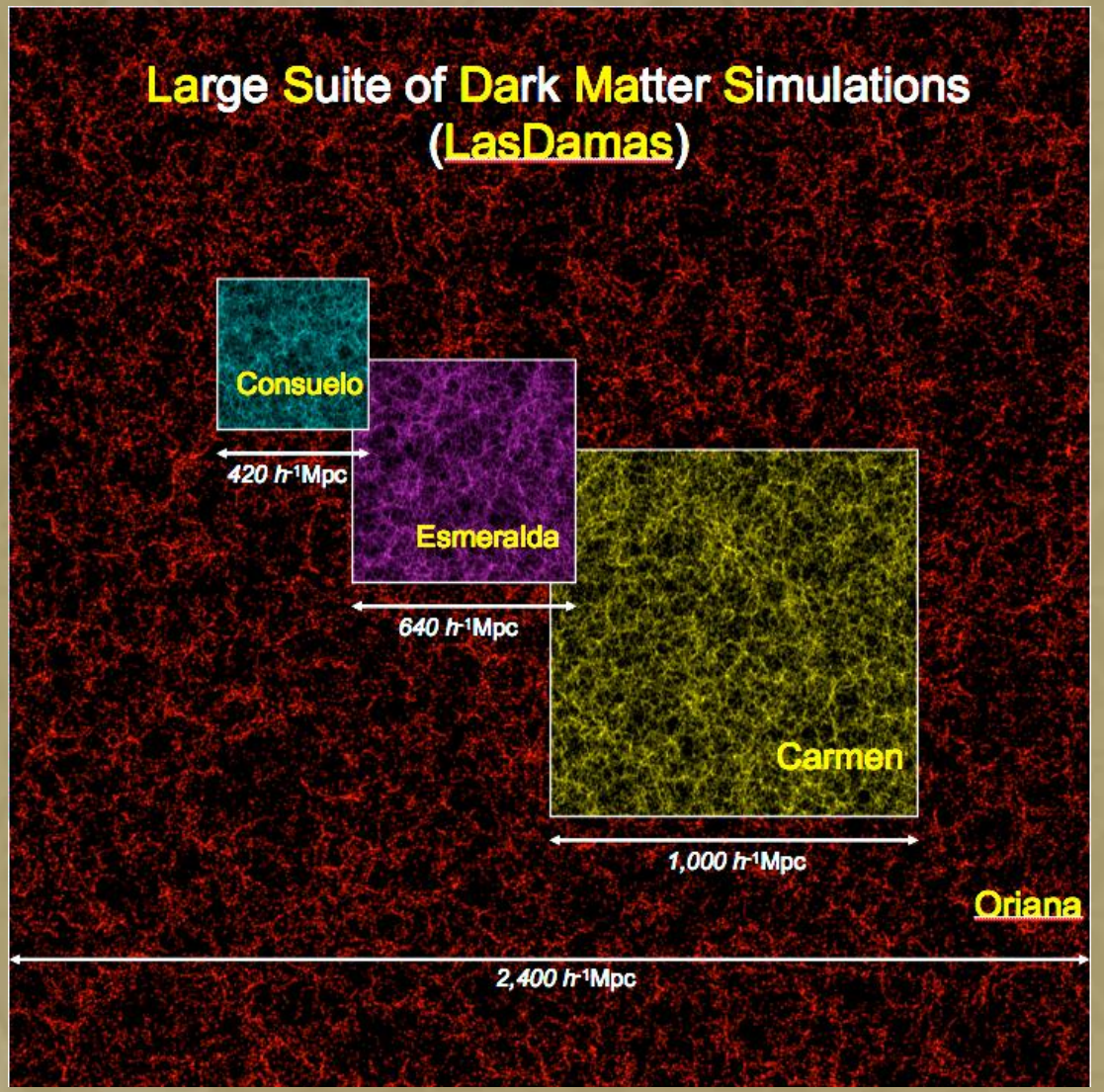
N-body Simulations

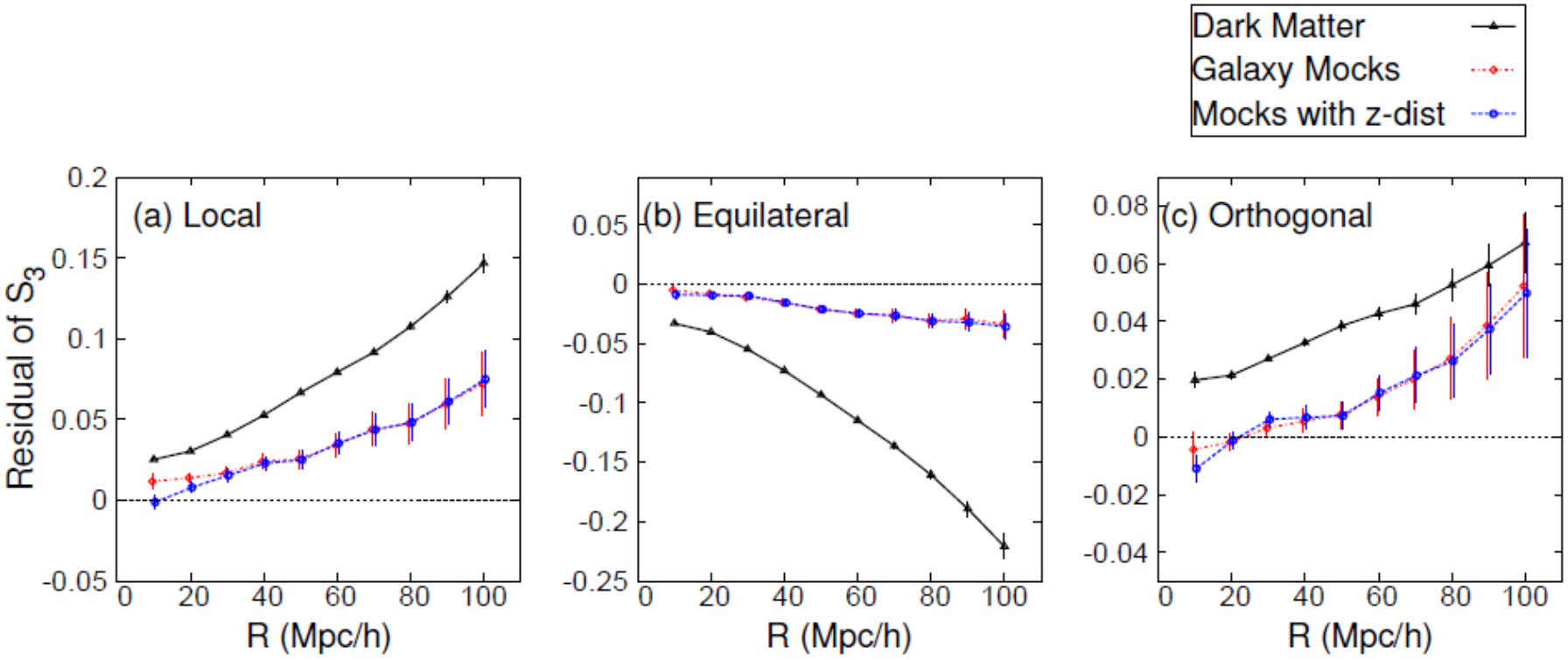
Three models:

- **Local (f_{nl}=100)**
- **Equilateral**
- **Orthogonal**

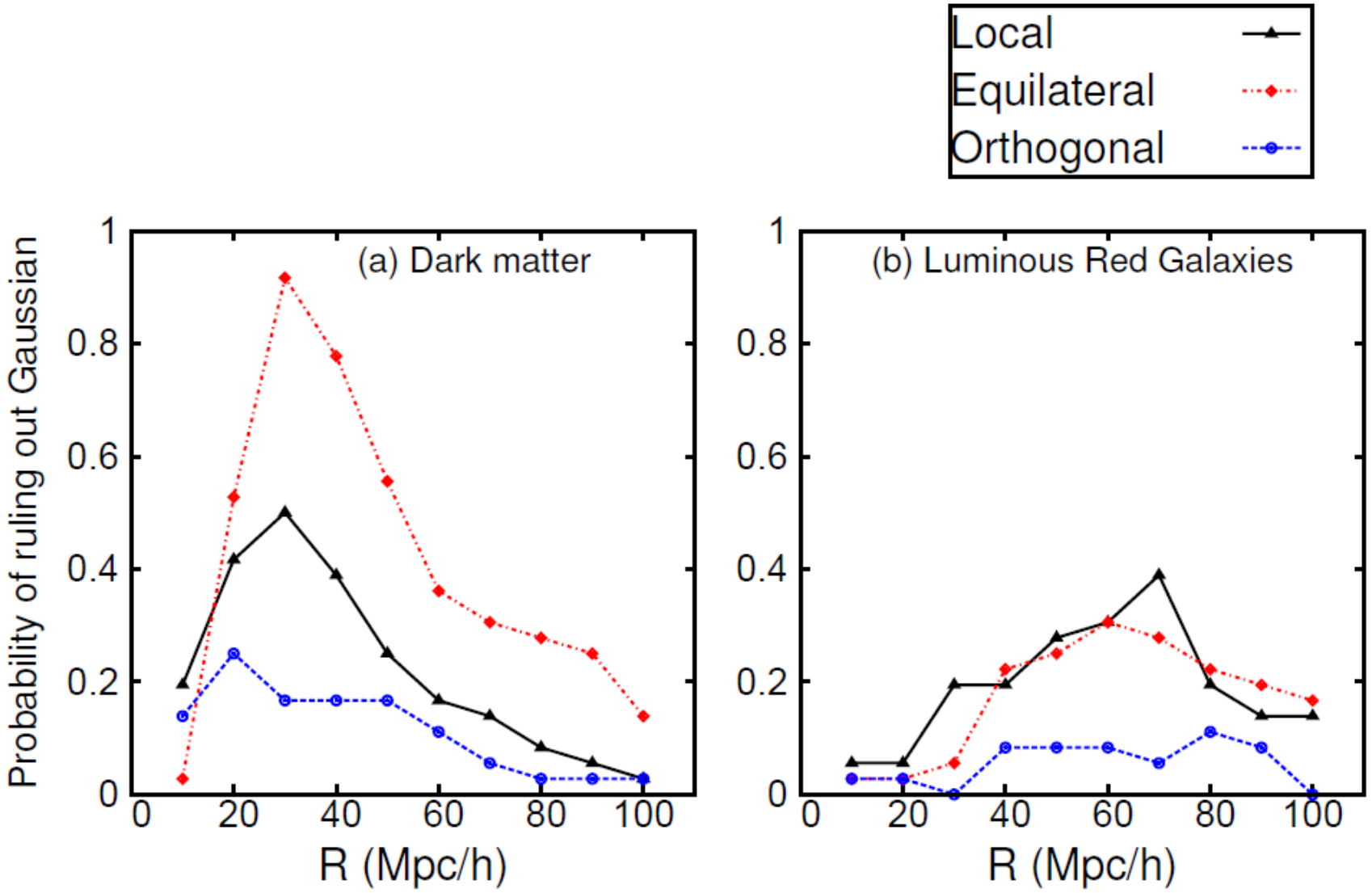
Compare to

- Gaussian





$$Residual = \frac{S_{Non-Gaussian} - S_{Gaussian}}{S_{Gaussian}}$$


Local
Equilateral
Orthogonal
(a) Dark matter
(b) Luminous Red Galaxies
Probability of ruling out Gaussian
R (Mpc/h)
R (Mpc/h)
0
0.2
0.4
0.6
0.8
1
0
20
40
60
80
100

Summary

- **Redshift distortions do NOT affect the chance of detecting Non-Gaussianity with S_3 and S_4.**
- **There are some preferred scales.**
- **For surveys like BOSS, skewness and kurtosis are NOT sensitive enough.**