Constraints on shear and rotation with massive galaxy clusters

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CosPA2016,Sydney
Nov, 2016

Outline

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- Study how it affects number of massive clusters
- Constrain the cosmological parameters including the shear and rotation parameter using observational data

Evolution of the density contrast

Related equations

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Related equations

- The equations describing the evolution of the density contrast of a fluid

$$\dot{\delta}_{\rm j} + 3H(c^2_{{\rm eff},j} - \bar{w}_{\rm j})\delta_{\rm j} + [1 + \bar{w}_{\rm j} + (1 + c^2_{{\rm eff},j})\delta_j]\vec{\nabla}\cdot\vec{u}_{\rm j} = 0 \quad (1)$$

$$\dot{\vec{u}}_{\rm j} + 2H\vec{u}_{\rm j} + (\vec{u}_{\rm j}\cdot\vec{\nabla}\vec{u}_{\rm j}) + \frac{1}{a^2}\vec{\nabla}\phi = 0 \quad (2)$$

$$\nabla^2\phi - 4\pi G a^2 \sum_{\rm k} \rho_{\rm k}\delta_{\rm k}(1 + 3c^2_{{\rm eff},k}) = 0 \quad (3)$$

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- Add the shear and rotation

$$\dot{\theta} + 2H\theta + \frac{1}{3}\theta^2 + \sigma^2 - \omega^2 + \frac{1}{a^2}\vec{\nabla}^2\phi = 0\ , \quad (4)$$

where θ is divergence of peculiar velocity

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- The shear and rotation tensor are given by

$$\sigma_{ij} = \frac{1}{2}\left(\frac{\partial u^j}{\partial x^i} + \frac{\partial u^i}{\partial x^j}\right) - \frac{1}{3}\theta\delta_{ij} \tag{5}$$

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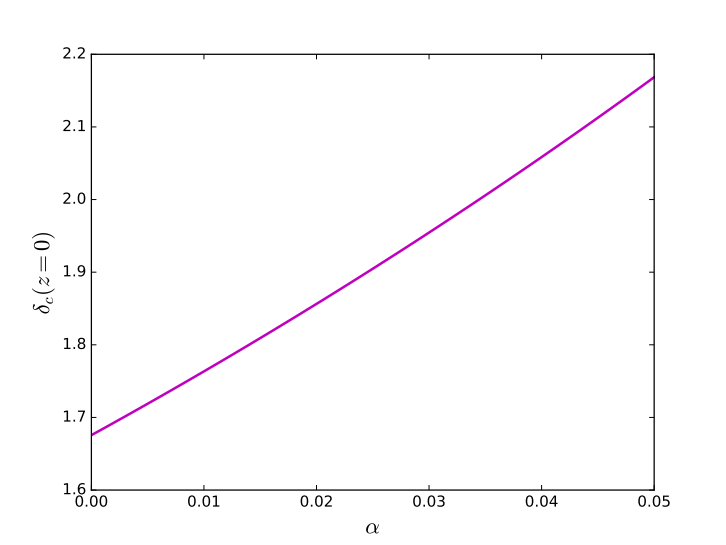

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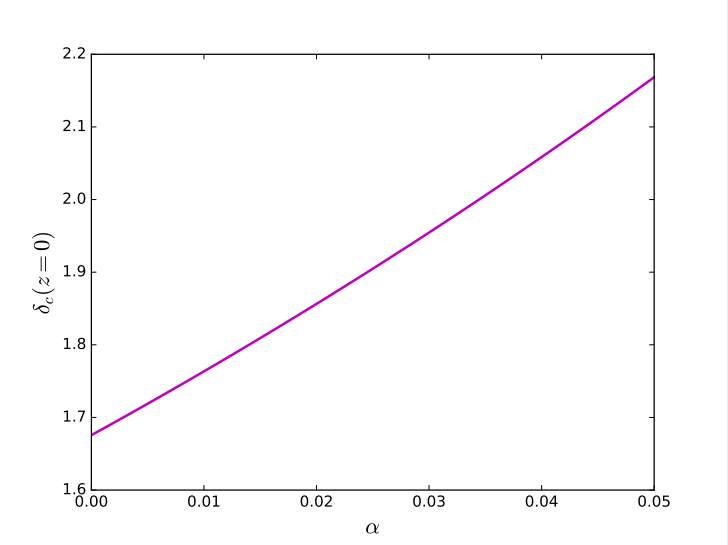

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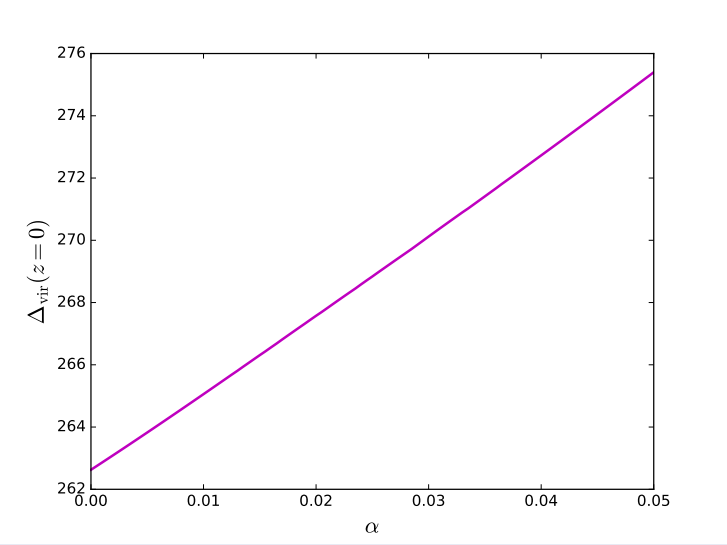

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- The linear matter power spectrum at redshift z

$$P(k,z) = P_0(k)T^2(k)D^2(z) \tag{12}$$

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- We examine a logarithmic relation for $\alpha \quad \Rightarrow \quad \alpha=-\beta\log_{10}\frac{M}{M_s}$

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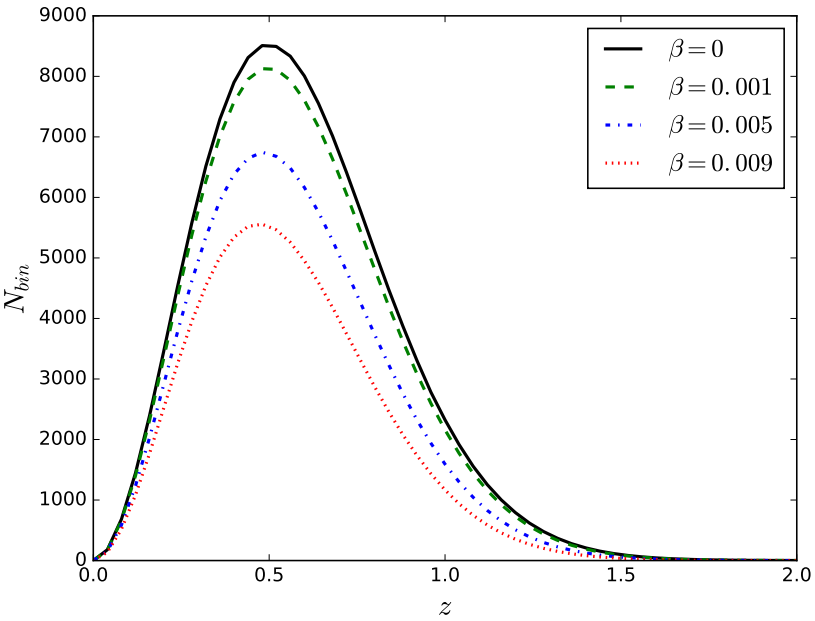

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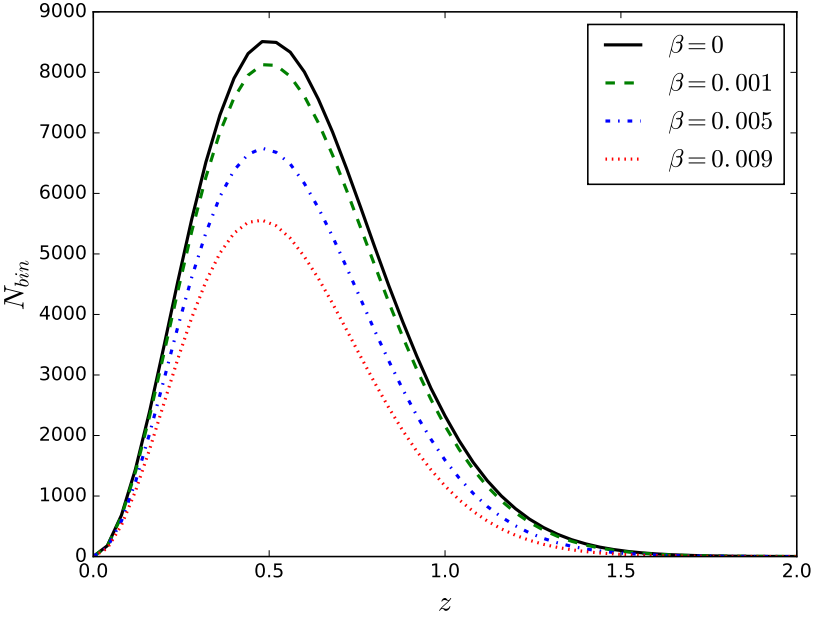
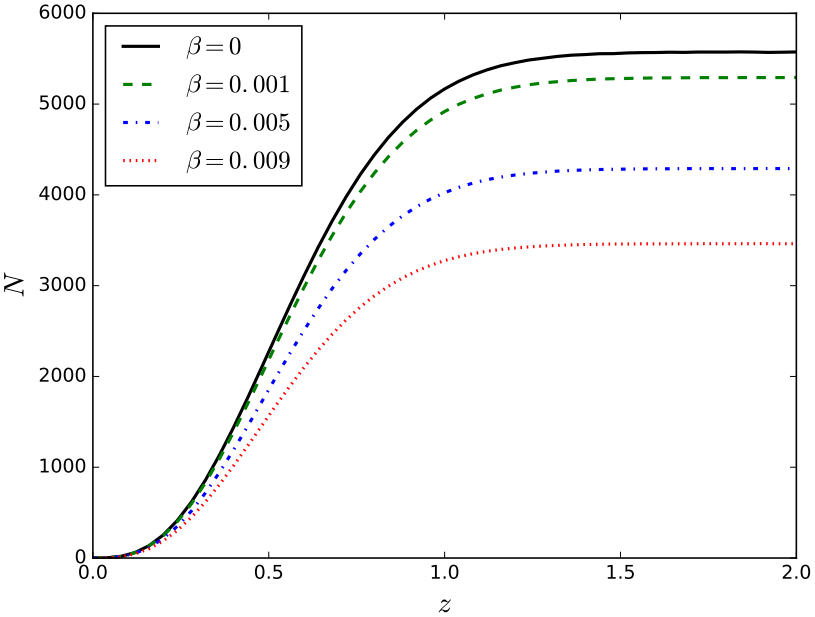


Evolution of the total number counts



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  1. Number of massive clusters collected by (Campanelli et al. 2012)
     The data is number of massive clusters with $M > 8 \times 10^{14} h^{-1} M_{\odot}$ up to redshift 0.9

Results

Summary of results

Parameters	Best fit value	$1-\sigma$	$2-\sigma$	$3-\sigma$
$\Omega_{\rm m}$	0.284	± 0.0064	$^{+0.013}_{-0.012}$	$^{+0.017}_{-0.016}$
h	0.678	± 0.017	$^{+0.032}_{-0.033}$	$^{+0.038}_{-0.043}$
β	0.0019	$^{+0.0008}_{-0.0015}$	< 0.0043	< 0.0054

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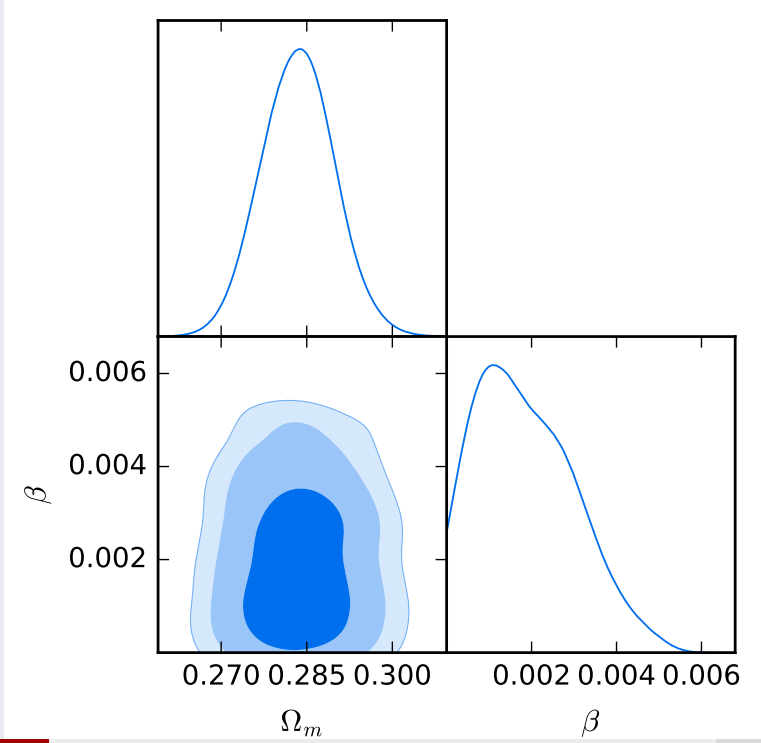

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Thanks for your attention