Is the 2MASS dipole convergent?

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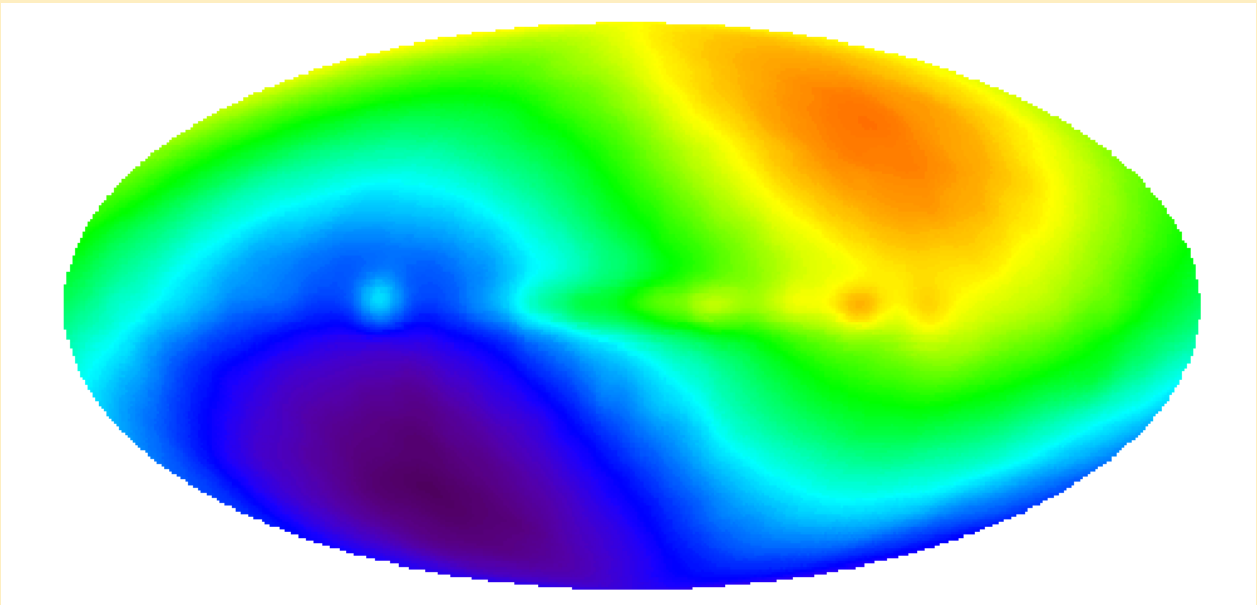
The β parameter

- Comparison of the Local Group (LG) velocity with its acceleration allows, within linear theory, to calculate $\beta \equiv \Omega_{\rm m}^{0.55}/b$:

$$\boldsymbol{v}_{\rm LG} \propto \beta\, \boldsymbol{g}_{\rm LG}$$

- The velocity of the LG known from the CMB dipole,

$$v_{\rm LG} = 622 \pm 35\,{\rm km/s} \text{ towards } (l, b) = (272 \pm 3^\circ, 28 \pm 5^\circ)$$



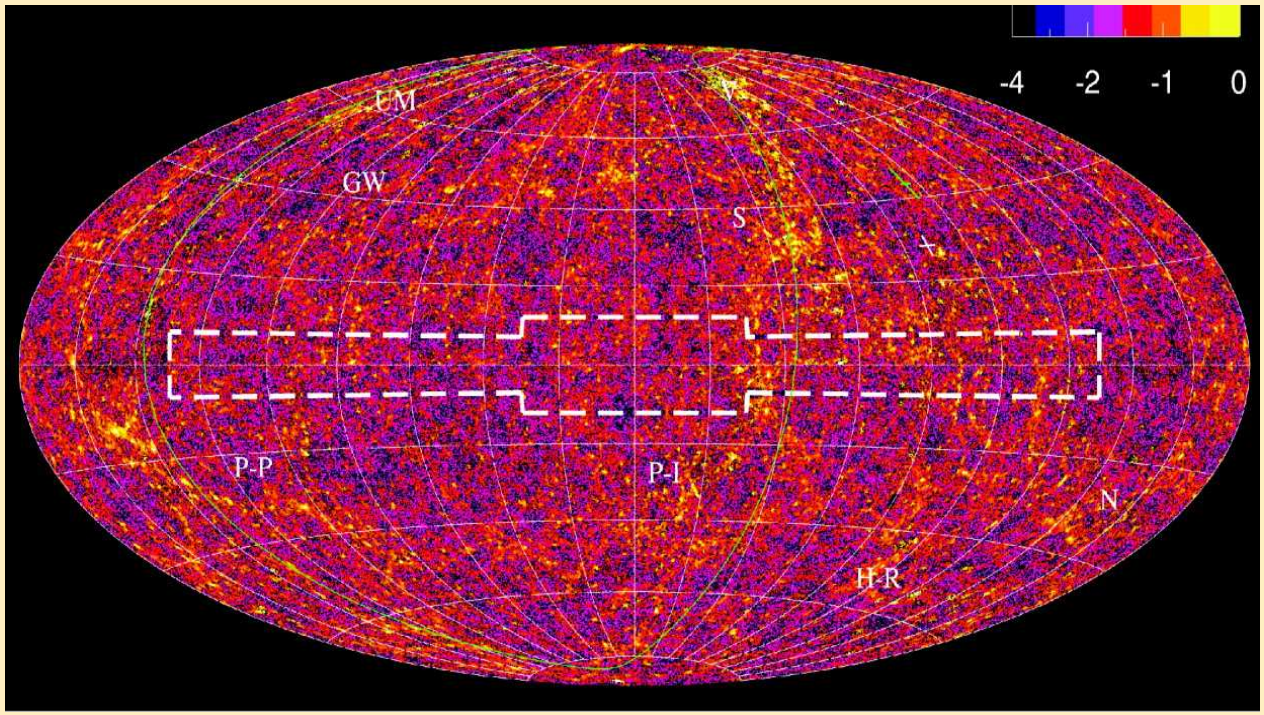
COBE, ©NASA

Dipole of the 2MASS survey

- The acceleration of the LG ('clustering dipole') is estimated from the *2-Micron All-Sky Survey* (**2MASS**):

$$\boldsymbol{g}_{\mathrm{LG}} \sim \rho_{\mathrm{L}}^{-1} \sum_i S_i \hat{\boldsymbol{r}}_i$$

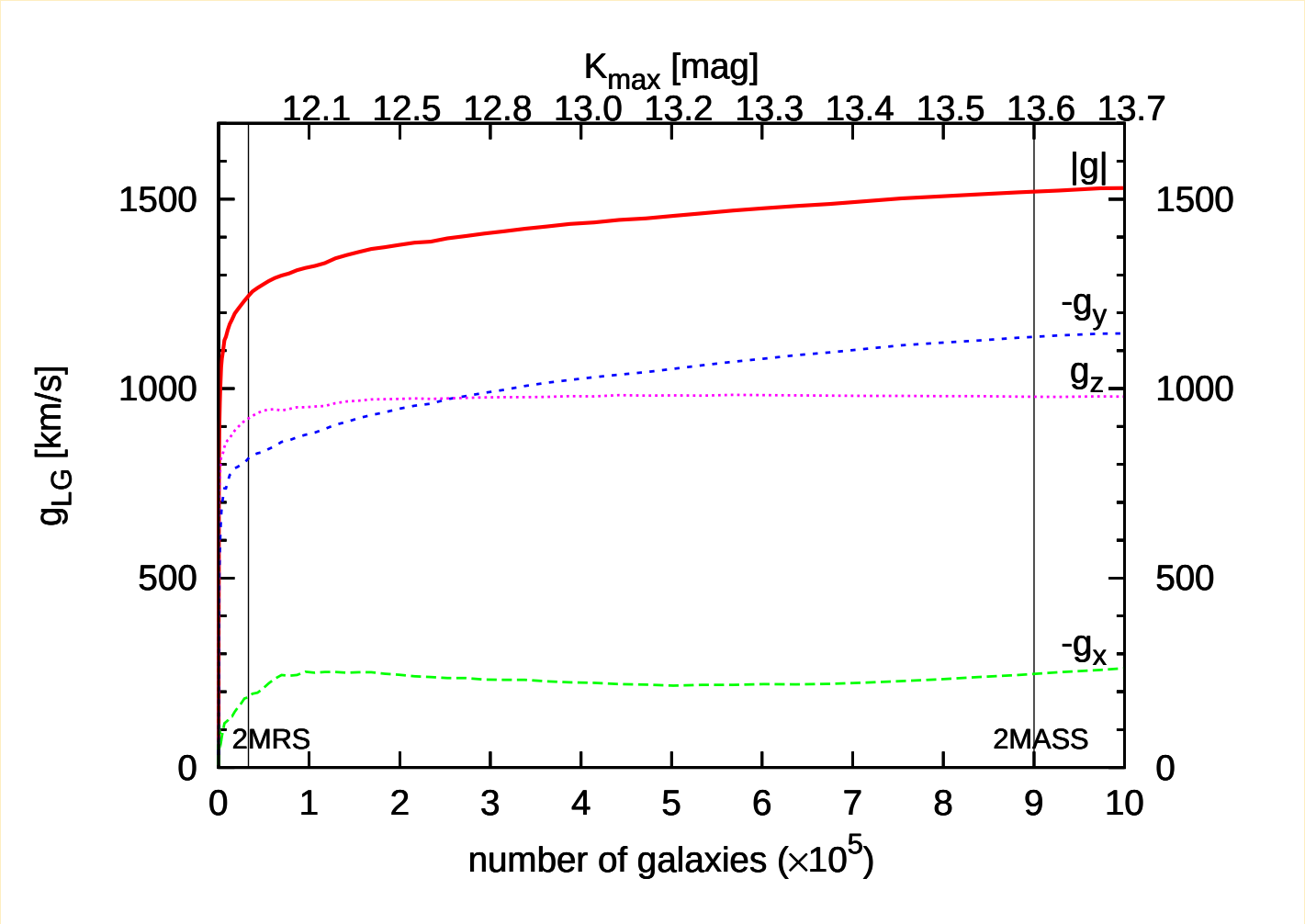
where S_i – observed flux of the i-th galaxy in the K_S band



Maller *et al.* 2003, ApJL

Is the 2MASS dipole convergent?

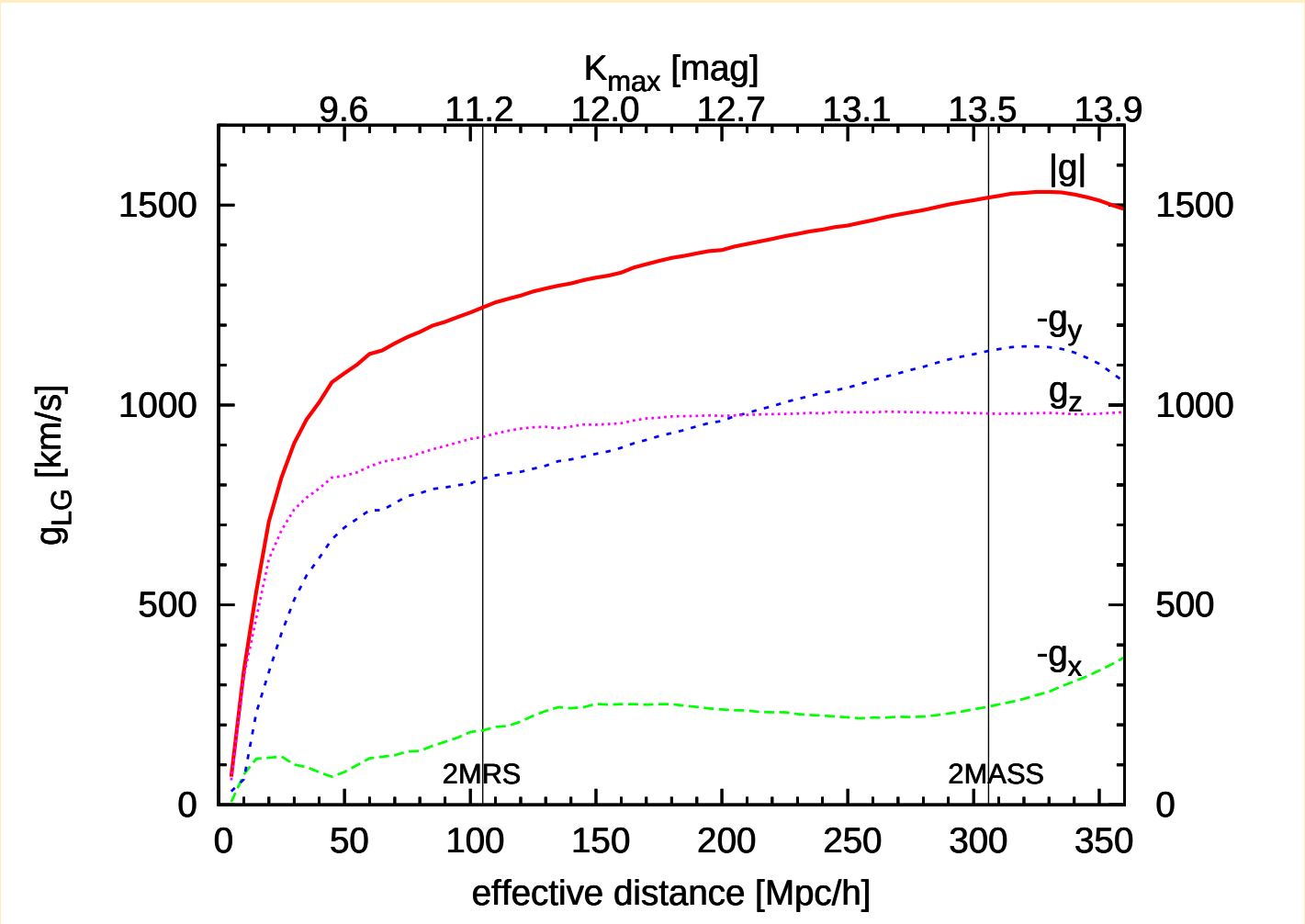
Growth of the 2MASS dipole (1)



(1): as a function of *number of galaxies*

Is the 2MASS dipole convergent?

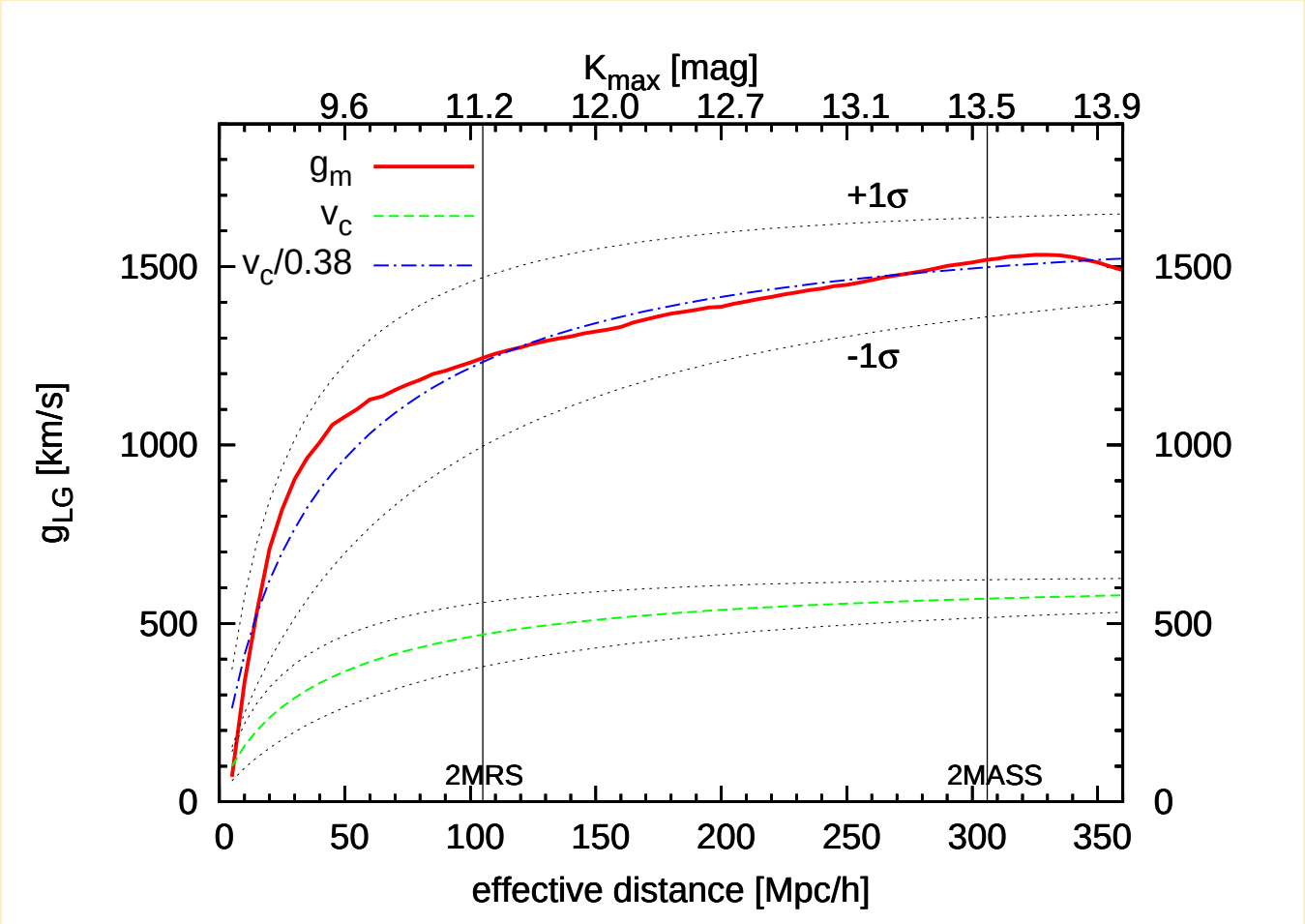
Growth of the 2MASS dipole (2)



(2): as a function of *effective distance*

Is this expected?

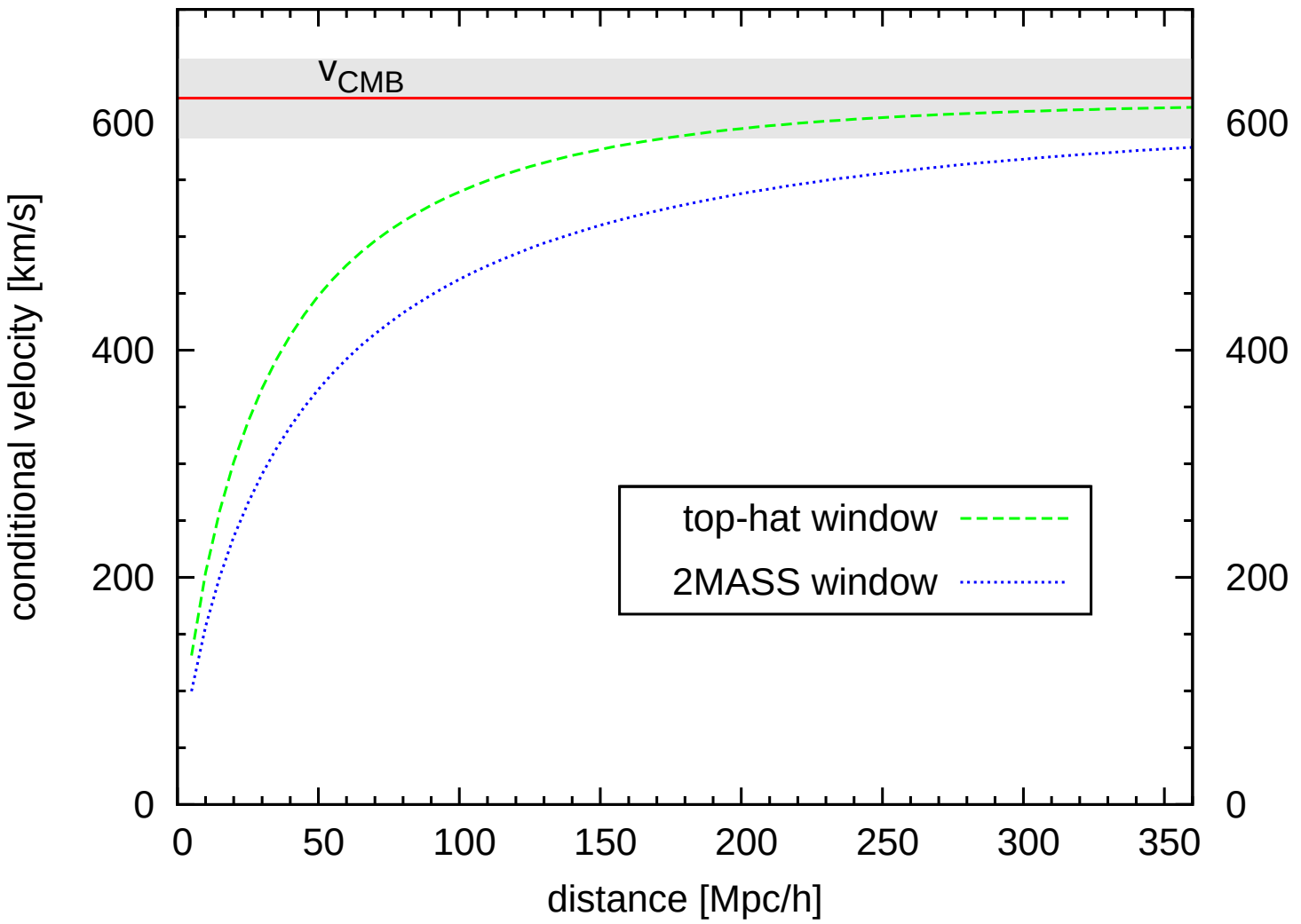
Comparison with theoretical expectations



Conditional mean velocity, v_c (JVW 1990; KL 1990), for Λ-CDM power spectrum and cosmological parameters from 5-year WMAP

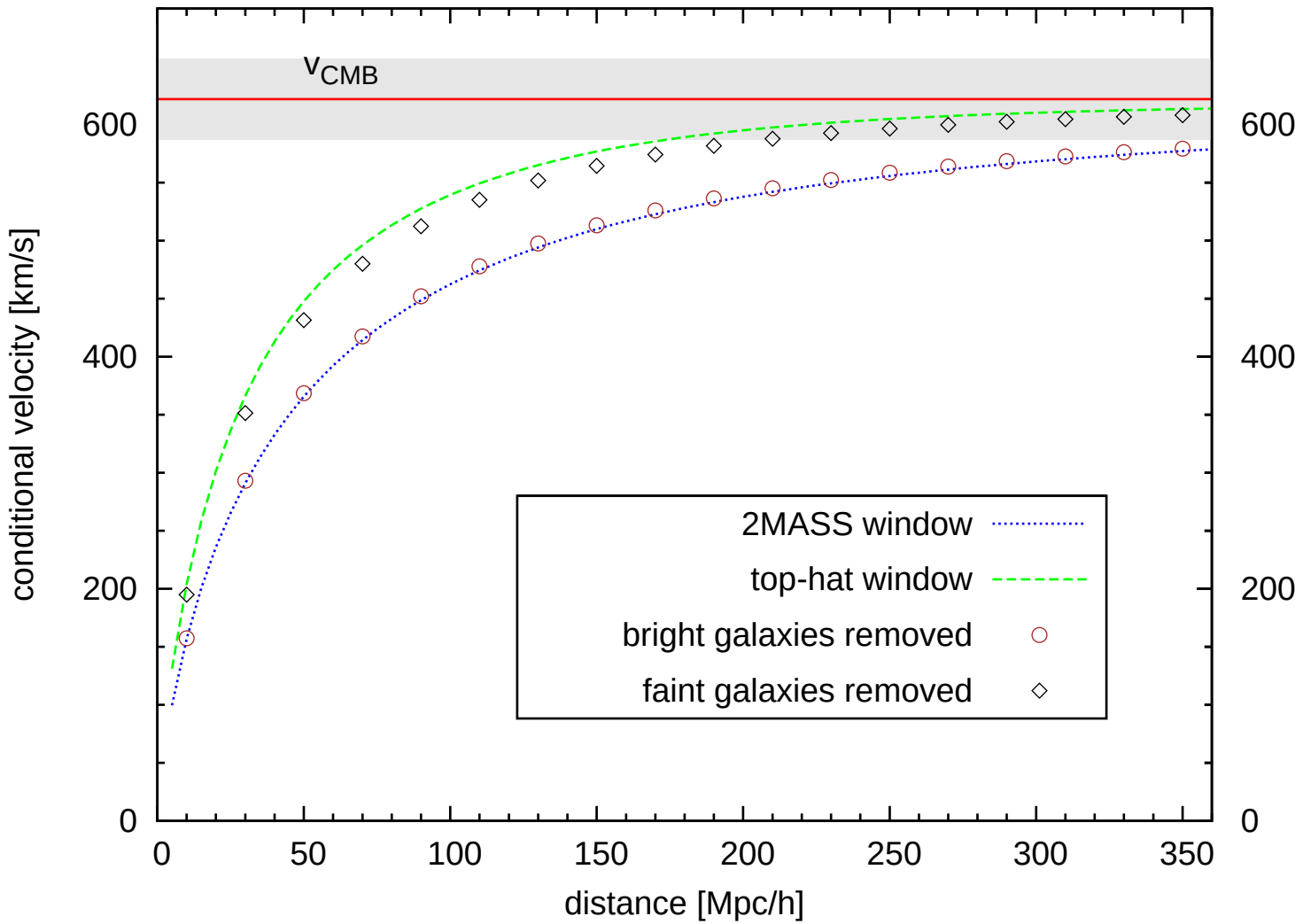
Theoretical expectations

Effect of different observational windows



Theoretical expectations

Whence the difference?



Growth of the 2MASS dipole: results

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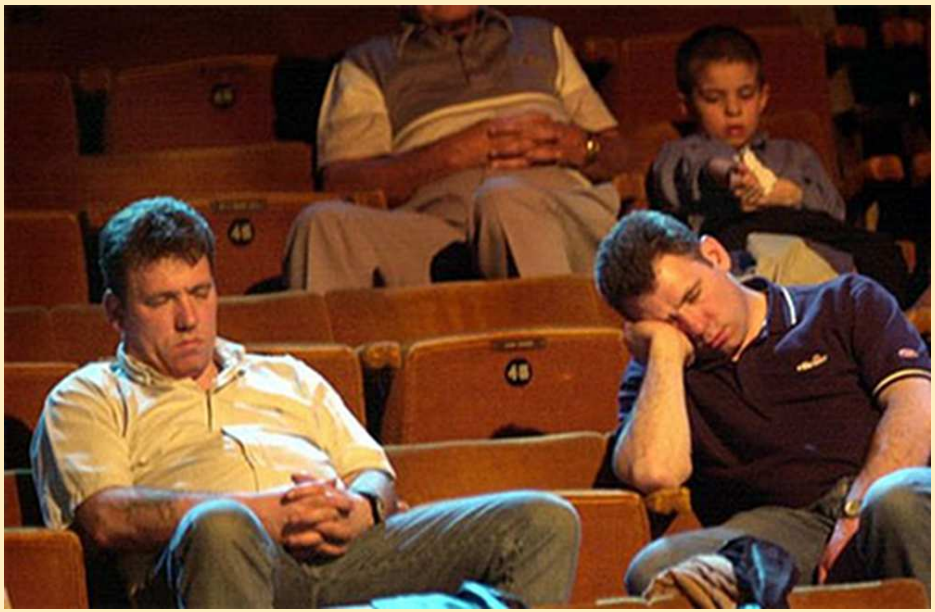
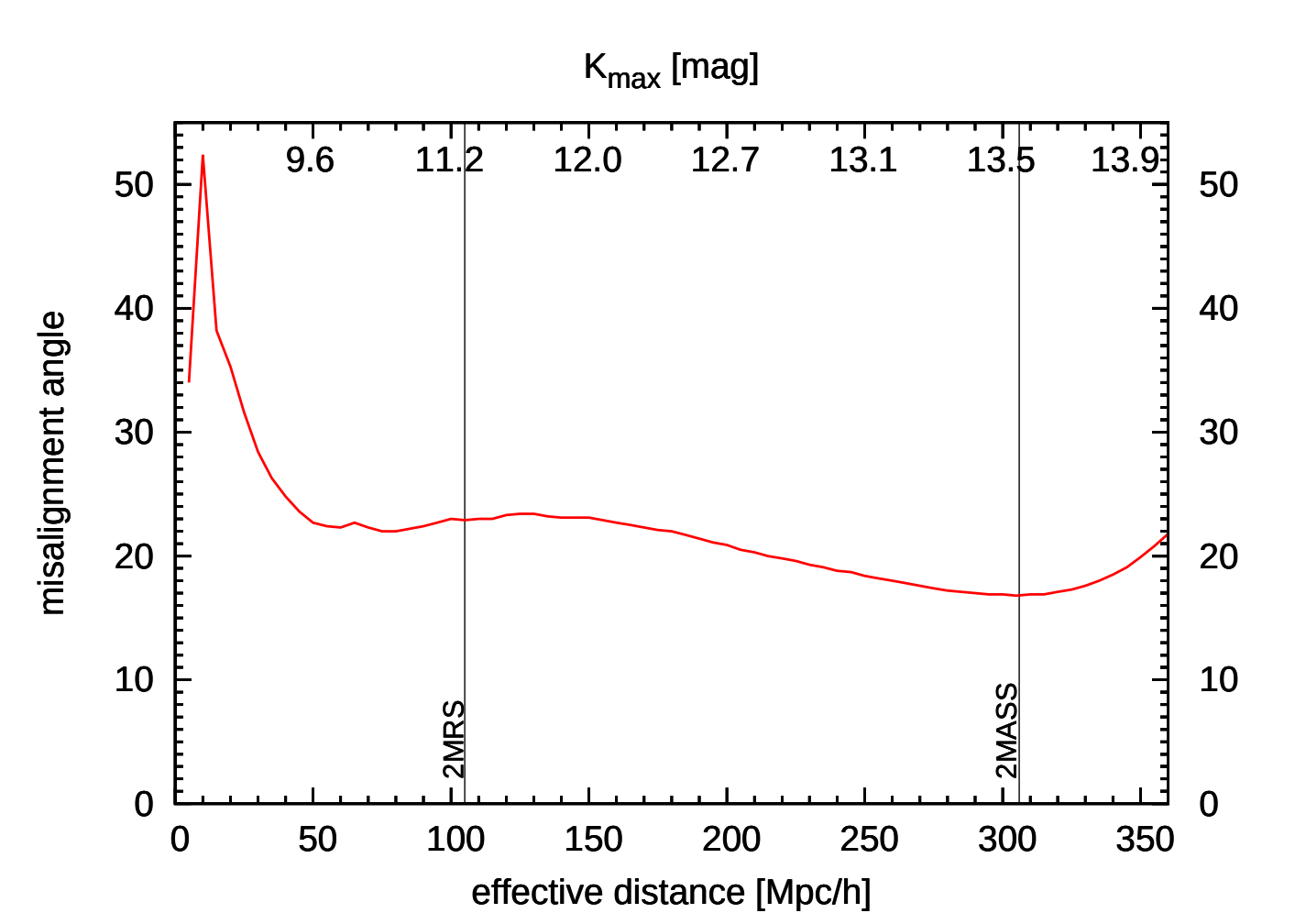
- However, observed growth of the dipole as expected in ΛCDM for the **2MASS** observational window
- A preliminary value of $\beta \equiv \Omega_\mathrm{m}^{0.55}/b$ is about 0.38
- Combined with linear biasing from Maller et al. (2005), $b_K \simeq 1.1 \pm 0.2$, it gives

$$\boldsymbol{\Omega_\mathrm{m} \simeq 0.21 \pm 0.07}$$

Thank you

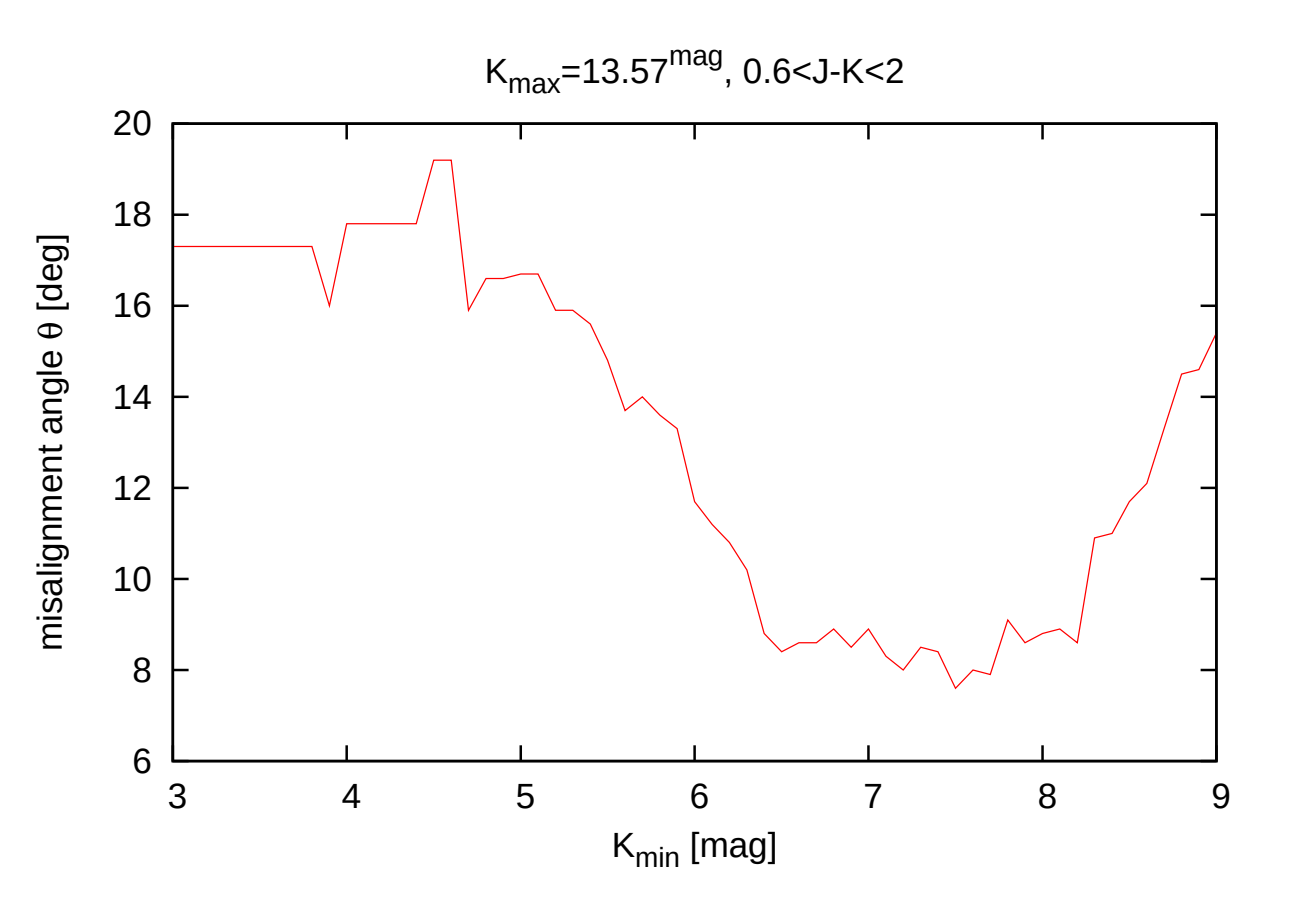


Misalignment angle (1)



(1): as a function of *effective distance*

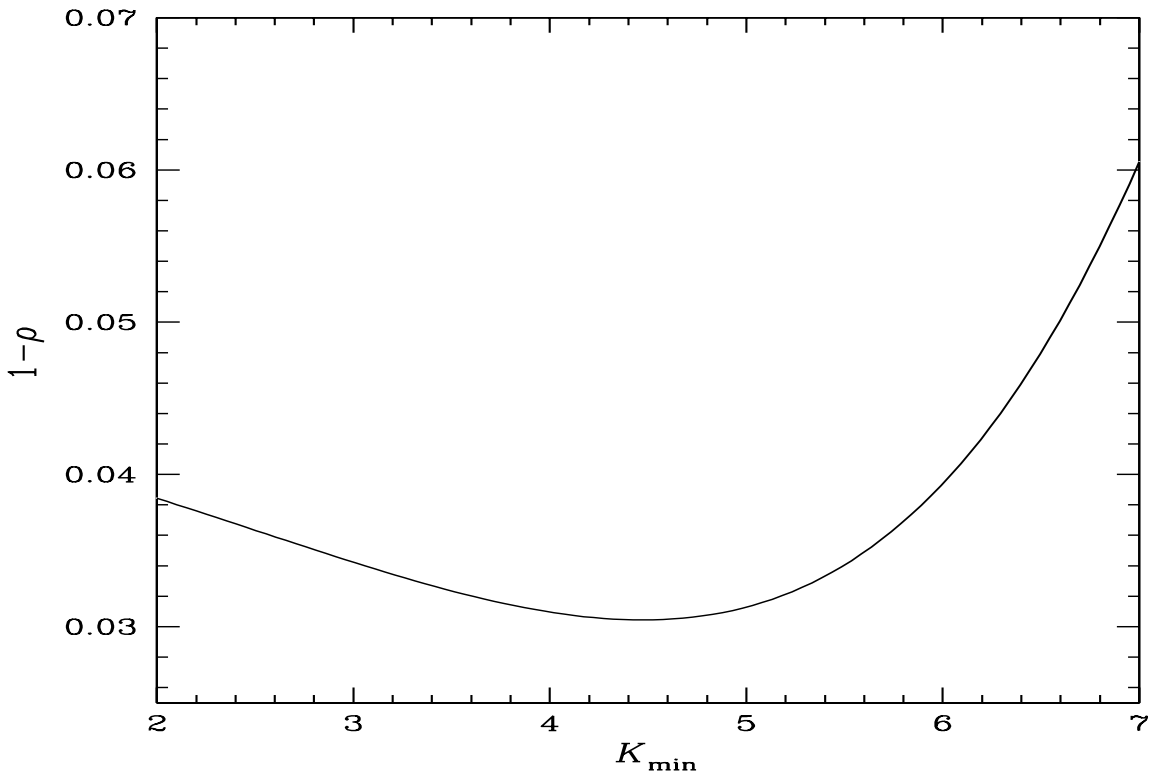
Misalignment angle (2)



(2): as a function of *minimal* magnitude of *included* galaxies

(for $K_{\rm max} = 13.57\,{\rm mag}$ corresponding to $R_{\rm eff} \simeq 300\,{\rm Mpc}/h$)

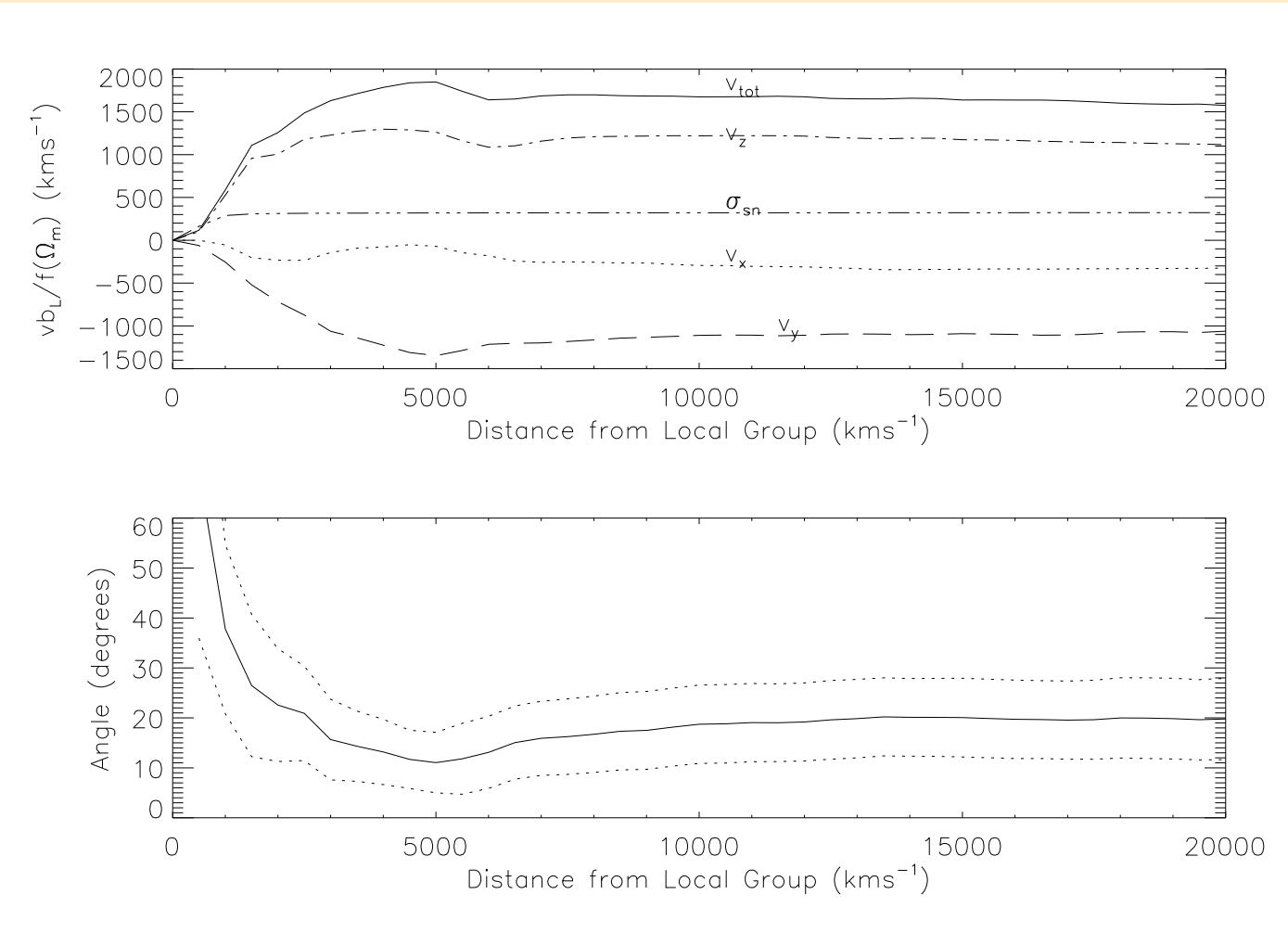
Misalignment angle: theory



Chodorowski *et al.* 2007, MNRAS

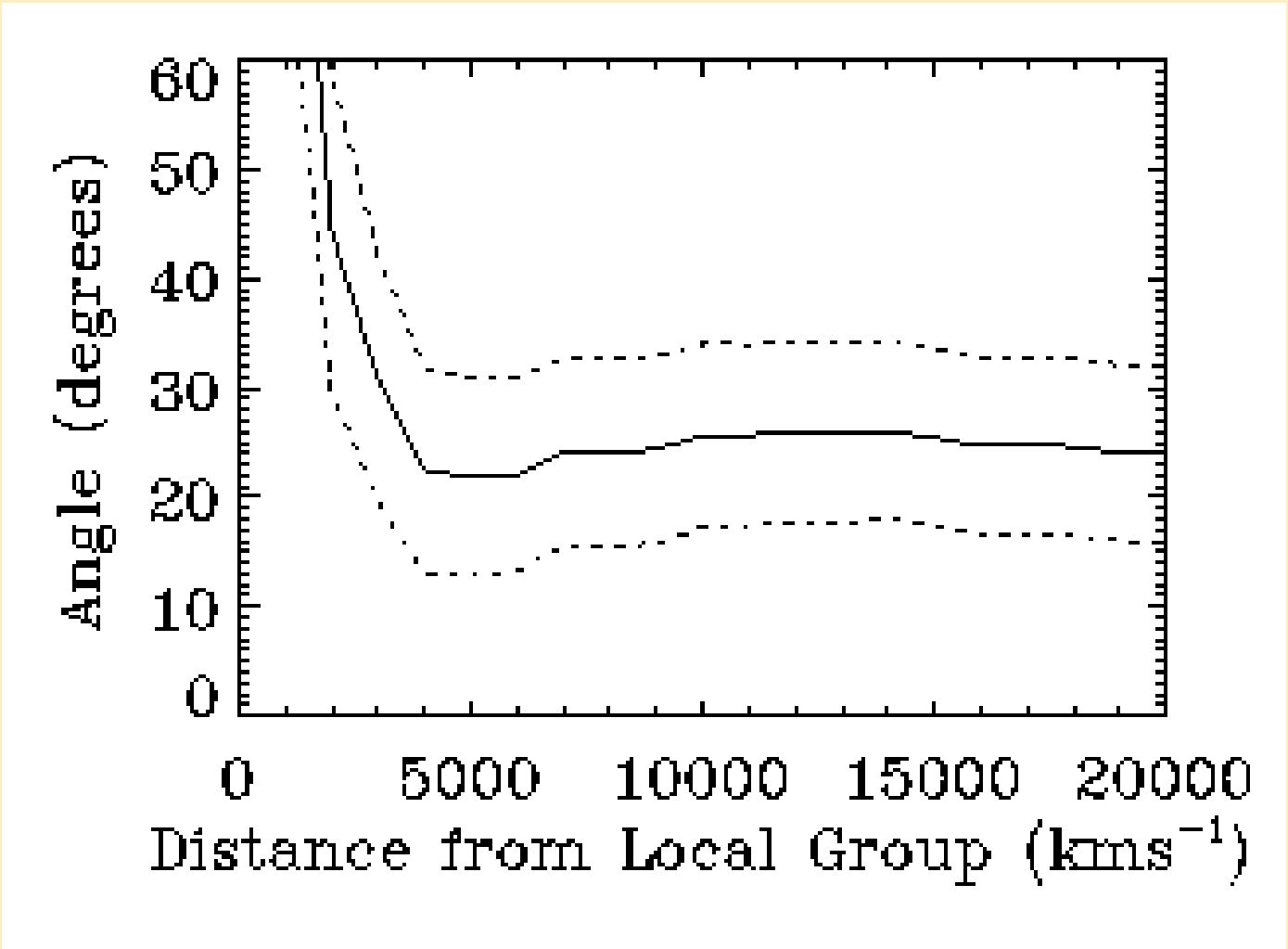
The misalignment angle $\theta \propto \sqrt{1-\rho}$, where ρ is the cross-correlation coefficient of $\boldsymbol{v}_{\rm LG}$ and $\boldsymbol{g}_{\rm LG}$. In above figure, decorrelation only due to nonlinear effects.

Erdoğdu et al. 2006, arXiv — 2MASS *Redshift* Survey



For 2M**R**S, $K_{\max} = 11.25\,\mathrm{mag}$, corresponding to $R_{\mathrm{eff}} \simeq 100\,\mathrm{Mpc}/h$

Erdoğdu et al. 2006, MNRAS — 2MASS *Redshift* Survey



CMB rest frame