SCALE-DEPENDENCE OF BIAS FROM APM-BGC SAMPLE

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Applying a discrete wavelet transformation (DWT)[1] to the spiral (SP) and elliptical+lenticular (EL) galaxies in APM bright galaxy catalog (APM-BGC)[2], we investigated the scale-dependence of bias parameter b in the linear bias model $(\delta\rho(\mathbf{x})/\bar{\rho})_g = b(\delta\rho(\mathbf{x})/\bar{\rho})_m$.

We showed that the scale-dependence of bias cannot simply be described by one parameter b. The linear bias model actually assumed that all j-spectra of the DWT-coefficient-represented bias parameters $\tilde{b}_j^{(n)}$ and $b_j^{(n)}$, where n and j are integers, are flat. Since these parameters are statistically independent, one cannot draw a general conclusion on either bias scale-independence or dependence from one or a few statistics. A systematical detection of the j spectrum is necessary.

The j-spectrum analysis of the APM-BGC galaxies shows that the scale-independent bias model is consistent with the SP and EL distributions if only statistics of 2-point correlation function or Fourier power spectrum are involved. The bias scale-dependence becomes, however, substantial when phase-sensitive statistics are applied. This result indicates that the bias scale-dependence is essentially related to the non-Gaussianity of galaxy distribution, i.e. the non-linear and non-local relationship between galaxy formation and their environment.

References

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