[S03-4] The Three-point Ellipticity-density-density Distribution

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We analyze 1008 elliptical galaxies of the Tully catalogue to determine the three-point ellipticity-density-density correlations. We investigate the alignment of the projected major axes of nearby elliptical galaxies with the directions of connecting the two nearest neighbors. From the probability density distribution, we find non-negligible signal of alignment. We also derive a theoretical ellipticity-density-density distribution from tidal field theory by incorporating the effect of projection onto the sky. It is founded that the distribution of the Tully galaxies fairly agrees with the theoretical prediction. Finally, we conclude that the three point ellipticity-density-density correlation of galaxies is consistent with the theoretical predictions, and expect that it may give an important new insight into the puzzle of galaxy formation.

[S03-5] The Axis-ratio Distribution of Galaxy Clusters in the SDSS-C4 Catalog as a New Cosmological Probe

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We analyze the C4 catalog of 748 galaxy clusters from the Sloan Digital Sky Survey (SDSS) to determine the axis-ratio distribution of their projected two dimensional profiles. It is found that the mean axis-ratio increases with cluster mass and luminosity, which is inconsistent with the result from N-body simulations where the cluster mean-axis-ratio decreases with mass. We also derive a theoretical axis-ratio distribution by incorporating the effect of projection onto the sky into the analytic formalism proposed recently by Lee, Jing, & Suto, and investigate how the theoretical distribution depends on the density parameter, Omega_{m} and the amplitude of the linear power spectrum, sigma_8. Tested against the observational data from the SDSS-C4 catalog, the theoretical prediction is found to work quite well if the background cosmology is described by the concordance model. Finally, fitting the observational data to the analytic distribution with Omega_{m} and sigma_{8} as two adjustable free parameters, we find the best-fitting value of sigma_{8}=(0.99 +/- 0.07)Omega_{m}^{(0.07 +/- 0.02)+0.1Omega_{m}}. It is a new sigma_{8}-Omega_{m} relation, different from the previous one obtained with the local abundance of X-ray clusters. We expect that the axis-ratio distribution of galaxy clusters, if combined with the local abundance of clusters, may put simultaneous constraints on sigma_{8} and Omega_{m}.